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DEVELOPMENT OF A FRAMEWORK FOR THE STANDARDIZATION OF MANAGEMENT OF DIABETES AND HYPERTENSION: THE CASE OF TSWANAS AND ZULUS OF SOUTH AFRICA.

BY

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A THESIS SUBMITTED TO THE DISCIPLINE OF PHARMACEUTICAL SCIENCES, SCHOOL OF HEALTH SCIENCES, UNIVERSITY OF KWAZULU-NATAL, WESTVILLE, FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PHARMACY

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DEVELOPMENT OF A FRAMEWORK FOR THE STANDARDIZATION OF MANAGEMENT OF DIABETES AND HYPERTENSION: THE CASE OF TSWANAS AND ZULUS OF SOUTH AFRICA

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CERTIFICATION

In this thesis the chapters are inscribed as a set of discrete research manuscripts, with a general introduction and final summary. Chapter two, chapter three and chapter four have been published while other manuscripts in the remaining chapters have been submitted to internationally recognized, peer-reviewed journals for publication.

This is to certify that the contents of this thesis are the original research work of Mr. Ebenezer K. Frimpong.

As the candidate's supervisor, I have approved this thesis for submission.
Supervisor: Dr. Manimbulu Nlooto
Signed:
Date:

PREFACE

This thesis is presented in a format of manuscripts. The findings of the study are presented in chapters 3,4,5 and 6 in a manuscript format as obligatory by the new regulations of the University of KwaZulu-Natal. A literature review has been published in the Indian Journal for Traditional Knowledge. Four manuscripts emanated from data collected. Three have been published and the other two have been submitted for publication in two reputable journals. These two journals are the Indian Journal of Traditional Knowledge (IJTK) and African Journal of Biomedical Research(AJBR).

The reference list is cited according to the instructions for authors as required by the journals where manuscripts have been submitted and according to the required reference style of each journal. A complete reference list is included at the end of chapter one and the synthesis chapter.

The dissertation consists of seven chapters as follows:

Chapter 1: Provides a background and a brief overview of the literature of the proposed study. This chapter highlights an overview of the rationale of the study, research questions, the aim, and objectives of the study. A general methodology has been included to achieve the aim and different objectives of the study.

Chapter 2: Consists of a literature review published in Indian Knowledge of Traditional Knowledge (2018) under the title "Clinical relevance and application of traditional complementary and alternative medicine for the management of diabetes and hypertension on the African continent, 2000-2017: A narrative review".

Chapter 3: Provides an original manuscript article published in Ethiopian Journal of Health and Development (2019), under the title "Management of diabetes and hypertension among Zulu traditional health practitioners: A study of focus groups".

Chapter 4: Comprises an original manuscript article published in Pan African Medical Journal (2019) under the title "Tswana traditional health practitioners' perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions".

Chapter 5: Consists of an original manuscript published in African Journal of Biomedical Research (2019) under the title "Management of diabetes and hypertension among Tswana and Zulu THPs: a comparative cross-sectional study using mixed methods approach".

Chapter 6: Provides an original manuscript submitted to Indian Journal of Traditional Knowledge (2019) under the title "Development of a modified interventional tool for the

management of diabetes and hypertension among Tswana and Zulu Traditional Health Practitioners in South Africa". Submissions ID:IJTK-1020.

Chapter 7: Provides the synthesis which includes general conclusions, strengths and limitations of the study, and then finally the recommendations.

DECLARATION 1 – PLAGIARISM

I, Ebenezer Kwabena Frimpong, declare that:

1. The research reported in this dissertation, except where otherwise indicated, is my original work.

2. This dissertation has not been submitted for any degree or examination at any other university.

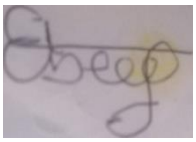
3. This dissertation does not contain other persons' data, pictures, graphs or other information unless specifically acknowledged as being sourced from other persons.

Where other written resources have been quoted, then:

i) Their words have been re-written, but the general information attributed to them has been referenced.

ii) Where their exact words have been used, then their writing has been placed inside quotation marks and referenced.

4. This exposition does not contain text, graphics or tables copied and pasted from the internet, unless specifically acknowledged, and the source is detailed in the dissertation and in the reference sections.



Signed Date : 04-06-2020

This is to certify that the contents of this dissertation are the original work of Mr Ebenezer Kwabena Frimpong as the candidate's supervisor, I have approved this thesis for submission.

Name: Prof. Manimbulu Nlooto

Signed:

DECLARATION 2 – ETHICS APPROVAL

A full ethical approval for the study was obtained from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (BE 567/17) – (Appendix I). Permission was obtained from the Traditional healers' association for both KwaZulu-Natal and North West provinces before the commencement of the study (Appendix II and Appendix III).

DECLARATION 3 – CONTRIBUTION TO MANUSCRIPTS

1. My contribution to the project was as follows:
Ebenezer Kwabena Frimpong: The first author – Contributed to the project by performing all literature reviews, data collection, statistical analysis and interpretation of the results as well as manuscript preparation and writing of dissertation.

2. The contributions of another author is as follows:
Dr Manimbulu Nlooto intellectualized and designed the study project. He supervised data collection and revised all the manuscripts for their intellectual contents and accepted the final version of each manuscript before submission to journals for publication.

DEDICATION

I dedicate this Doctor of Philosophy in Pharmacy dissertation to the everlasting memory of my elder sister Diana Afuah Gyamfuah Frimpong a medical nurse by profession who passed on in London in 2017. 1 Thessalonians 4:16-17 King James Version (KJV):

16 For the Lord himself shall descend from heaven with a shout, with the voice of the archangel, and with the trump of God: and the dead in Christ shall rise first:
17 Then we which are alive and remain shall be caught up together with them in the clouds, to meet the Lord in the air: and so, shall we ever be with the Lord.

RESEARCH OUTPUTS

A. Manuscripts published and submitted for publication

1. "Clinical relevance and application of traditional and complementary and alternative medicine for the management of diabetes and hypertension on the African continent,200-2017: A narrative review. *Indian Journal of Traditional Knowledge* Vol.17 (4), October 2018, pp.635-644.

2. "Management of diabetes and hypertension among Zulu traditional health practitioners: A study of focus groups". *Ethiopian Journal of Health and Development* 2019; 33(44):00-00.

3. "Tswana traditional health practitioners' perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions". *Pan African Medical Journal* 2019; 34:93. Doi:10.11604/pamj2019.34.93.19112.

4. "Management of diabetes and hypertension among Tswana and Zulu THPs: a comparative cross-sectional study using a mixed-methods approach". *African Journal of Biomedical Research* 2020;135-146.

5. "Development of a modified interventional tool for the management of diabetes and hypertension among Tswana and Zulu Traditional Health Practitioners in South Africa". Submitted to *Indian Journal of Traditional Knowledge*. Submissions ID:IJTK-1020.

B. Conferences

1. Oral presentation – "Management of diabetes and hypertension among Zulu Traditional Health Practitioners: A study of focus group interviews" – Thematic Session at CNPRM 2019, to be held at the Fairmont Tremblant in Mont Tremblant, Quebec, February 12th—15th.

2. The same abstract above was also accepted for an oral presentation at the 1st Joint International Conference on the potential ethnopharmacology and traditional medicine. Dakar, Senegal, 30 November – 02 December 2018.

3. Oral presentation – "Tswana traditional health practitioners' perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions"-Internal Congress of Medical Sciences (ICMS), Sofia, Bulgaria, May 09-12, 2019.

4. Poster presentation – “Tswana traditional health practitioners’ perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions”-World congress on controversies to consensus in Diabetes, Obesity and Hypertension (CODHy), Sorrento, Italy April 12-13, 2019

5. Poster presentation – “Tswana traditional health practitioners’ perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions”-The 39th Annual meeting of the Korean Society of Nephrology, May 23-26, 2019.

6. Poster presentation – “Tswana traditional health practitioners’ perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions”-42ND Annual meeting of the Molecular Society of Japan 2019, December 3-6, 2019.

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Finally, my parents (Michael Kwasi Frimpong and Cecilia Afua Frimpong) my siblings (Alexander, Benjamin, Margaret, Stella) for their prayers and support.

Thank God my Father for making it possible for me to go this far. Thank-you Jesus Christ. I am humbled by your grace and I trust you will guide me through the remaining journey.

I would like to acknowledge the financial support from the College of Health Sciences through the assistance of Dr Michelle Gordon .

Any omissions and deficiencies that may be recognized in this piece of work remain the sole responsibility of the researcher.

E.K Frimpong

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LIST OF ABBREVIATIONS

ACE: Angiotensin Conversion Inhibitors

ADA: American Diabetic Association

AFI: Ayurvedic Formulary of India

ATM: African Traditional Medicine

AU: African Union

AUA: American Urological Association

BHP: Biomedical Health Professionals

BP: Blood pressure

BREC: Biomedical Research Ethics Committee

CAM: Complementary and Alternative Medicine (CAM)

CCRAS: Central Council for Research in Ayurvedic Sciences.

CHS: College of Health Sciences

CO: Cardiac Output

DM: Diabetes mellitus

DOH: Department of Health

DST: Department of Science and Technology

EP: Ethnopharmacology

FGD: Focus Groups Discussion

GC-MS: Gas chromatography-mass spectrometry

GDM: gestation diabetes mellitus

GI: gastro intestinal

HAI: Health Action International

HBA1c: Glycosylated hemoglobin

IDF: International Diabetes Federation

IGF-1: Insulin-like growth factor

IP: intellectual property

KZN: KwaZulu-Natal

LADA: Latent Autoimmune Diabetes in Adults

MODY: Maturity Onset Diabetes of the Young

MP: Medical Practitioner

MRC-5: Medical research council cell strain-5

N/A: Not applicable

No.: Number

NS: Not stated

OCM: Orthodox Conventional Medicine

OGTT: oral glucose tolerance test

PAHO: Pan American Health Organization

PR: Principal researcher

RA: Research Assistant

SATHPCSA: South African Traditional Health Practitioners Council of South Africa

SD: Standard deviation

SPSS: Statistical package for social sciences

SSA: sub-Saharan Africa

TCAM: Traditional Complementary and Alternative Medicine

TCM: Traditional Chinese Medicine

THA: Traditional Healers Association

THP: Traditional Health Practitioner

THPCSA: Traditional Health Practitioners Council of South Africa

TLC: Thin Layer Chromatography

TM: Traditional Medicine

TPR: Total Peripheral Vascular Resistance

UKZN: University of KwaZulu-Natal

UN: United Nations

USA: United States of America

WHO: World Health Organization

WIPO: World Intellectual Property Organization

GENERAL ABSTRACT

Introduction: In sub-Saharan Africa, available World Health Organization data indicate an increase in the prevalence rate of non-communicable diseases such as diabetes and hypertension. Dwindling economies, rising costs of orthodox conventional medicines (OCM) and a lack of health care facilities in indigenous communities have led to the patronage of Traditional Medicine (TM) by the general population, with the assistance of traditional health practitioners (THPs) to combat these chronic conditions. However, the nonexistence of standardized and formalized Tswana and Zulu diabetes and hypertension treatment guidelines for THPs indicates the need to compare their methods and treatments approaches in the two culturally diverse environments. Understanding the similarities and differences of their methods and treatment approaches could serve as the basis of affirming evidence-based practice in TM that will lead to the development of a framework to assist in managing these two diseases in indigenous African communities. This study aimed to develop a framework for the standardization of traditional health practices to manage diabetes and hypertension among Tswanas and Zulus THPs in the North-West and KwaZulu-Natal (KZN) Provinces, South Africa.

Methods: A comparative cross-sectional descriptive study with mixed-method (embedded) approach was conducted in the uMgungundlovu and uThukela Districts of KZN, and the Bojanala and Dr. Ruth Sekgopomati Districts of the North-West Province. **Phase 1A** entailed a series of focus group discussions (FGDs) with 67 THPs in KZN and 40 in the North-West Provinces about their management of diabetes and hypertension in three geospatial areas (urban, traditional/tribal and farm areas), the data being analysed using thematic content analysis.

In **Phase 1B,** a researcher-administered questionnaire was used to conduct face-to-face interviews about the management of diabetes and hypertension among 437 THPs in KZN and 426 in North West Province. The qualitative data was analysed using thematic content analysis while the quantitative data was examined and reported using descriptive statistics.

In **Phase 2,** an analytical approach was used to develop a modified interventional tool that was adapted from the Ayurveda treatment guidelines for both diabetes and hypertension based on findings from Phases 1A and Phase 1B. OCM and Ayurveda health traditions experts' opinion regarding the developed diabetes and hypertension guidelines were sought after their validation

process that led to the development of a framework for the standardization of traditional health practices regarding the two conditions.

Results: This study found that most Zulu and Tswana THPs acquired their knowledge and training from one of the following ways: by a family member, other person, and gift from birth, a calling without any form of training and through professional training. The majority of Zulu THPs acquired their knowledge as a gift from birth, while the majority of Tswana THPs acquired their knowledge and training via family members. Acquisition of knowledge as a gift from birth entails a call to practice via ancestral spirits initiation, while from family members involves training received from other experienced THPs in the family. There were similarities in the Zulu and Tswana THPs cultural understanding of both diabetes and hypertension. Most THPs regarded diabetes and hypertension as the same condition, as one (having diabetes) leads to the other (hypertension). The following symptoms: weight loss, sweating easily, shortness of breath, feeling dizzy, and difficulties in breathing, excessive hunger and eyesight problems, were the most commonly reported clinical features for both diabetes and hypertension by the THPs.

Ethnopharmacological modalities and treatment approaches used by the Zulu and Tswana THPs to manage both diabetes and hypertension diseases were mainly the use of herbal mixtures, with *Aloe vera* as a major constituent. Besides, the following medicinal plants: *Hypoxis hemerocallidea*, *Persea americana*, *Sutherlandia frutescens* and *Harpagophylum procumbens* were used by both groups of THPs in its management.

Commonalities in their responses from the findings in Phase 1A and Phase 1B compared to adapted Ayurveda treatment guidelines for both diabetes and hypertension led to the development of treatment guidelines for both conditions. The developed framework to manage diabetes and hypertension for use by Zulu and Tswana THPs was validated by experts in the field of OCM and Ayurveda health traditions.

Conclusion: Some similarities were noted between the Zulu and Tswana THPs and OCM in terms of the description of clinical features of diabetes and hypertension. The use of several medicinal plants by the Zulu and Tswana THPs to manage the two diseases has been proving scientifically to be effective against them.

The interventional tool will assist Tswana and Zulu THPs to manage diabetes and hypertension within traditional African communities. Recommendations, including signing of intellectual

property (IP) agreement between the Department of Science and Technology (DST) legal experts and THPs, will help OCM researchers to obtain samples of herbal mixtures to conduct scientific research through *in vivo, in vitro* and randomized control trials (RCT) studies to make a meaningful contribution to updated versions of the developed guidelines.

CHAPTER 1

This chapter provides a background and a brief overview of literature of the proposed study. It includes the rationale of the study, research questions, the aims and objectives of the study and a summary of the methodology.

INTRODUCTION

1.1 Background and context of the study

Traditional Complementary and Alternative Medicine (TCAM) plays an important role in the healthcare delivery system of both developed and developing countries[1]. Statistics have shown that about 80% of the population in developing countries use Traditional Medicine (TM) for their health care needs [2], while alternative medicine is a growing market in developed countries. TM has contributed considerably to modern-day medicine, with many products being derived from medicinal plants [3]. Approximately 60% of the children suffering from malaria in countries such as Ghana, Nigeria, Mali, and Zambia are treated with herbal preparations [4]. Most Chinese people use herbal preparations, which accounts for 30-50% of the overall medicinal consumption. In Mexico, traditional health practitioners (THPs) are stationed in health centres built by the government to help in the treatment of diseases [5]. Many people in industrialized countries also use TCAM, with relatively high percentages of consumption having been reported in countries such as England (47%), Canada (70%) and Germany (75%) [5]. In this regard, TM is a viable alternative to orthodox medicine and therefore worthy to be investigated.

An estimated 380 million people are projected to be diabetic by 2025, which is a major cause of premature mortality in various countries on the African continent [6]. There has been an increase in diabetes mellitus (DM) patients in sub-Saharan Africa (SSA) [7], with a prevalence rate of 7% having been reported for countries such as Nigeria, Ghana, South Africa, Kenya, Guinea, and Cameroon due to poor dietary habit, obesity and inadequate physical activity as the main causative factors for type 2 diabetes amongst the adult population [8]. Further, hypertension is one of the significant factors for heart disease [9]. Hypertension and its associated health effect affects approximately one billion people [9,10] and has been identified as one of the leading risk factors globally for mortality [11]. The African Union (AU) described hypertension as a major health challenge facing the continent, with approximately 20 million people living in SSA being hypertensive [12].

Zulus and Tswanas THPs are noted for their involvement and treatment of diseases in the communities where they live in[13,14]. This is evident in a study conducted in the North-West Province of South Africa which identified diabetes, high blood pressure, measles, asthma and whooping cough as some of the diseases managed by THPs in the region[14]. A similar study conducted in KwaZulu-Natal province found that 93% of diabetic patients believed in the effectiveness of herbal preparations that they were using to manage their disease [15]. The perception of the patients regarding TM necessitate further investigation into its application. The application of TM by THPs in South Africa underscores its viability as a credible alternative to orthodox medicine. Studies have shown that THPs in South Africa are involved in the management of diabetes and hypertension[16,17] by

applying TM. A study conducted in the former Northern province of South Africa(now Limpopo) revealed the use of herbal therapies by THPs in the management of diabetes [16]. Similarly, a study conducted by Peltzer *et.al* (2001) in the Northern province of South Africa(now Limpopo) indicated the use of herbal mixtures by THPs in the management of hypertension [17]. Ironically, there is a scarcity of information on studies conducted to establish commonalities in the methods and treatment approaches employed by THPs of different ethnic groups in the management of diabetes and hypertension. The aim of this study was therefore to develop a framework for the standardization of traditional health practices to manage diabetes and hypertension among Tswanas and Zulus THPs in North-West and KwaZulu-Natal Provinces, South Africa. A framework was developed by modifying the standardized Ayurveda treatment guidelines for both diabetes and hypertension[18,19].

1.2 Brief overview of the literature

This section provides a brief overview of the literature. A comprehensive literature review has been reported in chapter 2 of this thesis.

1.2.1 Summary of application of TCAM in different parts of the globe

According to the World Health Organization (WHO), "*Traditional medicine refers to health practices, approaches, knowledge, and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques, and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being*." Furthermore, WHO defines complementary and alternative medicine (CAM) as a "*broad set of health care practices that are not part of a country's tradition, or not integrated into its dominant health care systems*" [2].

In Latin America, the Pan American Health Organization (PAHO) promotes CAM, such as herbal therapy, acupuncture and massage amongst the population in the region [20]. Most Universities in Cuba and the United States of America (USA) offer courses in TM [20]. In the Asian region, where national policies regulate traditional health practice in most of the countries, approximately 80% of the population rely on alternative medicine, with some of the most notable practices being: Ayurveda, Unani, Traditional Chinese Medicine and spiritual therapy[21]. The practice of TM has been incorporated into the health care system in countries such as India, Myanmar, Nepal, and Thailand, with TCAM courses being taught in institutions of higher learning in most countries[21].

The incorporation of CAMs into the curriculum of education in Europe was accepted when it was recognized by European parliament. Most European countries have enacted policies to regulate and license CAM practitioners[22]. A case in point is the United Kingdom, where public sector hospitals have been established purposely to regulate the practice of CAM, such as homoeopathy[22].

A survey conducted in Australia revealed that a fifth of its population used alternative medicine [23]. This is evident in the exponential increase of patronage by patients despite a well-established medical health system, the situation is largely due to CAMs influence in managing chronic conditions [24]. Chronic diseases, such as diabetes and high blood pressure, are being managed using alternative medicine [25], with the economic impact in Australia estimated to be four billion Australian dollars annually [26].

Turning our attention to Africa, African Traditional Medicine (ATM) incorporates herbs and spiritual means in curing diseases[27,28] and consists of approximately 5000 species of plants[29]. Within the past decade, the development and recognition of ATMs have received support from the WHO, with a resolution on ATM having been passed by World Health Assembly in 2003 that led to the declaration of August 31st each year as being ATM day[2]. In 2001, during an African Union(AU) summit, the various heads of state declared 2001-2010 as the ATM decade of excellence, which led to the formation of regulatory bodies for healers associations in some of the countries [30].

1.2.2 Description of established and recognized systems of TCAM

1.2.2.1 Ayurveda

This traditional medicine system dates back to 1500 BC, it is widely known as the science of life. Ayurveda derived its name from these Sanskrit words Ayur (life) and Veda (Knowledge). Ayurveda describes a human being as a composition of water, fire, earth, air, and vacuum. Ayurveda placed much emphasis on the theory of tridoshas Vata(ether and air), pitta(fire) and Kapha(earth and water). Vata, Pitha and Kapha known as the three doshas in Ayurveda are the physiological units in human beings. It is significant to point out that a person achieves good health when the above mentioned three doshas are in equilibrium. According to Ayurveda, a person becomes sick when there is a disturbance in the three doshas due to internal or external factors such as emotional and physical stresses, weather conditions, diet, work and family relationships[31]. Treatment regime in Ayurveda comprises exercise, diets and lifestyle management on the part of individuals[32]

1.2.2.2 Traditional Chinese Medicine (TCM)

This important traditional medicine system dates to thousands of years and depends on the Yinyang and Wuxing concepts. TCM formula composed of different drugs that function together to produce a synergistic effect in an individual[33].

1.2.2.3 Unani

Unani traditional medicine systems evolved from Greco-Arabic medicine over the past 2500 years. Unani therapy focusses on an individual's body, soul and mind as a unit. Its philosophy is based on the fact that an individual acquires a disease as a result of a disorder in his or her temperament[33].

1.2.2.4 Kappo traditional medicine

This traditional medicine system evolved over the past 1400 years. Its philosophy leans on the fact that an individual acquires disease as a result of the psychic disorder as such its therapy focusses on an individual rather than the illness[33].

1.2.3 Traditional Health Practitioners (THPs) in Africa

THPs employ culturally linked appropriate methods of healing of diseases on the African continent[34]. Studies have shown that the acquisition of knowledge and training of THPs assist them in the management of diseases. In a study carried out in Zambia, THPs stated that they acquired knowledge used in the management of diseases from other family members[35]. Similarly, THPs in Cameroun acquired knowledge of medicinal plants used in the management of diseases from other family members[36]. In Lesotho, approximately 34% of THPs interviewed in a study conducted revealed that they acquired their knowledge used in the management of diseases from ancestral spirits[37]. In South Africa, 27 THPs who were interviewed in the five regions of the Limpopo province stated that they acquired their knowledge and training through other THPs, elders in their families and ancestral spirits via dreams [38]. Studies conducted in Africa have shown that THPs acquired knowledge used in the management of diseases through professional training. In Cameroun, 36 out of 106 THPs who were trained about diabetes and its management were accessed eight months after the workshop to find out if they were applying the knowledge they acquired during the workshop. Findings from the study revealed that most of the 36 THPs could remember what they were taught during the workshop[39]. In South Africa, about 51 THPs who took part in at least one of the three diabetic workshops organized in the Nelson Mandela Metropole within 17 months had a basic understanding of diabetes and its complications when they were accessed via individual interviews after the study period[40]. Regarding diagnosis, THPs in Lusaka, Zambia stated that they relied on spiritual guidance for diagnostic purposes in the management of hypertension[41]. Similarly, some THPs in the Northern Province of South Africa (now Limpopo) relied on spiritual guidance via ancestors for diagnosis purposes[42]. In Nigeria, THPs in a study conducted in stated that they relied on the signs and symptoms reported by patients seen by them in the management of diabetes[43].

Studies in Africa have shown that most THPs employ the use of herbal mixtures in the management of diseases. A study conducted in Kenya revealed that THPs prescribed herbal mixtures to their patients for the management of diabetes[44]. Similarly, THPs in the Nelson Mandela Metropole of South Africa prescribed herbal mixtures in the management of hypertension[45].

1.2.4 Relevance of THPs on health care in Africa

Many people living in Sub-Saharan Africa (SSA) consult THPs for their health care needs [46,47]. The need to recognize THPs in the broader health care system has been emphasized as they are often accessible to the communities they serve [48]. The ratio of Medical Practitioners (MPs) to patients is remarkably high than that of patients and THPs[49]. Table 1 presents the ratios of MPs and THPs to patients in selected African countries.

Table 1 Ratios of MPs and THPs to patients in selected African countries.

Country	MPs: Patient	THPs: Patient	Reference
Ghana	1:6250	1: 200	[49]
Uganda	1:25000	1:700	[49]
Swaziland	1:10000	1:100	[49]
South Africa	1:1000	1:170	[50,51]
Uganda	1:25,000	1:700	[49]
Zimbabwe	1:6,250	1:600	[49]

In Nigeria, a study including 388 people in Lagos showed that herbal therapy recommended by THPs is the preferred mode of treatment for diabetes [52]. A study conducted in Uganda reported the usage of TM with the help of THPs amongst inhabitants in the Iganga and Bugiri Districts due to its affordability and the scarcity of diabetic drugs in clinics and pharmacies [53]. Research carried out in selected South African communities revealed the usage of TM with the assistance of THPs to manage hypertension among mainly female participants [54].

1.2.5 Traditional Health Practice in South Africa

THPs in South Africa provided services long before the Dutch colonised the Cape in the 17th century [55]. Under colonial rule, THPs were not allowed to practice freely due to the enactment of a Witchcraft Suppression Act, which came into force in 1957 [56]. However, this did not prevent them from providing services and being given recognition in the societies where they operated. THPs continue to be consulted as they are readily available and accessible, and understand the culture of the people in the communities in which they live, being able to assist their patients accordingly [57]. The enactment of the Traditional Health Practitioners Act in 2007 established the Interim Traditional Health Practitioners Council (THPC) in South Africa (Act No 22 of 2007)[58]. This act recognises four main categories of practitioners who should undergo a minimum period of training within a stipulated time to practice: diviner (12 months), herbalist (12 months), traditional birth attendant (12 months) and traditional surgeon (5 years) [59].

1.2.5.1 Diviner (sangoma,umthandazi or amagqirha)

Sangoma is an indigenous isiZulu term for a THP who had been called by ancestors to practice as a healer. Most of these THPs are females and diagnose patients with the help of ancestral spirits. They rely on throwing of bones to ascertain what is wrong with an individual and application of appropriate remedy to heal an individual as well as prediction of the future of a client(patient) in consultation for their services[60]. Umthandazi is a person known as a faith healer in isiZulu culture whiles amagqirha is a faith healer in isiXhosa culture. Umthandazi or amagqirha relies on divine intervention to heal people from their diseases[60].

Herbalist (*izinyanga/amaxhwele*)

These THPs are predominantly males and possess extensive knowledge about the curative properties of medicinal plants and herbs in the treatment of diseases. Most of these THPs use parts of medicinal plants (roots, the bark of trees and leaves), herbs and animal parts to treat diseases[61].

1.2.5.2 Traditional birth attendant (*ababelethis*i or *abazalisi*)

These THPs are predominantly females who perform the roles of midwives in local communities within the African continent. THPs assist in the delivery of babies when women are in labour in indigenous communities across the African continent [61].

1.2.5.3 Traditional surgeon (*iingabi*)

These are THPs who are responsible for male circumcision within African communities; they mostly perform their duties during the initiation of teenagers into adulthood organized by various tribes on the continent[62]

1.2.6 Managing both diabetes and hypertension using OCM and TCAM methods

1.2.6.1 Diabetes Mellitus (DM)

DM is a chronic metabolic disorder associated with insulin deficiency. In summary, the pathophysiology of DM entails the following mechanisms: Insulin is responsible for the regulation of glucose to the cells of the body (liver, adipose, and muscle) except for smooth muscle. Insulin reaches the smooth muscle via insulin-like growth factor-1(IGF-1) which is a normal hormone in the blood responsible for the regulation of the effects of growth hormone. The supply of glucose to the body is obtained from the intestinal absorption of food and the disintegration of glycogen to glucose in the liver and non-carbohydrate substrates. To maintain glucose levels in the body, insulin

is needed to inhibit the breakdown of glycogen, stimulate the transportation of glucose to the fat tissues and muscles and store glucose in the form of glycogen. Insulin defect and insensitivity of its receptors play a major role in the formation of diabetes because of poor regulation of glucose in the human body[63].

Type1 and Type 2 (Insulin resistance) are the two main types for DM [64]. Type 1 diabetes is characterised by β-cell annihilation typically immune mediated resulting to complete insulin deficiency while Type 2 diabetes is characterised by hyperglycaemia in relation to progressive resistance to the action of insulin resulting to the loss of β-cell function with time thereby affecting insulin secretion[65,66].

Type 1 is mostly associated with children, while Type 2 is commonly diagnosed with adults [67]. Contributory factors of Type 1 diabetes are as follows: the annihilation of the beta cells associated with the pancreas, the manifestation of antibodies to islet cells, genetic disposition and environmental factors, while obesity, high blood pressure and limited physical activity are the major contributory factors associated with an individual acquiring Type 2 diabetes[65,67,68].

Other forms of diabetes have been identified these include gestation diabetes mellitus (GDM), maturity-onset diabetes of the young (MODY) and latent autoimmune diabetes in adults (LADA). GDM is detected during pregnancy caused by varying degrees of glucose intolerance [69], while MODY is caused by monogenic disorders as a result of β-cell dysfunction [70]. LADA occurs in older adults as a result of the type 1 process showing similar clinical phenotype as Type 2 diabetes [71].

According to the American Diabetic Association (ADA), the signs and symptoms that indicate a person to be diabetic include: loss of sight, tiredness, slow healing of wounds, frequent urination and thirst [72,73]. Diabetes is diagnosed when a test conducted revealed an average plasma concentration within a period (≥6.5%), or a two-hour plasma of glucose (≥11.1mmol/l) and fasting plasma glucose (≥7.0 mmol/l) via an oral glucose tolerance test (OGTT) [74].

Type 1 diabetes is mostly treated with insulin, with hypoglycemia and weight gain is some of the side effects [75]. Metformin, glibenclamide, statins, and fibrates are used by patients to treat type 2 diabetes, with ophthalmic and cerebrovascular conditions being some of its complications [76-78]. The use of drugs depends on the nature of diabetes, the persons' age and other factors of an individual diagnosed with the disease. Concerns have, however, been raised over the usage of anti-diabetic drugs due to their side effects, such as gastrointestinal (GI) complications and hypoglycemia [79].

Owing to the side effects of orthodox medicine, people have resorted to using alternative medicine to treat diabetes and its complications. Unlike conventional medicine, which establishes how a disease is manifested, TM explains the reason why an individual is affected by a disease at a specific point in time and introduces the cosmological part of a disease cause [80]. THPs knowledge about

diabetes in Kenya revealed that 'sugar disease' was a common terminology used to describe this chronic condition by traditional healers [44]. Chege *et al.* (2015) reported that THPs associated diabetes with worm infestation, stress and poor diet habits. Treatment approaches employed by THPs in Kenya included parts of plants, animals, and minerals (dispensed in the form of powder or suspension to patients) accompanied by lifestyle management advice to patients [44].

In Cameroun, THPs believed that diabetes was caused by witchcraft and could only be cured by supernatural powers and not biomedical trained health professionals, who can only treat the symptoms of diseases [39]. In South Africa, a study among THPs revealed that their knowledge about diabetes was as a result of information received from the ancestors through spiritual means [42]. THPs in the northern province of South Africa (now Limpopo) described diabetes as a 'disease of sugar', and mentioned a decrease in weight, headache and constant urination as some of the signs and symptoms [42].

A study conducted in Nigeria identified 115 plants with hypoglycemic effects, such as *Aloe vera*, *Allium sativum* and *Momordica charantia* [81]. Approximately 23 plants are widely used by the Basotho tribe (Free State Province) to manage diabetes, these plants (*Panax ginseng*, *Allium sativum*, *Papaver somniferum*, and *Taraxacum officinale)* are being used to treat diabetes complications [82,83]. Medicinal plants (*Euclea undulata, Schkuhria pinata* and *Elaeodendron transvaalense*) purchased from THPs in various locations across South Africa have shown hypoglycaemic activities [84].

1.2.6.2 Hypertension

Hypertension is clinically diagnosed in a patient having (≥140/90 mmHg) confirmed by a successive ambulatory blood pressure monitoring day time average or home blood pressure monitoring average((≥135/85 mmHg)[85]. In summary, the pathogenic mechanism involves an elevation of cardiac output (CO) or total peripheral vascular resistance (TPR), with both being elevated in most hypertensive patients[86]. The important physiological mechanisms actively involved in the development of hypertension are as follows: First, the Autonomic nervous system: in regulating blood pressure, the autonomic nervous system plays a significant role, with an increase in peripheral sensitivity to norepinephrine in hypertensive patients. In addition, hypertensive patients are susceptible to a higher rate of responsiveness to stressful stimuli in their daily activities[86] Secondly, Sodium and water excretion: retaining sodium and water results from an unhealthy relationship between pressure and sodium excretion due to a reduced renal blood flow while a steadily rise of angiotensin causes an increase in blood pressure[86].

Thirdly, the role of vasodilators: potential vasodilators, such as bradykinin and nitroxide, help to regulate blood pressure[87]. The deactivation of bradykinin by angiotensin-converting enzymes (ACE)

leads to an increase in blood pressure[87]. Last but not the least, the Renin-angiotensin system: **t**he secretion of renin from the juxtaglomerular apparatus associated with the kidney leads to the conversion of substrate renin (angiotensinogen) to angiotensin I. Angiotensin I, which is physiologically inactive, is quickly converted to Angiotensin II, specifically in the lungs. This potential vasoconstrictor, such as Angiotensin II, causes an increase in blood pressure[87] Essential and secondary are the two major types of hypertension, the former being most frequently diagnosed, with secondary being caused by a reversible factor, sometimes being curable [88].

The signs and symptoms of hypertension include a feeling of dizziness, headache in the morning and blurred vision [89]. It has been reported that to control and prevent hypertension, lifestyle modification is very important [90], with the blood pressure (BP) needing to be checked every 3-6 months to control hypertension [91]. Hypertension is treated mostly with ACE inhibitors, diuretics, beta-blockers and calcium antagonists [92]. The side effects of anti-hypertensive drugs have been reported and include depression, headache and swollen ankles [93].

In Zambia, THPs described hypertension as a disease associated with weakness in the body, breathing rapidly and fast flowing of blood in the body [41]. THPs in the above study also stated that information received from the spiritual realm helps them to diagnose a patient; they mentioned stroke and enlargement of the heart as some of the complications associated with this chronic condition and preferred herbal therapy for the management of the disease [41]

In another study on hypertension in South Africa, THPs mentioned hypertension as a disease related to high blood pressure in their local dialect [94]. Feeling of dizziness and pains in a person's body were some of the symptoms associated with hypertension. Furthermore, THPs also stated that they obtained diagnostic information about this disease from ancestors in their dreams [94].

A study found that 96% per cent of the people living in SSA used herbal medicine to treat hypertension.[95] In a survey conducted in Nigeria, about 21% of the urban population used garlic (*Allium sativum*) in the management of hypertension [96].

1.2.7 Relevance of guidelines used in the management of diabetes and hypertension.

In the management of diabetes and hypertension, there are standard treatment guidelines that have been developed to assist practitioners in OCM and Ayurveda health traditions to treat patients affected by this chronic conditions[18,19,97,98]. These developed treatment guidelines contain information about causes, signs and symptoms, steps to follow in diagnosing a patient, complications of diabetes and hypertension, pharmacological and non-pharmacological approaches to be adopted in the management of these two diseases.

These guidelines are normally updated annually by a committee of experts involved in the management of both diabetes and hypertension. Ayurveda practitioners and BHPs are taking through to acquaint themselves with current information from updated versions of these standard treatment guidelines for effective management of both diabetes and hypertension. It is significant to point out that unlike Ayurveda treatment guidelines for both diabetes and hypertension (Appendix XIX and Appendix XX) which assist Ayurveda practitioners to manage diabetes and hypertension, there is a non-existent tool to assist Zulu and Tswana THPs in the management of diabetes and hypertension.

1.3 Rationale of the study

An estimated 438.4 million people with diabetes will be globally disease-ridden by 2030 [99]. A study conducted in South Africa revealed a high prevalence rate of diabetes among the adult population [100]. Hypertension has been identified as one of the leading risk factors (globally) for mortality [11]. Poor health outcomes associated with allopathic medicine for chronic conditions encourage many people to rely on alternative medicine [54,101].

Approximately 80% of the population in sub-Saharan Africa consult THPs for their health care needs who do not have a standardized protocol for their practice [102]. The general acceptance of TM in modern science is still not encouraging yet little has been done to ascertain its reliability and effectiveness in terms of practice [103]. Even though TM legitimacy and treatment approaches have been challenged [104], its usage in modern-day Africa is on the ascendancy without much documented adverse effects [105].

About 400 plants with anti-diabetic effects such as *Allium sativum*, *Gymnema Sylvestre* and *Momordica charantia* and medicinal plants with antihypertensive properties (Olea europaea, subspecies Africana leaves) have been documented[106,107] Clinical trials research conducted with patients confirmed the effectiveness of alternative medicine in the management of diabetes and hypertension[108-111]. A controlled clinical study in India found that herbal extracts helped in the reduction of blood sugar levels of patients diagnosed with type 2 diabetes [112].

The practise of traditional healing is associated with the culture and environment within which THPs operate. However, similarities and differences in treatment approaches employed by THPs in different cultures and environments are not well documented. Some studies have reported the use of herbal mixtures for the management of diabetes and hypertension[16,17,113] Comparison and outcomes of treatments similarities or differences among THPs from different cultures and environment may as well be used as ways for affirming the evidence base of practice which could lead to standardization of treatment approaches. A well-documented framework may serve as a guide to

researchers who are interested in traditional practices and treatment approaches used by THPs from Tswana and Zulu cultures. The development of a framework will assist policymakers in the regulation of traditional practices about the management of diabetes and hypertension as well as curriculum development for the training of THPs. Besides, it will help health authorities in various countries to evaluate and monitor the management of diabetes and hypertension among THPs. Health promotion and awareness about TM methods and practices among the general population will be greatly enhanced. These developed guidelines to be used by THPs in the management of diabetes and hypertension will boost the confidence people have in this health tradition that is culturally appropriate to their health needs and cost-effective. More importantly, for the industry to self-regulate which will motivate formal research into the medicinal properties of the formulations but with intellectual property protection to THPs. Lastly, it will assist researchers to obtain credible information from patients who seek THPs treatment care options for randomised control trial (RCT) purposes. This study aims to develop a framework for the standardization of traditional health practices for the management of diabetes and hypertension following perspectives from Tswanas and Zulus THPs in North-West and KwaZulu-Natal Provinces, South Africa.

1.4 Conceptual framework

The conceptual framework (**Figure 1**) will focus on the factors contributing to the lack of standardization of management of diabetes and hypertension by THPs. These factors are assembled under bio-physiological, education and research, interventions as well as socio-cultural causative groups.

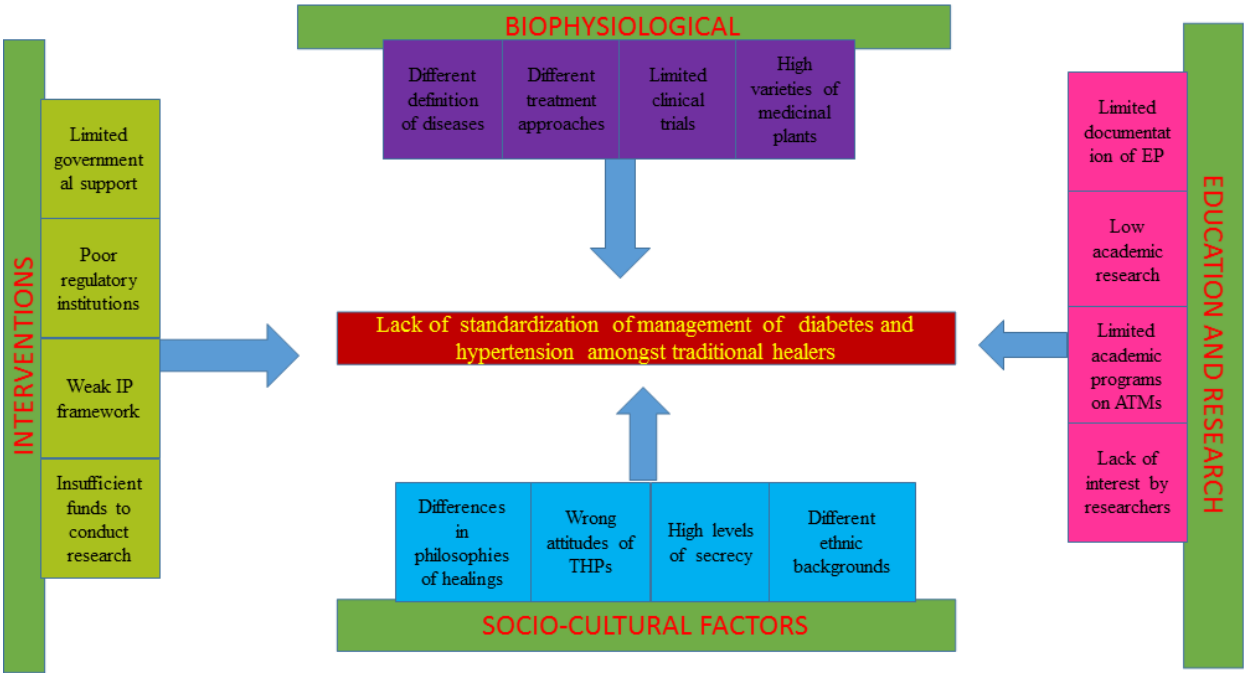

Figure 1. A conceptual framework for the study developed from the extant literature.

Legend: ATM: African traditional Medicine; EP: ethnopharmacology; THP: traditional health practitioners; IP: intellectual property.

1.5 Research questions, aims, and objectives

1.5.1 Research questions

The general question that this study aims to answer was as follows: "what are the factors contributing to the standardization of management for diabetes and hypertension by traditional healers amongst Zulus and Tswanas?" Our specific questions were as follows:

1. How do Tswanas and Zulus THPs acquire their knowledge and training on the management of diabetes and hypertension?
2. What are the similarities and differences in the cultural understanding of the above two diseases amongst Tswanas and Zulus THPs?
3. What are the similarities and differences in the description of clinical features of diabetes and hypertension amongst Tswanas and Zulus THPs?
4. What are the similarities and differences in the ethnopharmacological and treatment approaches used by Tswanas and Zulus THPs for diabetes and hypertension?
5. How can an intervention framework help for the standardisation of management of diabetes and hypertension by Tswanas and Zulus THPs?

1.5.2 Aims and objectives of the study

This study aimed to determine the factors contributing to the standardization of management for diabetes and hypertension by traditional healers. The specific objectives were as follows:

1. To establish whether Tswanas and Zulus THPs acquire specific knowledge and training on the management of diabetes and hypertension.
2. To determine similarities and differences in the cultural understanding of diabetes and hypertension amongst Tswanas and Zulus THPs.
3. To evaluate similarities and differences in the description of clinical features of diabetes and hypertension amongst Tswanas and Zulus THPs.

4. To determine similarities and differences in the ethnopharmacological and treatment approaches used by Tswanas and Zulus THPs for diabetes and hypertension
5. To develop an intervention framework for the standardization of treatment approaches of diabetes and hypertension by Tswanas and Zulus THPs.

1.6 General methodology

1.6.1 Study design

A comparative cross-sectional study was carried out amongst Tswanas and Zulus THPs managing and treating diabetes and hypertension in using the mixed-method (embedded) approach, whereby the interview guide and questionnaire had the same focus[114]. The interview guide and the questionnaire seek to elucidate the same response from the THPs included in this study. This study was carried out in different phases described below:

Phase 1. Mixed qualitative and quantitative approaches:

Phase 1A. Focus Group Discussions (FGDs) consisting of not more than 14 Tswana or Zulu THPs as recommended by these researchers[115] was carried out about the management of diabetes and hypertension, using an interview guide among THPs, in the three geospatial areas (urban, traditional or tribal and farm areas).

Phase 1B. A researcher administered questionnaire was conducted using face- to- face interviews about the management of diabetes and hypertension amongst Tswanas and Zulus THPs.

Phase 2. An analytical approach was undertaken to develop an interventional framework based on standardized Ayurveda treatment guidelines for diabetes and hypertension[18,19].

Description of study sites

Figure 2 illustrates the sites where the study was carried out in South Africa.

1.6.2 Study areas

KwaZulu- Natal province has a population of about 10 million and occupies 7.7 percent of the Country's land area. Its capital is Pietermaritzburg and Durban is the economic hub for the province. The province shares a border with the Kingdom of Eswatini[116].

The North-West province has 8.7% of South Africa's land area. It has a population of about 3.5 million. Its Capital is Mahikeng with Potchefstroom as a major city. The province shares a border with Botswana[116] (www.brandsouthafrica.com).

Figure 2. Map of South Africa showing study areas with red arrows a: North-West; b KwaZulu-Natal[117] (www.castserve.com).

1.6.3 Study population, inclusion and exclusion criteria

In both phases, 1A and 1B, the inclusion criteria for participants was a minimum of aged 18 years with more than one year's experience in managing diabetes and hypertension. Those eligible THPs with less than one year of experience in the management of both diabetes and hypertension were excluded from the study.

1.6.4 Recruitment and selection of participants

Zulu and Tswana THPs were recruited based on our inclusion and exclusion criteria relevant to the study research questions. A researcher needs to find a sample that matched the established criteria.

1.6.5 Sample size and sampling technique

Phase 1A: This study included Zulu and Tswana THPs aged 18 years old and above, irrespective of gender. THPs were drawn from urban, traditional or tribal, and farm areas in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa. THPs experienced in the management of diabetes and hypertension were eligible for this study. Purposive sampling was used to select participants[118]. 67 Zulu and 40 Tswana THPs took part in Phase 1A of this study.

Phase 1B: A snowball sample method was employed to recruit participants for the study[119]. Each participant who took part in the face-to-face interviews was used to refer to other THPs for the study.

The calculation of sample size:

A sample size with a statistical power of 80% was computed using the following statistical parameters: Effect size equals 0,33type 1 error(α) equals 0,05(the probability of falsely rejecting the null hypothesis equals to 5% and a type 2 error (β) equals 0.02 (the probability of falsely failing to reject the null hypothesis equals 20%). Based on the above parameters a minimum sample size of 93 participants (THP's) was computed for each geospatial location in each municipality in the North West and KZN provinces. To maintain the precision across the 12 selected geospatial locations, the total sample size was computed for 1,116(93x12) participants in this study, with 558 participants in each province respectively [120]. A sample size of 1,116 THPs, from both North-West and Kwa Zulu-Natal provinces, was targeted for the face-to-face interviews. A total of 863 THPs comprising of 437 Zulus and 426 Tswanas representing 77, 33% of the targeted population of 1,116 took part in the study.

Phase 2: In phase 2, an analytical approach was undertaken to develop an interventional framework based on standardized Ayurveda treatment guidelines for diabetes and hypertension[18,19].

1.6.6 Data collection techniques and tools

The data collection methods employed in Phase 1A and Phase 1B were as follows:

Phase 1A: FGDs with the help of developed interviewed guide (Appendix V) were held in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa to find Zulu and Tswana THPs to find Zulu and Tswana THPs about the management of both diabetes and hypertension. It is significant to point out that the interview guide employed in the FGDs held in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa was translated from English to isiZulu and Tswana languages by experts for content validity.

Phase 1B: This phase was a mixed-method (embedded approach) study and involved researcher administered interviews. Face-to-Face interviews with Zulu and Tswana THPs were conducted with the help of semi-structured questionnaire (Appendix VIII) which was translated from English to isiZulu and Tswana languages by experts for content validity. The semi-structured questionnaires

employed in Phase 1B of the study collected information on the socio-demographics of the participants. In addition, the research administered questionnaire contained questions on cultural understanding of both diabetes and hypertension diseases, training and acquisition of knowledge for the management of diabetes and hypertension, signs and symptoms of diabetes and hypertension, medical complications of both diabetes and hypertension, treatment modalities and approaches used in the management of diabetes and hypertension, challenges faced in the management of diabetes and hypertension and recommendations to improve diabetic and hypertensive care in South Africa. Zulu and Tswana THPs were visited in their homes, place of work and sometimes during their monthly meetings. The study was conducted concurrently, between September 2018 and September 2019 in both KwaZulu-Natal and North-West provinces.

Phase 2: In phase 2, findings from Phase 1A and Phase 1B and an adapted modified Ayurveda treatment guidelines for both diabetes and hypertension (Appendix XIX and Appendix XX) led to the development of a modified interventional tool to be used by Zulu and Tswana traditional health practitioners in the management of diabetes and hypertension

1.6.7 Data analysis

Phase 1A: Qualitative data from the FGDs carried out in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa were analysed following Tesch's recommendation of identifying themes and sub-themes in the raw transcribed data. The following steps were followed: First, transcriptions were read thoroughly, and general ideas were written down; second, an attempt was made to get a general understanding of the statements made by THPs in the study; third, similar topics were clustered together; fourth, topics were abbreviated, and the codes were written down. Topics identified from step 4 were turned into categories. A decision was taken on each abbreviated category and codes were alphabetized. The final step, a preliminary analysis, was performed to arrange data belonging to each category.

Phase 1B: Qualitative data from the mixed-method (embedded) study approach carried out in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa were analysed following Tesch's recommendation of identifying themes and sub-themes in the raw transcribed data as described in Phase 1A of this study. For quantitative data analysis, data was captured on an excel sheet and analysed using the software package for social sciences (SPSS) version 20 for windows[121]. A descriptive statistics analysis was performed using frequencies and percentages. Categorical variables was presented using tables and graphs.

Phase 2:

In **Phase 2,** an analytical approach was used to develop a modified interventional tool that was adapted from the Ayurveda treatment guidelines for both diabetes and hypertension based on findings from Phases 1A and Phase 1B. OCM and Ayurveda health traditions experts' opinion regarding the developed diabetes and hypertension guidelines were sought after their validation process that led to the development of a framework for the standardization of traditional health practices regarding the two conditions.

1.6.8 Ethical considerations

The study has received approval from the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal under reference number: BE 567/17. The purpose of the study and procedural formalities were explained to participants. Participation was voluntary; in the various FGD sessions participants were requested to give informed consent before being interviewed.

1.7 Layout of the dissertation/structure of the dissertation

The dissertation is entitled "Development of a framework for the standardization of management of diabetes and hypertension: The case of Tswanas and Zulus of South Africa".

This study employing a mixed methods study approach has been conducted in both uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa.

The dissertation comprises of:

- **Chapter 1**: Provides a background and a brief overview of the literature of the proposed study. This chapter highlights an overview of the rationale of the study, research questions, the aim, and objectives of the study. A general methodology has been included to achieve aim and different objectives of the study.
- **Chapter 2**: Consists of a literature review published in *Indian Knowledge of Traditional Knowledge* (2018) under the title "Clinical relevance and application of traditional complementary and alternative medicine for the management of diabetes and hypertension on the African continent, 2000-2017: A narrative review".
- **Chapter 3**: Provides an original manuscript article published in *Ethiopian Journal of Health and Development* (2019), under the title "Management of diabetes and hypertension among Zulu traditional health practitioners: A study of focus groups".

- **Chapter 4**: Comprises an original manuscript article published in *Pan African Medical Journal* (2019) under the title "Tswana traditional health practitioners' perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions".

- **Chapter 5**: Consists of an original manuscript published in *African Journal of Biomedical Research* (2020) under the title "Management of diabetes and hypertension among Tswana and Zulu THPs: a comparative cross-sectional study using mixed methods approach".

- **Chapter 6**: Provides an original manuscript submitted to *Indian Journal of Traditional Knowledge* (2019) under the title "Development of a modified interventional tool for the management of diabetes and hypertension among Tswana and Zulu Traditional Health Practitioners in South Africa".

- **Chapter 7**: Provides the synthesis which includes general conclusions, strengths and limitations of the study then recommendations.

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CHAPTER 2

A narrative review was carried out to find the clinical relevance and the management of diabetes and hypertension on the African continent. The review was carried out to ascertain the use of Traditional Medicine and the role played by traditional health practitioners in the management of diabetes and hypertension on the African continent. The findings are published in the *Indian Journal of Traditional Knowledge*. The final version of the article is presented in chapter 2.

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Clinical relevance and application of traditional complementary and alternative medicine for the management of diabetes and hypertension on the African continent, 2000-2017: A narrative review

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Evidence based Traditional complementary and alternative medicine (TCAM) in the management of diabetes and hypertension is essential for its general acceptance in the scientific community.The aim of this study was to find clinical relevance and use of TCAM in the management of diabetes and hypertension on the African continent. To achieve our aim Google scholar, web of science, Pub-med and Cochrane library electronic databases were searched for the period 2000-2017 using specific keywords related to the study. Based on our search criteria regarding the use of TCAM in the management of these chronic conditions (diabetes and hypertension) 24 papers were finally selected and analyzed in this study. The results suggest a prevalence rate of 17-84 % TCAM use among the studied population with the use of mainly herbs and medicinal plants in the management of diabetes and hypertension. Our findings have shown that there is ample evidence of TCAM use in the management of diabetes and hypertension on the African continent. There is an urgent need to conduct research into the potency of medicinal plants as well as find the effect of concurrent use of TCAM and conventional drugs in human beings suggested by WHO in its health policy document released in 2002.

Keywords: African Traditional Medicine, Disease management, Traditional health practitioners, Indigenous knowledge

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People living in developing countries depend on traditional medicine (TM) for their healthcare needs[1]. The use of traditional complementary and alternative medicine (TCAM) among a population varies from one country to the other. The prevalence rate of the use of complementary and alternative medicine (CAM) was estimated at 40 % among the general population in the USA[2] while a prevalence rate of CAM use was reported at (63.9 %) in India[3]. These above rates are almost similar to those reported in the use of TM in Guinea (33 %)[4] and South Africa (52.79 %) among the general population[4,5]. According to World Health Organization (WHO), 'Traditional medicine refers to health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being'. Furthermore, the WHO defines (CAM) as a "broad set of healthcare practices that are not part of a country's own tradition, or not integrated into its dominant healthcare systems"[1].

TM has contributed a lot to modern day medicine; most of the modern medical products are obtained from medicinal plants[6]. It has been reported that 11 % of prescribed drugs classified as essential drugs by the WHO are obtained from the plant[7]. Poor health outcomes associated with allopathic medicine for chronic conditions encourage many people to rely on alternative medicine[8,9]. Despite a well organised health system and accessibility and availability of conventional medicine to inhabitants in developed countries the use of alternative medicine is on the increase; relatively high percentages of consumption have been reported in countries such as England (47 %), Canada (70 %), Germany (75 %), 48.5 % Australia and 40 % USA[10].

African Traditional Medicine (ATM) incorporates herbs and spiritual means in curing diseases[11]. Causes of illnesses and diseases may be associated with

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social or spiritual realms from anthropology perspective; physical things may show themselves in the spiritual realms before they become physical[12]. It has been reported that many people resort to alternative medicine for their healthcare and spiritual problems[13]. TM practise is associated with socio-cultural and environmental settings of the people. To most Africans, TM leads to the preservation and transfer of cultural heritage from one generation to to the other[14]. In traditional African settings traditional health practitioners occupy enviable positions because of accessiblity of their treatment methods and cost effectiveness of the their medicinal products[15]. People usually consult them because they are readily available and accessible, they do understand the culture of the people in the communities they live and are able to assist patients accordingly[16]. Furthermore, people usually consult practitioners who takes time to listen, understand and deal with their health condition at all times[17].

An estimated 380 million people are projected to be diabetic by 2025[18]. There has been an increase in diabetes mellitus patients in sub Saharan Africa[19]. A prevalence rate of 7 % has been reported for countries such as Nigeria, Ghana, South Africa, Kenya, Guinea and Cameroon due to poor dietary habit, obesity and deficiency of physical activity as main causative factors for type 2 diabetes amongst the adult population[20].

Diabetes is a disease associated with hyperglycemia and ineffective lipid, carbohydrate or protein metabolism. Type 1 (insulin dependent) and type 2 (non-insulin dependent) are the two major types of diabetes mellitus. The major complications of diabetes include the following: nephropathy, hyperlipidemia and ketoacidosis. As a result of the above mentioned complications, there is a reduction of life expectancy of a diabetic patient as well as increment in his or her medical expenses[21,22]. Type 1 diabetes is mostly treated with insulin; hypoglycaemia and weight gain are some of the side effects[23]. Metformin, glibenclamide, statins and fibrates are used by patients to treat type 2 diabetes[24,25].

One of the most important risk factors for heart disease is hypertension[26]; it affects about one billion people on this planet[27,28]. Hypertension has been identified as one of the leading risk factors (globally) for mortality[26]. The African Union (AU) described hypertension as a major health challenge facing the continent; approximately 20 million people living in sub-Saharan Africa is hypertensive[29].

According to a guideline developed for hypertension as a disease, an individual is hypertensive when on multiple occasions his or her systolic pressure ($\geq$ 140 mm Hg) and diastolic blood pressure is ($\geq$ 90 mm Hg). Primary and essential are the two major types of hypertension with the former not associated with any causative factor (likely to be caused by a combination of environment and genetic factors) and the latter caused by another medical condition[30]. Hypertension is treated mostly with Angiotensin Conversion inhibitors (ACE), diuretics, beta blockers and calcium antagonists[31]. Side effects of usage of anti-hypertensive drugs have been reported which include: depression, headache and swollen ankles[32].

Several studies had been conducted regarding the usage of alternative medicine by people in the management of chronic conditions such as diabetes and hypertension around the globe. A research carried out in Pakistan (randomized placebo-controlled clinical trials) involving type 2 hyperlipedemic diabetic patients showed a decrease in fasting serum glucose level ($p < 0.05$) when their blood samples were analyzed, after they were administered with medication of these plants (*Artemisia absinthium*, *Citrullus colocynthis* and *Gymnena sylvestre*) within a 40 day period[33]. The use of Unani medicines *Sankhahuli* (*Convolvulus pluricaulis*) and *Gokhru* (*Tribulus terrestris*) by patients in India revealed a significant improvement in both their systolic ($p < 0.0001$) and diastolic pressures ($p < 0.0001$) after 28 days of using these therapies[34].

A meta-analysis of randomized controlled trials published in literature (between January 1966 and December 2013) indicated the effect of yogic exercise on lipid profiles and glycemic control in Type 2 diabetic patients[35].

In a survey conducted in Nigeria, about 21 % of the urban population used garlic (*Allivum sativum*) in the management of hypertension[36]. In Ivory Coast, *Allivum sativum* was identified as one of the 33 species of plants used by inhabitants in Agboville district for the management of hypertension[37].

The general acceptance of TM in modern science is still not encouraging yet little has been done to ascertain its reliability and effectiveness in terms of practice[38]. Even though TM legitimacy and treatment approaches have been challenged[39], its usage in modern day Africa is on the ascendancy without much documented adverse effects[40].

Although clinical trials are the gold standard for western modern medicine and are essential for its general acceptability around the globe ,there is some evidence of the use of TCAM in the management of diabetes and hypertension across the African continent among the general population. This study aimed to explore clinical relevance and application of traditional complementary and alternative medicine for the management of diabetes and hypertension on the African continent in order to inform policy makers in the health sector, general public, education and research.

Methods

Databases and specific keywords

Google scholar, web of science, Pub-med and Cochrane library electronic databases were searched for the period 2000-2017. Specific keywords used in carrying out the search were traditional medicine and diabetes in Africa, traditional medicine and hypertension in Africa, clinical evidence and usage of TCAM in the management of diabetes and hypertension in Africa. Citations from identified published papers relevant to our study were tracked and found.

Inclusion criteria were clinical relevance (observational, randomized, non-randomized control trials under the supervision of biomedically trained healthcare professionals) and use of TCAM in the management of diabetes and hypertension. Exclusion criteria applied to publications (related to CAM use in the management of diabetes and hypertension) in a language other than English and not reported in the 21st century.

Selection of potential research papers

About a hundred potential papers were produced according to the search criteria implemented via online. This number was reduced to 24 papers because they were related to TCAM usage on the management of diabetes and hypertension on the African continent. According to the National Institute of Health[41] classification of CAM includes the following:

a) Alternative medical systems (i.e. *Ayurveda*, Naturopathy, Homeopathy, Acupuncture and Tibetan medicine.
b) Mind and body associated interventions (i.e. music therapy, meditation, prayer and spiritual healing.
c) Biologically based therapies (i.e. herbal therapy, dietary supplements and unique diets.
d) Manipulative and body-based methods (i.e. massage, chiropractic and osteopathic medicine).
e) Energy based therapies (i.e. therapeutic touch and different methods which affects bioelectric field of the body.

Much emphasis was placed on randomized controlled, non-randomized and observational studies which involves the management of diabetes and hypertension by the usage of TCAM self-administered or with the help of BHPs and THPs.

Standardized definitions of TCAM by both NIH and WHO (stated in text) helped us to access and selected potential research papers for this study.

Analysis of Data extracted from search criteria

Selected papers taken into consideration for this review were analyzed based on the following:

Country, year of study, TCAM type, study design, number of participants, main reasons of using TCAM, prevalence rate of TCAM as well as reported outcomes among a studied population in the various countries across the African continent.

Review findings

Research articles that made the list were grouped under this two main themes:

a) Self-administered or THPs prescribed TCAM used by respondents in the various studies published online according to our search criteria as described in section 2 above (Table 1).

b) TCAM used by people under the supervision of BHPs in the studies that met our search criteria (Table 2).

Twenty four published articles out of a nearly 100 were included based on our search criteria. In general papers reporting TCAM use whether self-administered, THPs prescribed or recommendations from family and friends were included in this study.

Discussion

This review found that participants in studies (Table 1) mainly indicated spiritual, cultural, family influence, accessibility of TM, approachability of THPs and inadequate hospitals as some of the reasons why they opted for TCAM instead of conventional medicine for the management of diabetes and hypertension. This is in agreement with other studies conducted in United States of America. In a survey

Table 1 — Articles reporting use of TCAM in the management of diabetes and hypertension on the African continent

Author and year of publication	Research time frame	Country	Study design	Sample size of participants included in the study	Treatment modalities	Reasons of TCAM use	Outcomes	Prevalence Rate of TCAM use
[46]Rutebemberwa, *et al.*, 2013	July-August 2011	Uganda	Exploratory with FGDs and key informants interview	32	Herbs (NS)	Affordability and scarcity of diabetic drugs in clinics.	NS	NS
[4]Baldé, *et al.*, 2006	April 1-30 June 2003	Guinea	Cross sectional , Questionnaire	397	Medicinal plants (*Pileostigma thorningii, Xylopia aethiopica, Ficus capensis*	Participants believed in the efficacy of medicinal plants.	Improvement in their conditions	33%
[55]Dièye et al., 2008	May-30 June 2006	Senegal	Cross sectional survey , direct interview	220	Medicinal plants (*Morenga oleifera, Sclerocarya birrea*)	Believed in the efficacy of medicinal plants.	Improvement in their conditions	65%
[61]*Ogbera, et al.*, 2010	September 2008-december 2008	Nigeria	Cross sectional survey, questionnaire	263	Bitter leaf, *Aloe vera*, garlic	Cost effective.	Reduction in blood sugar levels	46%
[8]Hughes, *et al.*, 2013	May-November 2010	South Africa	Cross sectional, face to face interview	135	Tea with other mixtures (NS)	Family and friends recommendations.	NS	21%
[36]Osamor & Owumi, 2010	NS	Nigeria	Cross sectional Semi-structured survey	440	Herbs (NS) and garlic	Hypertension caused by supernatural forces only CAM can cure the condition.	NS	29%
[44]Rachid, *et al.*, 2012	October 2009 to June 2011	Algeria	Ethnobotanical study survey, Interview guide	470	Medicinal plants (*Trigonella foenum, Rosmarinus officinalis, Artemisia herba alba*	Accustomed with traditional knowledge.	NS	28.3%
[62]Singh, *et al.*, 2004	2000-2001	South Africa	Cross sectional, face to face structured interviews	200	Spiritual healing, Vitamin E and herbs (NS)	Friends advice and efficacy.	Reduction in blood sugar levels and blood pressures	38.5%
[56]Laadim, *et al.*, 2017	September 2013-April 2014	Morocco	Ethno pharmacological survey, predetermined questionnaire	700	Medicinal plants (*Trigonella foenum, Oreganum vulgare, Olea europoea*)	Satisfied with CAM usage.	Decrease in blood pressure, reported side effects (sore stomach, vomiting)	61%
[63]Negbenebor, *et al.*, 2017	NS	Nigeria	Cross sectional, self-structured questionnaire	100	Medicinal plants (*Allium cepa, Allium sativum, Azadrachta indica)*	Believed in the efficacy of medicinal plants.	Improvement in their conditions	69%
[51]Olisa & Oyelola, 2009	2 April to 26 June 2007	Nigeria	Cross sectional, questionnaire	500	*Allium sativa, Aloe vera, Azadirachta indica*	Perceived failure of conventional medicine.	Reduction in blood pressure, gastro-intestinal side effects	25%

(Contd.)

Table 1 — Articles reporting use of TCAM in the management of diabetes and hypertension on the African continent (*Contd.*)

Author and year of publication	Research time frame	Country	Study design	Sample size of participants included in the study	Treatment modalities	Reasons of TCAM use	Outcomes	Prevalence Rate of TCAM use
[48]Eddouks, *et al.*, 2002	NS	Morocco	Interview guide	700	Medicinal plants (*Nigella sativa, Allium sativum* and *Olea europaea*)	Believed in the efficacy of medicinal plants.	NS	80%
[49]Jouad, *et al.*, 2001	May1997-NS	Morocco	Interview guide		*Artemisia herba alba, Nigella sativa, Allium sativum*	Efficacy and less costly of phototherapy use.	NS	76%
[64]Kretchy, *et al.*, 2014	May-October 2012	Ghana	Cross sectional descriptive (qualitative & quantitative)	400	Herbal preparations (NS), moringa & garlic	Cheaper alternative compared to conventional medicine.	NS	19.5%
[65]Peltzer, 2004	NS	South Africa	Cross sectional, Interview guide	100	Herbs (NS), Prayers, Tea, holy water	Belief that hypertension can be cured.	NS	75%
[66]Hjelm & Atwine, 2011	NS	Uganda	Descriptive studies	24	Herbs (NS) and prayers	Failure of the mainstream healthcare system.	NS	NS
[67]Nuwaha & Musinguzi, 2013	NS	Uganda	Cross sectional survey	258	Herbal therapies (NS), life style interventions (reduction in salt intake, increase in physical activities, reduction in alcohol intake)	Effectiveness of alternative medicine.	NS	56.2%
[5]Davids, *et al.*, 2016	August 2014-september 2015	South Africa	A cross sectional study in depth interview	112	Medicinal plants (*Lessertia frutescens, Leonotis leonurus, Artemisia afra*	Limited side effects.	Relief of symptoms	52.79%
[68]Amel, 2013	January-June 2010	Algeria	Interview, questionnaire	200	Medicinal plants (*Allium cepa, Allium sativum, Olea europea)*	Religious influence based on Holy Quran readings about plants.	NS	15.5%
[47]Atwine, *et al.*, 2015	February-April 2011	Uganda	Descriptive, FGDs	17	Extracts of *Aloe vera* and *Eucalyptus* leaves	Failure of conventional medicine.	NS	NS

a) Legend: NS: not stated, Per cent (%) given per publication (prevalence rate)

As shown in Table 2 a total of 4 papers met our search criteria. Two out of the four studies reported were randomized control trials studies conducted in Mauritius. An observational study conducted in Cameroun made the list because it was done under the supervision of BHPs. A research work carried out by these authors (Amira & Okubadejo)[2]in Nigeria made the list even though part of the studies were descriptive(interview guide) patients blood pressures and compliance to prescribed under BHPs were documented over a 3 month period.

Table 2 — Published articles representing the use of TCAM in the management of diabetes and hypertension under BHPs supervision.

Author & year of publication	Research time frame	Country	Study design	Participants	Treatment modality	Control for study	Outcomes of TCAM use based on clinical data
[60]Somanah, *et al.*, 2012	November 2010-Mrch 2011	Mauritius	RCT	127	Fermented papaya supplement	Water regimen	Improved the effect of oxidated tension on targeted organs. Decrease in C reactive protein, cholestrol, uric and serum ferritin levels.

(*Contd.*)

Table 2 — Published articles representing the use of TCAM in the management of diabetes and hypertension under BHPs supervision. (*Contd.*)

Author & year of publication	Research time frame	Country	Study design	Participants	Treatment modality	Control for study	Outcomes of TCAM use based on clinical data
[59]Toolsee, *et al.*, 2013	November 2010-Mrch 2011	Mauritius	RCT	300	Green tea	Water regimen	Improvement of mean arterial blood pressure. 2.7 % and 5.1 % anti-oxidant potential in men and women sera.
[58]Tsabang, *et al.*, 2015	NS	Cameroun	Observational	182	Herbal remedies	NS	64.17 % (decrease and blood pressures and regulation of sugar levels).
[2]Amira & Okubadejo, 2007	NS	Nigeria	Descriptive, Observational	225	Garlic, native herbs, ginger, bitter leaf, *Aloe vera*, prayers and fasting	NS	Average initial systolic/diastolic pressure (158.3/100.9), average final systolic/diastolic pressure (140.4/87.7).

a) Legend: NS: not stated

conducted in the North-American country involving 1035 participants to find out their perspectives about alternative medicine, respondents (69 %) mentioned cultural beliefs and philosophical orientations towards health as some of the reasons why they depend on alternative medicine for their primary healthcare goals. Findings by these two authors, Kaptchuk & Eisenberg (1998)[42] revealed the significance of cultural beliefs and spirituality dependence as some of the reasons why people use alternative medicine in the management of diseases[42,43]. Another finding in this review revealed that traditional knowledge in congruent with cultural beliefs about diabetes influenced usage of TCAM amongst studied population in Algeria[44]. Drozd (2000)[45] argued that perceptions and interpretation of illness are influenced by the culture of an individual. The author reported that in the management of diseases such as diabetes, understanding the culture of a diabetic patient by a healthcare professional is critical because cultural values influence the choices patients make every day[45].

Findings from this study have shown that increasing cost of conventional medicine and poor economic conditions lead people to rely on alternative medicine for their primary healthcare needs. The usage of TM amongst inhabitants in the Iganga and Bugiri districts due to its affordability and the scarcity of diabetic drugs in clinics and pharmacies were reported in Uganda[46]. This is an agreement with findings from a research work carried out in Ghana where accessibility and affordability of TM than western biomedicine were cited as some of the reasons why people rely on alternative medicine[13]. Moreover, poor accessibility of modern medicine to people living in developing (low and middle) countries was revealed in a survey conducted by WHO and Health Action International (HAI). It has been established that failure of conventional medicine to completely eradicate health problem encourages people to lean on alternative medicine[42].

Findings from this study revealed that most of the hypertensive patients using CAM alongside conventional medicine, in Ghana, withheld this information from BHPs they consulted for the management of this chronic condition citing reasons such as lack of interest shown by BHPs regarding the use of alternative medicine for the disease other than allopathic medicine. This is in agreement with a study conducted in Uganda where type 2 diabetic patients refused to disclose information about their use of CAM to the relevant BHPs because they had limited information on the medicinal products they were using to manage the disease[47].

In this study, an average prevalence rate of the TCAM use by people on the continent recorded were as follows: Guinea (33 %), Senegal (65 %), Nigeria (69 %) Morocco (80 %), Algeria (28.3 %), South Africa (52.79 %). The above mentioned figures were relatively higher or slightly lower compared to findings documented by researchers in different parts of the globe. A prevalence rate of 48.5 % and 40 % of

CAM use in the general population were reported in Australia and USA, respectively[2]. Findings from this studies revealed a high prevalence rates of 80 % and 76 % (CAM usage) among studied populations in Morocco in 2001 and 2002 respectfully[48,49]. These figures (80 % and 76 % prevalence rates) reported from studies conducted in Morocco are quite higher than what have been reported (63.9 %) prevalence rate of CAM use by the general population in the management of hypertension in India[3].

In this study, concurrent use of CAM and conventional medicine by majority of the people were noted in Moroccan settings. About 75 % of type 2 diabetic patients used medicinal plants alongside conventional medicine to treat diabetes[48]. This is in agreement with findings from other studies conducted in countries such as India and Jamaica. A research conducted in Jamaica involving 743 patients revealed that 80 % of the respondents used natural products alongside prescribed medication in the management of diabetes and hypertension diseases[50]. In India, 521 patients who visited a hypertensive clinic over a 6 month period admitted concurrent usage of prescribed medication, *Ayurveda* and herbal medicines in the management of this chronic condition[3]. It is significant to point out the concurrent use of traditional medicine and conventional medicine by people has not been extensively researched into by the scientific community[51]. Research have shown that use of conventional medicine for the management of diabetes and hypertension has side effects such as severe headache, visceral pain and fatigue[23,32]. These side effects associated with conventional medicine encourages people to rely on TM which is known to be relatively safer[8,9]. Awang & Fugh-Berman (2002)[52] found that some herbs (st John worth, garlic) and supplements (ephedra) have been proven scientifically to have influence on concurrent administered drugs. These same authors Awang & Fugh-Berman (2002)[52] indicated that herbal medicines may increase or decrease pharmacological actions of prescribed drugs in older adults and people with weak immune systems. Rahman (2001)[53] suggested the need to standardize formulations of garlic for the treatment of disease since different formulations of garlic might affect its efficacy in the prevention of cardiovascular diseases[52,53]. However, research has shown the possibility of compatibility of conventional and alternative medicine in acting against diseases. Aiyegoro & Okoh (2009)[54] found out that plant could be used as synergist enhancers when prescribed in combination with conventional medicine to mitigate the effects of antimicrobial therapy.

Findings from this study revealed that 20 % of the respondents using CAM for the management of diabetes in Senegal complained about side effects such as: hypoglycemic and hyperglycemic coma[55]. This could be attributed to CAM abuse owing to the fact that about 50 % of diabetic patients who took part in the survey were not well informed or had no information on the doses to take to manage this chronic condition (diabetes)[55]. Moreover, in Morocco diabetic patients (74 %) were not aware about toxicity of medicinal plants and only 24 % of respondents in a survey took that into consideration[56]. The documented plants and their side effects cited were as follows : *Lavandula stoeckas* (sore stomach); *Rosmarinus officinalis* (body pain) *Origanum vulgare* (abdominal pain); *Tetraclinis articulata* (abdominal pain) *Olea europaea* (vomiting) *Artemisia absinthium* (vomiting) and *Allium sativum* (decrease in BP)[56]. This is in agreement with a similar study carried out in a middle East country (Jordan) where 35 % of diabetic patients using herbal medicine complained about side effects such as headache, itching and sweating[57].

This study (Table 2) has shown that there is scarcity of information on clinical trials on the effectiveness of TM in the management of diabetes and hypertension in Africa. World Health Organisation (WHO) suggested the need to research more into TM backed by clinical trials in its strategic policy document on alternative medicine[1]. The use of herbal therapies in clinical settings (observational studies or randomized clinical trials) for the management of diabetes and hypertension on the African continent is not well documented. In Cameroun, about 182 diabetic and hypertensive patients were given herbal remedies over a 10 day period and their conditions were evaluated which showed reduction in the blood sugar levels and arterial blood pressures in patients[58]. In Mauritius, a study conducted revealed the effect of green tea in the improvement of mean arterial blood pressure of pre-diabetes adults over a 14 week period[59]. In the same country (Mauritius), clinical evidence showed that fermented papaya could improve the effect of oxidated tension on targeted organs in diabetic patients[60]. In Nigeria, 88 out of a total 225 hypertension patients attending a hypertension clinic were observed and interviewed by BHPs within a 3

month period[2]. There was no significant difference in the BP control of both CAM users and those depending solely on conventional medicine for the management of diabetes and hypertension. The figures reported were as follows: average initial systolic/diastolic pressure (158.3/100.9) and 161.0(103.5) for CAM and non-CAM users, respectively. At the end of the 3 month study period these figures (average initial systolic/diastolic pressure) were reported for CAM users (140.4/87.7) and non-CAM users (142.8/90.1).

Implications of findings for future research into TCAM

Increasing levels of TCAM use in the management of diabetes and hypertension on the African continent as reported in Tables 1&2 climax the urgent need for evidence base support of TCAM. Even though TM legitimacy and treatment approaches have been challenged[39], its usage in modern day Africa is on the ascendancy without much documented adverse effects[40]. It is significant to evaluate the safety, potency and efficacy of herbs and medicinal plants before use by people. Efforts must be made to standardize medicinal plants (doses, its interactions with conventional drugs and side effects) and supplement used by the general population. WHO policy document suggested the need to ensure the safety and efficacy of herbal medicines by the application of suitable standards and following Good Manufacturing Practices[1]. Moreover, scientific research into the possible effect of interactions between prescribed drugs and TCAM inside humans requires urgent attention.

Limitations of this review

This review is about research based studies on the usage of TCAM in the management of diabetes and hypertension on the African continent. Studies included in this review were based on formal quality of assessment since this was not systematic review which rely on expert judgement. All identified articles were retrieved from different kinds of journals and include both quantitative and qualitative work. A bias towards work published in English cannot be overstated.

Conclusion

This review has shown that herbal therapies are the most preferred mode of treatment for diabetes and hypertension for many people on the African continent. However, most of the people who used herbal therapies in the management of these chronic conditions (diabetes and hypertension) were not aware about the constituents of these herbal therapies administered to them by THPs. Standardization of medicinal plants, herbal products, dosage, packaging, storage and product life are essential to ensure safety and efficacy of TM. In order to transform the potential of TM for the benefit of the entire population on the African continent, RCT using indispensable standardized products (herbs, plant extracts, etc.) in humans must be given the needed consideration.

THPs involved in the management of diabetes and hypertension must be given the needed recognition by incorporating their practices into the healthcare stream. They must be given special orientation about safe preparation of different herbal therapies, formulation of doses, storage of medicinal products and follow up with patients about treatment outcomes. Universities across the continent should offer both undergraduate and graduate courses in TM. There must be efforts to fully recognize and incorporate TCAM into the healthcare system in the various countries across the African continent as recommended by WHO in its policy document on TCAM, released in 2002.

Governments in Africa must enact laws to make medical insurance accessible to users of TM.

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CHAPTER 3

The narrative review published and presented in chapter 2 revealed the use of traditional medicine with the assistance of traditional health practitioners in the management of diabetes and hypertension on the African continent. Hence, a study was carried out in KwaZulu-Natal to find out Zulu traditional health practitioners perspectives in the management of diabetes and hypertension using focus group discussions with the help of an interview guide (Appemdix V). The findings are published in the *Ethiopian Journal of Health and Development*. The final version of the article is presented in chapter 3.

Original article

Management of diabetes and hypertension among Zulu traditional health practitioners: A study of focus group interviews

Ebenezer Frimpong[1*], Manimbulu Nlooto[1]

Abstract

Introduction: On the African continent, the rising cost of Western medication that is accessible for the treatment of both diabetes and hypertension encourages people to rely on traditional medicine assisted by traditional health practitioners to mitigate the effects of these chronic conditions. This study was carried out to explore Zulu traditional health practitioners' perspectives on managing both diabetes and hypertension.

Methods: Five focus group discussions sessions were held in June 2018, using a semi-structured interview guide. Discussions were audiotaped and the content was thematically analysed. Sixty-seven traditional health practitioners (39 females and 28 males) were purposely selected from the three geospatial locations (urban, traditional or tribal, and farm areas) in uMshwathi (UMgungundlovu District) and Emnambithi/Ladysmith (uThukela District), KwaZulu-Natal, South Africa.

Results: The majority of Zulu traditional health practitioners regarded diabetes and hypertension as the same condition, since one (having diabetes) leads to the other (hypertension).The following symptoms – weight loss, sweating easily, shortness of breath and eyesight problems – were the most commonly reported clinical features for both diabetes and hypertension by Zulu traditional health practitioners in this study.Although many traditional health practitioners were secretive about the recipes used in their practice, a few indicated using herbal mixtures containing *Aloe vera* and *Allium sativum* (garlic) for the management of both diabetes and hypertension.

Conclusions: Some similarities exist between Zulu traditional health practitioners and orthodox conventional medicine in terms of the description of clinical features of diabetes and hypertension. Ethnopharmacological preparations consisted mainly of two medicinal plants, *Aloe vera* and *Allium sativum*, for the management of both diabetes and hypertension by Zulu traditional health practitioners. *Ethiop. J. Health Dev.* 2019; 33(4):219-228]

Keywords: Diabetes,hypertension,polyherbal formulations,herbal mixtures,traditional health practitioners

Introduction

Many people living in sub-Saharan Africa consult traditional health practitioners (THPs) for their health care needs, either as the only source of healing or as the first person in their pathway to care(1). Besides, due to the high cost of Western medication for the treatment of both diabetes and hypertension, people rely on traditional medicine, assisted by THPs, to control the effects of these chronic conditions(2,3).

The World Health Organization (WHO) defines a traditional health practitioner as "a person who is recognized by the community where he or she lives as someone competent to provide health care by using plant, animal and mineral substances and other methods based on social, cultural and religious practices" (4). THPs employ non-conventional approaches(spiritual beliefs, local wisdom and herbs) to cure diseases (5). The Traditional Health Practitioners Council of South Africa (THPCSA) is tasked with the regulation of THPs' activities in all nineof the country's provinces.The South African Traditional Health Practitioners Act recognizes herbalists (*izinyanga/amaxhwele*), diviners (*izangoma,umthandazi* or *amaggirha*), traditional surgeons(*iingabi*) responsible for circumcisions, and traditional birth attendants (*ababelethisi* or *abazalisi*)(6).The THP Act recommends that these four main categories of practitioners should undergo a minimum period of training within a stipulated time to practice: herbalist (12 months), diviner (12months), traditional surgeon (5 years) and traditional birth attendant (12months) (7).

A report released by the International Diabetic Federation (IDF) in 2017 indicated that, globally, 425 million people are diabetic(8) and that the condition accounts for 5 million deaths every year. In the USA, it has been estimated that about 30.3million people have diabetes (9), while India has approximately 40.9 million people known to be diabetic(10). Data documented by IDF in 2017 revealed that there are 0.5 million people with diabetes in Cameroon,0.7 million people in Kenya, and approximately 3.2 million in South Africa(8). It has been established that one third of adults globally suffer from hypertension (11), with approximately 1.56 billion adults projected to be hypertensive by 2025 (12). Poland has the highest prevalence rate (women 72.5% and men 68.9%) of hypertension among the global population(13), while astudy conducted in Ghana indicated aprevalence rate of between 25% and 48% among the population(14), with the higher rate in urban areas (14). In South Africa, a quarter of the population aged 15-64 years old is known to be hypertensive (15). Studies conducted on the African continent reveal the assistance offered by THPs to patients in the treatment of both diabetes and hypertension(2,3).

Findings from studies carried out by researchers regarding the management of diabetes and hypertensionby THPs in various countries report a range of successes and challenges. In Kenya, for example, Chege *etal.* (2015) report that Nairobi THPs rely on the reported signs and symptoms of diabetes by their patients, rather than a physical examination of

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patients as employed in orthodox conventional medicine (OCM) for diagnosis purposes. One of the challenges faced by Nairobi THPs is the non-standardization of the dosage of herbal mixtures they prescribe for patients with diabetes(16). A study conducted in Zambia revealsthat Lusaka THPs relyon divination for diagnosis purposes, which cannot be evaluated scientifically(17). In South Africa, THPs practicing in the former Northern Province (now Limpopo) describeclinical features such as polyuria, blurred vision and poor wound healing associated with diabetes, which is in agreement with the scientific literature. Moreover, THPs in the study stated that some of the diabetic patients were cured of diabetes within two weeks of takingtheir herbal mixtures (18).Similarly,Van Huyssteen*etal.* Report similarities between the description of clinical features (dry mouth, poor wound healing, and persistent hunger) for diabetes provided by THPs' in Nelson Mandela Metropole and those of OCM. Ironically, however, these THPs lacked a basic understanding of terms such as 'hyperglycemia' (high sugar levels) and 'hypoglycemia' (low sugar levels). This was reported as a major challenge of the study(19).

The current study aimed to contribute to addressing the scarcity of information regarding the management of diabetes and hypertension by THPs in uMshwathi (UMgungundlovu District) and Emnambithi/Ladysmith (uThukela District), KwaZulu-Natal, South Africa.The participants were purposely selected from the three geospatial locations (urban, traditional or tribal, and farm areas) in both uMshwathi and Emnambithi/Ladysmith.The specific objectives of the study wereto determine the diagnosis, description of clinical features, and the ethnopharmacological and treatment approaches used by Zulu THPs in the management of diabetes and hypertension. Findings of the study will help THPs, researchers and health authorities to fashion a robust strategy for the management of these conditions.

Methods

Study design: A qualitative study using focus group discussions (FGDs) was conducted among THPs in KwaZulu-Natal on 22 June 2018 in Emnambithi/Ladysmith (uThukela District).

Study setting: The study took place in KwaZulu-Natal Province, South Africa, with the principal researchers (PRs) conducting FGDs with 67 THPs (39 females and 28 males) from uMshwathi (UMgungundlovu District) and Emnambithi/Ladysmith (uThukela District) in the local town hall in Ladysmith on 22 June 2018.The main purpose of a focus group discussion (FGD) is to explore the opinion of particular group of people.Taking into account the availability of the three geospatial locations (urban, traditional or tribal, and farm areas) in both districts, participants (THPs) were purposely selected with the help of executives (key informants) from the two districts' traditional healers' associations. A key informant is an individual (a member of a study population) who facilitates research by educating the researcher on a given subject of examination (21).

Procedure for recruitment and selection of participants: Contacts from the provincial association of THPs led the research team to the district associations in the study areas. With the help of leaders in the district associations, initial contacts were made with participants included in this study.

Study population, sampling technique, and sample size: This study included THPs aged 18 years old and above, irrespective of gender. THPs were drawn from urban, traditional or tribal, and farm areas. THPs experienced in the management of diabetes and hypertension were eligible for this study. Purposive sampling was used to select participants.

The research teamconducted five FGDs in both uMshwathi and Emnambithi/Ladysmith municipalities. The five FGDs each consisted of no more than 14 participants (22), except for FGD3, which had an extra participant. The five FGDs were denoted bycodes, i.e. FGD1: group 1(GP1), which had 14 participants; FGD2: group 2(GP2), with 14 participants; FGD3: group 3(GP3), with 15 participants; FGD4: group 4(GP4), with 14 participants; and FGD5: group (GP5), with 10 participants. FGDs were conducted in isiZulu language with the help of two research assistants (RAs) who served as moderators. It is significant to point out that a pilot project was conducted to test the suitability of the data collection instrument.Before each session, participants were asked to complete a questionnaire that included information on demographics. One research assistant (RA) operated the digital voice recorder and audiotaped conversations based on an interview guide,while the other listened attentively and took notes about conversations in each session. In each session (typically lasting about an hour), the two RAs introduced themselves and explained briefly what the study was about and encouraged THPs to express themselves freely. The two RAs made sure that clarity was sought, in case participants missed important information from a statement made by a participant. Participants were asked to comment on statements made during FGDs to indicate whether they agreed or disagreed with them.The RAs made sure that discussions were held until no new information was added to a topic under consideration. The PRs made sure that everything was in order during FGD sessions. Field notes were collected in each of the FGD sessions. The following observations were made: First, the compositions of GP1, GP2 and GP3 were predominantly female. Second, participants expressed adesire to offer information during the discussions,which were held cordially. However, the mood of the participants changed when the RAs asked participants to name medicinal plants and other constituents of their herbal mixtures used in the management of diabetes and hypertension.

Data analysis:Data collection and analysis were conducted concurrently;audiotaped conversions were transcribed verbatim by the assistants of RAs who were fluent in isiZulu language.Transcripts were analysed by a PR (a PhD research scholar trained and prepared in workshops organized by experienced tutors and researchers in the field of qualitative research, both in

South Africa and abroad) and two independent qualitative researchers, following Tesch's recommendation of identifying themes and sub-themes in the raw transcribed data (23) (seeTable 1). The following steps were followed: First, transcriptions were read thoroughly, and general ideas were written down; second, an attempt was made to get a general understanding of the statements made by THPs in the study; third, similar topics were clustered together; fourth, topics were abbreviated, and the codes were written down. Topics identified from step 4 were turned into categories. A decision was taken on each abbreviated category and codes were alphabetized. The final step, a preliminary analysis, was performed to arrange data belonging to each category(23).

Quantitative data analysiswas carried out using SPSS version 20(24). Numerical values (age) and years of experience were expressed as mean± standard deviation, while other parameters were expressed in frequencies (n) and percentages (%).Thematic content analysis was used for the qualitative part of this study(25). To adhere to the trustworthiness of the analysed data, THPs' quotes have been reported verbatim.Checking was done whereby participants were given the findings of the study to assess whether they were in line with their experiences.

Ethics approval

The study received approval from the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal under reference number BE 567/17.The purpose of the study and procedural formalities were explained to participants. Participation was voluntary, and in the various FGD sessions, participants were requested to give informed consent before being interviewed. Further findings of the study are presented thematically to ensure anonymity.

Table 1:Identified themes and sub-themes from analysed raw transcribed data of Zulu THPs' responses

Major themes	Sub-themes
Theme 1: Perceptions of diabetes and hypertension	• Understanding diabetes and hypertension • Are diabetes and hypertension curable or manageable? • Identifying a person with diabetes and hypertension • Perceived causes of diabetes and hypertension • Perceived major complications of diabetes and hypertension
Theme 2: Treatment modalities for diabetes and hypertension	• Ethnopharmacological interventions • Non-pharmacological interventions
Theme 3: Prescribing practices for diabetes and hypertension	• The severity of a patient's condition;high/low concentration of a mixture and age
Theme 4: Effectiveness of prescribed medication	• TM vs Western medication
Theme 5: Concurrent use of TM andWestern medication	• Encouragements and instructions to follow when on these two medications
Theme 6: Contraindications of medication	• Avoidance of takingTM and Western medication simultaneously
Theme 7: Feedback and monitoring of patients	• Positive feedback report from patients
Theme 8: Challenges faced in the management of diabetes and hypertension	• Inaccessibility of medical tools for diagnosis
Theme 9: Recommendations to improve diabetic and hypertensive care in South Africa	• Collaboration with biomedical health professionals(BHPs) • Endorsement and recognition from the government

Results

Socio-demographic characteristics of respondents: Table 2 presents the socio-demographic characteristics of respondents. Of the 67 participants recruited for this study, 58.2% were females. The mean age of respondents was 50.06 years ±14.13, with mean years of work experience as a THP of 18.83 years ±13.52.Nearly half of the respondents were married (47.8%); had a high school education (50.7%); and reported following a traditional religion (47%).The majority of THPs in this study (58.2%) used both divination and herbal practices.Most of them (95.5%) were registered with the Traditional Health Practitioners Council of South Africa (THPCSA), while less than half (47.8%) were registered with their local district associations.

Table 2:**Socio-demographic characteristics of THPs selected for the study**

Variables	Mean ± SD	n (%)
Age(years)	50.06(14.13)	N/A
Years of experience	18.83(13.52)	N/A
Gender	Female	39(58.2)
	Male	28(41.8)
Marital status	Cohabiting	2(2.9)
	Married	32(47.8)
	Single	30(44.8)
	Widows	3(4.5)
Religion	Christian	12(17.9)
	Traditional	31(46.3)
	Traditional and Christian	21(31.3)
	Other (Nazareth)	2(3.0)
	N/A	1(1.5)
Education	Nil	3(4.5)
	Primary school	29(43.3)
	Tertiary	1(1.5)
	High school	34(50.7)
Kind of practice	Both divination and herbal	39(58.2)
	Divination	2(3.0)
	Herbal	26(38.8)
Type of practice	Full-time	31(46.3)
	Part-time	35(52.2)
	N/A	1(1.5)
Place of practice	Home	63(94.0)
	Home and market	1(1.5)
	Office	3(4.5)
Registration (THPCSA)	No	3(4.5)
	Yes	64(95.5)
Registration(THA)	No	35(52.2)
	Yes	32(47.8)

THPCSA (Traditional Health Practitioners Council of South Africa; National body); THA(Traditional Healers Association; Local association in respective districts); SD(Standard deviation); N/A(Not applicable)

Summary of themes from the focus discussion groups (FGDs): In total, five FDGs were conducted with THPs.Themes were identified from the responses of the 67 Zulu THPs, which are briefly explained below

A) Perceptions of diabetes and hypertension

Understanding diabetes and hypertension

Most of the participants in this study described diabetes as a sugar disease:

*"It is a sugar disease."*Female 1, GP1

*"Diabetes can be one of the high sugar levels or low blood sugar levels."*Female 3, GP2

In addition, the majority of the THPs regarded diabetes and hypertension asthe same condition,since having diabetes leads to hypertension:

*"Diabetes and blood pressure (BP) are related. It is a norm that people who suffer from high BP are alsoaffected by diabetes because of the imbalance between sugar and salt in the body."*Female2, GP1

*"Diabetes and BP are more or less the same."*Male 2, GP2

Are diabetes and hypertension curable or manageable?

With regard to the question of whether diabetes and hypertension are curable, the majority of the THPs indicated that they were not. Across FDGs, there was a strong consensus that these two diseases could only be managed:

"Diabetes not curable it can only be managed." FGD participants in all the groups

*"We don't fully heal totally, because these two diseases cannot be completely cured but controlled."*Female 4, GP1

Identifying a person with diabetes and hypertension

Some of the THPs relied on the spiritual realms and ancestral spirits to diagnose the two diseases. Mostof the THPs relied on the condition of the patient, including their description of complaints and symptoms (weight loss, sweating easily, shortness of breath, eyesight problems), while others relied on the clinical diagnosis done byone of the BHPs at hospitals and local clinics:

*"People with BP or diabetes sweat a lot."*Male 3, GP4

"*Loses weight, sweats a lot, eyes become affected too."*Female 3, GP1

"*Person goes to the doctor to check sugar levels and then they come back to me for treatment.'*'Male 2, GP1

"When the person comes, the sprits do the talking(mine) and the patient's ancestral spirits 'amadlozi' will lead me into knowing what is troubling the person and also how I can be of help to treat the person and for how long.''Female 4, GP1

Perceived causes of diabetes and hypertension

The perceived cause of both diabetes and hypertensioncan be illustrated by the statements below made by study participants:

a. Diabetes: consuming too much sugar, fatty, and junk food, lack of physical activities.

"Too much sugar, too much salt intake and eating fatty foods.''Female 5, GP2

"Too much salt, eating fatty and junk foods.''Male 3, GP2

b. Hypertension: stress, thinking too much, eating too much salt and fatty foods.

"Excessive intake of salt, fat and other unhealthy foods.''Male 1, GP2

Perceived major complications of diabetes and hypertension

Most THPsin this study perceived major complications of both diabetes and hypertension, as follows:

a. Diabetes: stroke, eyesight problems, and amputation as a result of diabetic wounds.

"If diabetes/BP, a person can have stroke.''Female 2, GP4

"Wounds which are difficult to heal for people with diabetes (some not all) others even get amputated because of the serious condition they suffer from.''Male 1, GP2

b. Hypertension: nerve damage, heart diseases, and stroke.

"Stress levels can become high, which will cause the condition to progress to the next stage, leading to a stroke or fatality.''Male 4, GP2

"Hypertension leads to heart diseases.''Male 3, GP5

B) Treatment modalities for diabetes and hypertension

Ethnopharmacological interventions

MostTHPs recommended the use of herbal mixtures to manage the two diseases, specifically garlic and aloe vera:

"We mix different herbs according to the level of illness. These are very bitter to taste but they help. However, we use different mixtures because we learn how to do so differently.''Female 1, GP1

"Reduce salt intake, drink lots of water, regular exercise, eat fruits (apples), spinach, other vegetables, and avoid using cooking oil or fat when cooking.''Male 3, GP5

"Mixture of various herbs, 'amakhambi', are used to control these conditions; also garlic is used to control these conditions.''Male 2, GP1

"Aloe and garlic are used for this disease.''Male 4, GP4

Non-pharmacological interventions

The majority of the THPs highlighted the significance of exercise in the management of both diabetes and hypertension:

"The sick should avoid eating fatty foods, should exercise to enhance proper blood circulation.''Male 1, GP5

"In my case, if someone says that they have BP, I simply use my hand to heal using massage therapy; due to massaging the person, the diastolic and systolic will automatically change.''Male 4, GP5

C) Prescribing practices for diabetes and hypertension

The severity of a patient's condition;high/low concentration of a mixture and age

Most THPs in this study believed that the dosage of their prescribed medications depended on the severity of a patient's condition and theirbody's response to consuming a certain quantity of herbal mixtures:

"...I look into the eyes to check if the herbal mixture prescribed is making any improvements; so, I tell them to take a dosage of two teaspoons/tablespoons, because if they take overdose their condition might get worse and I also risk going to jail for making them drink more they should.''Female1, GP1

"Mixture of different herbs, 'amakhambi', cooked, boiled or soaked, are given to the sick using a dosage which is line with the person's level of sickness or age" Female 3, GP2

"The dosage depends on how strong the mixture is because most of the mixtures are organic and very bitter.''Male 2, GP4

D) Effectiveness of prescribed medication

TM vs Western medication

Most THPs acknowledged the fact that their prescribed mixtures were made from natural products and therefore were more effective thanWestern medication:

"We know that traditional medicines are [more] effective than what the doctors prescribe because the patient's health improves.''Male 3, GP2

"People go to the doctor for medication and when they don't see any improvements, they come to me for effective treatment and most of them stop doctors' medicine because they have strong faith in what I give them. After taking my medication I refer them to the hospital for check-ups and they always come out with positive results.''Female 5, GP 1

"There are people on BP treatment from the hospitals/clinics who do not improve – proof

*that these pills are not what the sick people need. Hence, our natural methods are effective, even if it is just by consulting the sick (talking to them). We also get healing powers spiritually."*Male4, GP5

E) Concurrent use of TM and Western medication

Encouragements and instructions to follow when on these two medications

Most of the participants were not against the concurrent use of TM and Western forms of medication by their clients, but believed that both TM and Western forms of medication should be taken at different times:

*"I encourage them not to stop the medicine from the doctors."*Female 5, GP1

*"I don't discourage anyone to stop taking medicine given by doctors;they can take my medicine together with the doctors so that none of the medicine's effectiveness to treat the disease is reduced. For example if the doctor says medicine should be taken in the morning then they take my mixture beforebedtime. Or if the doctor says the medicine should be taken at night, I tell my patients to cook porridge in the morning as early as 5am, then drink what I have given them."*Female 6, GP1

F) Contraindications of medication

Avoidance of takingTM and Western medication simultaneously

Most of the participants believed that TM and Western medication should not be taken simultaneously to avoid contraindications:

*"People can use medicines from the doctors and traditional healers' medicines, although at different times because our medicines also clean human organs/system (including Western medication) in the process of treatment."*Female 7, GP3

G) Feedback and monitoring of patients

Positive feedback report from patients

The majority of the THPs contended that they do follow-ups oftheir patients, and some report back voluntarily to inform that their health has greatly improved after taking their prescribed medication:

*"We do follow-ups on our patients, and the patients, they do come to us voluntarily to inform that their health has greatly improved after taking our medication."*Female 4, GP4

*"After taking the THP's medicine for threedays, I encourage the patients to go for a check-up. If the report says the levels are reducing, I tell the patients to take the mixture again for the next 3 days."*Male 3, GP4

H) Challenges faced in the management of diabetes and hypertension

Inaccessibility of medical tools for diagnosis

Most of the THPs in the study complained aboutthe lack of scientific diagnostic tools, such as glucometers and sphygmomanometers, to assist them to make diagnoses:

*"I do not have any devices to do proper check-ups."*Female 1, GP3

*"Having testing devices will be very helpful to us traditional healers because estimating as we do now imposes a risk of the patients dying either from taking too much or too little as the mixture we prepare."*Female 8, GP3

*"Without devices, it is difficult for us to diagnose the patients."*Male 2, GP4

I)Recommendations to improve diabetic and hypertensive care in South Africa

Collaboration with biomedical health professionals

Most of the THPs in the study suggested collaboration with BHPs to assist in the management of diabetes and hypertension:

*"It wouldbe ideal if we worked together with doctors, share knowledge, ideas, and equipment. We can learn more from them on the types of diabetes and how to approach their treatment schemes because diabetes can be one of the high or low blood sugar levels.While other mixtures are meant for those with high sugar levels, giving them the wrong mixture will cause problems."*Female 9, GP2

Endorsement and recognition from the government

The majority of the Zulu THPs believed that the government should endorse this health tradition to make it more acceptable in the public domain:

*"The government should stand its ground to endorse traditional healers and to enforce our practice in a way that is known and accepted by the general public, in the same way 'Western ideologies'are accepted."*Male 5, GP5

Discussion

This study explored THPs'understanding of the management of diabetes and hypertension in KwaZulu-Natal.Respondents in this study recognized that diabetes and hypertension were not curable, contrary to findings from a similar study conducted in the northern province of South Africa, where traditional healers and faith healers stated that diabetes is curable(18).The definition of diabetes as a 'sugar disease' in the local dialect is in agreement with astudy conducted in South Africa in which both faith and traditional healers identified diabetes as a sugar disease (18). It is also in agreement with a similar study conducted in Kenya (16).

THPs in this study noted that diabetes and hypertension were related, with one condition leading to the other, and that people who suffered from hypertension could also suffer from diabetes due to the imbalance of sugar and salt in the human body. A study conducted in the USA has shown that 30% oftype 1 diabetic patients were also diagnosed with hypertension(26). Furthermore, Landsberg&Molitchreport that 50-80% of type 2 diabetic patients were more likely to be diagnosed with hypertension(26).

Likewise,aprospective cohort study conducted in the USA revealed that patients living with hypertension who were taking beta-blockers other than thiazide diuretic or angiotensin-converting-enzymeinhibitors to manage the condition had a greater risk(28%)of acquiringtype 2 diabetes(27).

When identifying a person with diabetes and hypertension, some THPs diagnose them spiritually.This is similar to the findings of studies conducted in Zambia and South Africa, where THPs diagnosed their patients spiritually to know the cause of diseases (17,18).Gumede stresses the need to take into account the linkage between spirituality and an individual's health to understand THPs' practices better. Moreover, within the African context of healing, divination is seen as the principal way of revealing the cause of disease affecting an individual(28).Some of the traditional healers relied on the condition of the patient, including a description of complaints and symptoms, while others relied on diagnosis done at hospitals and local clinics, with the help of BHPs.This is in agreement with a similar study conducted in Kenya, where THPs encouraged people to make use of their local clinic services to manage diabetes (16).The signs and symptoms (weight loss, sweating easily, shortness of breath, eyesight problems) of these two diseases by the THPs in the current study are in agreement with scientific literature(29-32).

Perceived causes of diabetes described by THPs in this study (eating junk foods, too much sugar and salt in the diet, lack of exercise) and hypertension (stress, eating too much sugar and salt), were mostly in agreement with what has been reported in the literature(33-35).THPs in this study also reported eyesight problems (retinopathy) and stroke as some of the major complications of diabetes and hypertension. Patients affected by both diabetes and hypertension are more likely to develop microvascular (retinopathy) and macrovascular (stroke) complications than those living without these chronic conditions (36). Regarding treatment modalities used in the management of diabetes and hypertension, most of the THPs mentioned herbal mixtures ('amakhambi'in isiZulu language) as being the form of medication often used.Similar studies conducted across the African continent report the usage of herbal mixtures by THPs to manage diabetes and hypertension.THPs in Kenya reported the use of herbal mixtures for the management of type 2 diabetes mellitus (16); this is equally true for the management of hypertension in Zambia(17). A clinical trial study revealed the effect of polyherbal formulation (*Momordica charantia*, *Trigonella foenum graecum*, *Withania somnifera* and *Mucuna pruriens*) to reduce blood glucose and HbA1cin type 2 diabetic patients within two weeks ($p<0.001$)(37). Moreover, patients with diabetic retinopathy who were administered with diabecon (polyherbal formulation)for three months experienced resorption of retinal and vitreous hemorrhage in their eyes (38).

THPs in this study were very secretive about revealing the contents of their herbal mixtures for fear of losing sensitive information to researchers who invent drugs from their knowledge without given them recognition.This is in agreement with a similar study carried out in Kenya, where theTHPs withheld information about the constituents of their herbal mixtures (16).Some mentioned specifically the use of aloe and garlic to treat both diabetes and hypertension.A recently published article reveals the contribution of garlic supplement in the regulation of blood glucose levels in type 1(within 2 weeks) and type 2(24 weeks) diabetic patients (39).Experimental results also showed the effect of aloe vera in the reduction of blood sugar levels of type 1 and type 2 diabetic rats(40).Moreover, spinach, a green leafy vegetable used by THPs in the management of diabetes, is known for its antioxidant potential(elevated concentrations of vitamin c and beta carotene),which might help reduce the risk of diabetes(41).

Individualized treatment options for THPs'patients were most preferred. A study conducted in Kenya revealed similar findings concerning individualized treatments by THPs(16).The THPS felt that managing diabetes at its early stage is essential to achieve effective results and to avoid serious complications, such as amputation.It has been established that diabetic patients with foot ulcers (approximately 43%) have had their limbs amputated (42).

Regarding prescribing practices, good dietary regimen, eating a lot of fruits and vegetables, and taking regular exercise, were suggested by THPs in this study to manage diabetes and hypertension, as has been reported in the literature. Some researchers argued that there is evidence to support the limited use of salt and sugar in dietary regimens (rich in vegetables) to prevent hypertension and its complications(43). These same researchers recommended the consumption of low salt intake (3.8 g/d) and a diet rich in vegetables (8-10 servings/d) by patients(43).The need for patients to exercise regularly, as indicated by the THPs in the current study, is in agreement with findings of other authors(44,45), who noted the significance of exercise in preventing and managing both diseases.

In the last FGD session (FGD5), a male THP specifically mentioned the effect of massage on a hypertensive patients' diastolic and systolic pressures.An observational study revealed the effect of massage in 29 healthy male subjects, with an increase in muscle blood volume being observed in these individuals compared to the volume in their rest period ($p<0.05$)(46).

THPs in this study voiced different opinions on the prescribed practices of medication provided to patients and were very cautious, as overdosing could kill a patient and land them in jail.Some THPs pointed out that prescribed dosage depends on the severity of a patient's condition and their age.Their mixtures are made from natural products and are considered to be more effective than the Western form of medication used to treat the same conditions.There has been a surge in TM use by people in Africa, with little documentation of adverse effects(47). Most THPs in this study were not against the concurrent use of TM

and Western medication by their clients and advised them to take these forms of medication at different times. Moreover, THPs in this study were very cautious regarding the issue ofcontraindications and advised their patients not to take TM and Western medication simultaneously. Significantly, detailed examples regarding the need for patients to take herbs and prescribed conventional medication at different times have been documented to avoid adverse effects(48).

KwaZulu-Natal THPs acknowledged the significance of finding out whether their clients'conditions have improved after consulting them. They did follow-ups to know the health status of their clients. THPs in a similar study conducted in Kenya monitored the progress of the health of their patients by doing consultations over the phone (16).

In this study, THPs expressed their willingness to co-operate with BHPs to manage diabetes and hypertension in South Africansociety. To improve diabetic and hypertensive care, they suggested the need for training regarding their management. They also indicated the need to have access to scientific tools, such as glucometers and sphygmomanometers, to assist in accurate diagnosis, and as a way of improving the services provided to people, some of whom are not able to access hospitals and clinics for a variety of reasons, such as distance to health facilities and lack of money to afford Western medication. In a study conducted in Uganda, inhabitants in Bugiri and Iganga Districts cited affordability of TM as one of the main reasons why they use this form of medication(2).

Conclusions

THPs in this study regarded diabetes and hypertension as being the same, since one condition could lead to the other.The description of clinical features by Zulu THPs for both diabetes and hypertension in this study has a lot in common with OCM literature regarding the signs and symptoms for these two chronic conditions.Overall,THPs in this study were very secretive in revealing the composition of their herbal mixtures; however, most of the participants mentioned the use of *Aloe vera* and *Allium sativum*(garlic) in the management of both diabetes and hypertension. Further studies are needed to determine whether other local indigenous communities manage diabetes and hypertension using the same approaches and treatment modalities.

Implications of results

In this study, THPs' willingness to co-operate with BHPs to manage diabetes and hypertension would be a way to assist affected individuals who contact these practitioners as their first line of care. A study conducted in South Africa reveals that despite THPs' willingness to co-operate with BHPs in HIV/AIDS management, some (43%) were hesitant to refer patients to receive the needed medical attention from clinics(50). In recognition of the important role that THPs play in providing health care to many people, for whom the THPis their first point of contact with a care provider, their contribution to addressing some chronic conditions needs to be enhanced. This could include encouraging them to refer patients to health care facilities timeously to avoid complications associated with both conditions.Some researchers suggested that THPs' delay in referring patients to receive medical treatment could have dire consequences forthe health of such individuals(51). Researchers indicated the significance of collaboration between THPs and BHPs as a step in the right direction to mitigate the effects of these chronic conditions affecting people's lives (52).

Limitations of the study

The findings of this study may not be generalizable for the entire population due to the small size of the population and because it occurred in the two districts in central KwaZulu-Natal. The use of FGDs to collect information from a specific group of participants in research has been criticized for not making use of hierarchal structures within a group, which might influence the contents produced by the group(49). In addition, there was inability of researchers to reach out to all THPs in the studied area to take part in this research. Last but not the least, there may be inaccuracies in the interpretation of facts because of transcription of verbatim quotes by THPs in isiZulu and which were translated into English. However, these limitations donot affect the main findings of this study.

Authors' contributions

FEK and MN conceived and drafted the paper, and accepted the final version of the manuscript for publication.

Conflict of interest

Authors declare no conflict of interest.

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CHAPTER 4

Employing the same interview guide (Appendix V) used in chapter 2, focus group discussions were held in the North-West province to find Tswana traditional health practitioners perspectives in the management of diabetes and hypertension in this study. The findings are published in the *Pan African Medical Journal*. The final version of the article is presented in chapter 4.

PanAfrican Medical Journal

Research

Tswana traditional health practitioners' perspectives on the management of diabetes and hypertension: a qualitative study using focus group discussions

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Abstract

Introduction: the literature suggests the involvement of Traditional Health Practitioners (THPs) perspectives in treating diabetes and hypertension in Africa. This study sought the perspectives of Tswana THPs in the management of both diabetes and hypertension. **Methods:** using a semi-structured interview guide, four Focus Group Discussions (FGDs) sessions were held with 40 THPs; FGD1 (12) FGD2 (6); FGD3 (13) and FGD4 (9) who were purposely selected from Bojanala and Dr. Ruth Sekgopomati Districts in the North-West Province of South Africa. **Results:** Tswana THPs perceived diabetes as a "sugar" disease and described hypertension as a disease associated with the abnormal flow of blood in a patient's body. In addition, some of the signs and symptoms of both diabetes and hypertension mentioned by Tswana THPs agreed with scientific literature. Tswana THPs employed the use of the following plants: borago officinalis, ziziphus mucronata, hypoxis hemerocallidea, sutherlandia frutescens, senna italica, urginea sanguinea and eucalyptus globulus in the management of diabetes and hypertension. **Conclusion:** some of the medicinal plants employed by THPs in the management of both diabetes and hypertension has been proven scientifically to be effective against these chronic conditions.

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Introduction

In most African communities where access to hospitals and clinics remains a challenge, patronage of Traditional Medicine (TM) with the help of Traditional Health Practitioners (THPs) offer people the opportunity to manage certain diseases affecting their wellbeing and health in general [1]. According to the World Health Organization (WHO), "traditional medicine refers to health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques, and exercises applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being" [2]. Furthermore, WHO defines Traditional Health Practitioner(THP) as, "a person who is recognised by the community where he or she lives as someone competent to provide health care by using plant, animal, mineral substances and other methods based on social, cultural and religious practices" [3]. In South Africa, a study reported that there were four groups of THPs recognized by the South African traditional healers act, namely: herbalists (izinyanga or amaxhwele), diviners (izangoma, umthandazi or amagqirha), traditional surgeons (iingcibi) [4]. The role played by THPs in the treatment and management of these two diseases (diabetes and hypertension) across the African continent has been documented [5, 6]. A research carried out in South Africa revealed the treatment of diabetes among THPs and faith healers in the northern province of South Africa [5]. Similarly, a study conducted in Zambia reported the treatment of hypertension among THPs in Zambia [6]. The two leading causes of cardiovascular diseases and their complications are diabetes and hypertension. Globally, it has been estimated that 1.39 billion people are affected by hypertension [7] while 300 million people are estimated to be diabetic by the year 2025 [8]. The present study sought Tswana THPs perspectives about the management of diabetes and hypertension. The specific objectives were: to determine Tswana THPs cultural understanding of both diabetes and hypertension; to determine the Tswana THPs description of clinical features for both diabetes and hypertension; to determine ethnopharmacological and treatment modalities employed by Tswana THPs in the management of both diabetes and hypertension.

Methods

Study design and setting: an exploratory descriptive study, using four FGDs, was conducted among THPs in urban, traditional and farmland areas in the Bojanala and Dr. Ruth Sekgopomati Districts of North West district in South Africa to obtain quantitative and qualitative data. It is significant to point out that FGDs are used to gather opinions in qualitative research [9]. In the Bojanala District, FGD session 1 was held in the living room of a traditional leader in Boitekong, while FGD session 2 was held in the local community hall in Montsana. FGD sessions 3 and 4 in Dr. Ruth Sekgopomati Districts (Pampierstadt and Manthe) were held in the living rooms of THPs leaders.

Study population and sample: purposive sampling was used to identify THPs who could provide information based on their availability and willingness to co-operate [10]. The four FGD sessions (12 in FGD1); (6 in FGD2); (13 in FGD3) and (9 in FGD4) had no more than 14 subjects based on the recommendation of Gill P et al. [11]. The inclusion criteria for participants was a minimum of aged 18 years with more than one year experience in managing diabetes and hypertension. Those eligible THPs with less than one-year experience in the management of both diabetes and hypertension were excluded. With regards to recruitment and selection of THPs leaders of various associations of THPs in the area of study (North West Province, South Africa) were contacted to obtain their support and assistance in making contact with appropriate practitioners. Furthermore, they helped to recruit eligible THPs to join FGDs held during business hours in the respective districts.

Ethics approval: this study obtained approval from the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal under reference number BE 567/17. Participation in this study was voluntary for THPs included in the final analysis. The purpose of this study was explained to the participants and they were allowed to ask questions before each FGD session started. Those THPs who volunteered to be part of the study gave written consent before joining FGDs.

Data analysis: there were simultaneous data collection and analysis with the help of two research assistants who were fluent in the Tswana language, the FGDs were audiotaped and transcribed verbatim. The raw transcribed data were analysed following Tesch's recommendation for identifying themes and sub-themes as presented

in a table below with the help of independent qualitative research experts. A meeting was held between the principal researchers to discuss the codes identified after data analysis [12]. The quantitative data were analysed using SPSS version 2.0 and thematic content analysis was used to analysed qualitative data [13, 14]. Descriptive statistics were used to present socio-demographic characteristics of participants expressed in frequency and percentage; mean values with standard deviation were used for age and years of work experience.

Results

Table 1 presents the socio-demographic characteristics of participants included in this study. Majority of the respondents recruited for the study were females (27/40, 67.5%). The mean age and years of work experience were 42.87 (13.69) and 11.29 (10.58) respectively. Majority of the participants were single (22/40, 55%); had high school education (21/40, 52.5%) and stated following both traditional and Christian religions 20/40 (50%). Many THPs 31/40 (77.5%) in this study used both divination and herbal practices. Most of the participants 36/40 (90%) were registered with both the South African Traditional Health Practitioners Council (SATHPC) and the local district associations (THA). It is significant to point out that 8 themes and 15 sub-themes emerged from the study (Table 2).

Tswana THPs perceptions towards diabetes and hypertension: THPs perspectives in the management of diabetes and hypertension are based on their understanding of these two diseases whether it is curable or manageable. Besides, how they were able to identify a patient affected by diabetes and hypertension was also taken into consideration. Last but not the least, Tswana THPs emphasized on the perceived causes and major complications of these two diseases.

Understanding diabetes and hypertension: most Tswana THPs believed that diabetes is a "sugar disease" and described hypertension as a disease associated with a patient having an abnormal flow of blood in a patient's body. "It is a sugar disease; the basic level of sugar is not the way is supposed to be in one's blood." Female 1, GP1. "It is a sugar disease…." Female 3, GP4. "Hypertension is when there is a lot of pressure in your blood system, your blood is not flowing according to a normal way." Female

2, GP4.

Diabetes and hypertension are they curable or manageable? Most of the THPs were of the assertion that diabetes and hypertension could be cured following an appropriate treatment regimen. "Yes, both diseases are curable, with relevant treatment." Female 2, GP2. It is significant to point out that all the participants in (GP2) voiced out that they agreed with what she said. "Yes. They are curable." ***All the THPs in GP4. "Yes, these two diseases are curable." ***All the THPs in GP 3. "Both sugar diabetes and hypertension can be brought under control." *** All the THPs in GP1.

Identifying a person with diabetes and hypertension: majority of the THPs based their diagnosis on the knowledge of the signs and symptoms of these two diseases or signs and symptoms reported by patients seen by them. Tswana THPs mentioned the following: frequent urination, excessive sweating, frequent thirst, excessive desire to eat, as possible signs and symptoms of the two diseases. A few relied on BHPs and ancestral spirits for diagnosis. "A person suffering from diabetes urinates now and then." Female 1, GP4. "Diabetic person sweats a lot." Male 2, GP3. "There are symptoms that we pick up when a person has diabetes, firstly that person normally has dry skin, also his/her mouth dries up. A person with diabetes is always hungry and he/she gets extremely weak when he/she is hungry, and his/her hard palate is also very dry." Female 8, GP1. "The person who suffers from hypertension has similar symptoms as the one with diabetes, but also sweating is the most common symptoms just like a TB patient. Just like diabetes a person suffering from hypertension has a very low sex desire. Hypertension sufferers are normally impatient and short-tempered as well." Female

1, GP 1. "Once the clinic or doctor has confirmed we can start with the treatment." Male 2, GP1. "Our knowledge and also guidance from our ancestors." Female 2, GP2.

Perceived causes of diabetes and hypertension: Tswana THPs stated that poor diets (consumption of excess sugar, salt, fatty foods, and red meat) are the perceived causes of both diabetes and hypertension. "They must avoid fatty/oily food. Salty and spicy food." Female 3, GP1. "They must avoid meat, especially fatty meat, they must also avoid red meat if it is chicken they must remove the skin." Female 4, GP3.

Perceived complications of diabetes and hypertension: Tswana THPs indicated poor eyesight, wounds associated with diabetic patients that do not get healed, amputation, stroke and erectile dysfunction as some of the perceived medical complications for diabetes. "With sugar diabetes is…once you can have a minor

scratch or a wound…you don't get healed." Female 4, GP1. "Hypertension leads to stroke." Male 3, GP3. "In men it causes erectile dysfunction." Female 1, GP2.

Treatment modalities: Tswana THPs employed both ethnopharmacological and non-pharmacological treatment approaches in the management of these two diseases

Ethnopharmacological interventions: Tswana THPs employed the use of herbal mixtures in the management of both diabetes and hypertension. "We use the following herbs, for both diabetes and hypertension, both diseases normally go together, meaning often you find a person suffering from diabetes also having hypertension as well. So we use **ditserempepe, matlhare a se-rooiboom, aloe** and **mositakgomo**." Female 2, GP2. "For treatment, I mix **lekgala,** and **lerumo la madi,** I also take **mosibeletswane** and boil it, afterward I pour in two-litre bottle for the patient to drink at home." Male 1, GP4. Tswana THPs recommended the use of herbal mixtures with the composition of these medicinal plants borago officinalis, ziziphus mucronata, hypoxis hemerocallidea, sutherlandia frutescens, senna italica, urginea sanguinea and eucalyptus globulus.

Non-pharmacological interventions: Tswana THPs stated the significance of exercise in the management of both diabetes and hypertension. "They must exercise regularly, they must take care of their bodies." Female 1, GP3.

Prescribing practices: Tswana THPs prescribed dosage leaned on the severity of a patient's health condition and a patient's ability to consume a certain amount of herbal mixtures.

The severity of a patient's condition, high/low concentration of a mixture and age: THPs in this study relied on the age of a patient, severity of patients and the concentration of prescribed herbal mixtures. "It will depend and his/her condition, he/she might drink a quarter of a cup once, twice or three times a day." Female 4, GP1. "Yes, we do consider different age groups of patients as well as their conditions like pregnant women." Female 3, GP3.

Effectiveness of prescribed TM: Tswana THPs argued about the effectiveness of their prescribed herbal mixtures compared to western medications.

TM vs western medications: THPs believed that their prescribed herbal mixtures had no side effects when taken by their patients. "No, our traditional medication does not have any side effects…." Female 2, GP2. "There are no side effects." Male 2, GP4.

Concurrent use of both prescribed medicines and western medications to avoid contraindications: Tswana THPs were not against taking these two forms of medications but advised their patients to take these two forms of medications (TM and conventional orthodox medication) but different times during the day to avoid contraindications.

Encouragements when on these two forms of medications (prescribed herbal mixtures and western medications): Tswana THPs offered encouragements and advice to patients on both their prescribed medicines and western medications for the management of these two diseases. "Yes, they can take their herbal mixtures with western medication." Male 3, GP3.

Avoidance of taken TM and western medication simultaneously: "If they take their clinic in the morning advise them to take their traditional medication in the evening or during the day." Male 3, GP2. "Also there must be a space between traditional medication and western medication, for example, if the patient takes the western one in the morning, then he/she must take the traditional one in the evening, alternatively the patient must ensure that there's four hour interval between the time he/she took the one medication before he/she can take another one. "Female 3, GP3.

Feedback and monitoring of patients: Tswana THPs acknowledged the significance of monitoring the progress of the patients seen by them.

Positive feedback report from patients: some of the THPs contended that they do follow-ups by calling their patients over the phone. "There's constant communication between us and our patients, they always tell us and also we can see them, again often when they go for their check-ups at the clinic, they are always told whether their conditions have improved or not." Female1, GP4.

Challenges faced in managing these two diseases: Tswana THPs spoke about the lack of scientific tools to help them with diagnostic purposes.

Inaccessibility of medical tools for diagnosis: Tswana THPs bemoaned inaccessibility of scientific tools in the management of both diabetes and hypertension. "Western doctors have the equipment to

check whether a patient is diabetic or not, with us, we only depend on signs." Male 2, GP3. "The only thing is that they have the equipment to detect these diseases and we only rely on the signs and guidance from our ancestors." Male 3, GP2.

Recommendations to improve diabetic and hypertensive care in South Africa: Tswana THPs highlighted the significance of collaboration with BHPs to assist in the management of both diabetes and hypertension. The proposed partnership with BHPs was intended to assist in managing diabetes and hypertension.

Collaboration with biomedically health professionals: "I believe that if all South African medical health practitioners both traditional and western, must work together, traditional healers must also be allowed to see and treat patients in hospitals, I think that can improve not only diabetic and hypertension care but the health care in general." Female 3, GP4.

The need for a two-way referral system of patients: Tswana THPs suggested the implementation of a two-way referral system of patients in the management of both diabetes and hypertension. They believed that BHPs were the ones against the two-way referral system. "The clinic and western doctors seem to be the ones who have problems to refer patients to us." Female 2, GP3.

Endorsements and recognition from the government: Tswana THPs appealed to the government to give them the same attention as the BHPs working in the hospitals. "Government must also intervene because we are realizing that western doctors are highly respected as opposed to us, African healers. We always give solutions to some of the health problems in this country, but we hardly get any recognition or credit." Female 3, GP1.

Discussion

Tswana THPs in this study description of diabetes as a "sugar disease" agrees with a similar study conducted in the Northern province of South Africa where THPs described diabetes as a sugar disease [5]. Regarding hypertension, Tswana THPs associated the disease with a patient having an abnormal flow of blood in his or her body. This is in agreement with a research carried out by Goma et al. in Zambia where some of the THPs in Lusaka described hypertension as a disease associated with blood flowing fast in a patient's body [6].

Tswana THPs in this study had varied opinions on whether hypertension and diabetes were curable or could only be managed. The assertion about the curability of diabetes and hypertension by THPs in FGDs 2, 3 and 4 is in agreement with the statements of THPs in the northern province of South Africa which indicated that diabetes was curable using African Traditional Medicine [5]. In a similar study conducted in Nigeria, THPs believed that hypertension was curable [15]. However, in FGD 1, the THPs stated that diabetes and hypertension could only be managed but not cured completely. THPs in FGD 1 assertion that these two diseases cannot be cured completely is in agreement with scientific literature as opposed to the statements made by THPs in FGDs 2, 3 and 4 which seem to suggest that these two diseases could be cured completely following appropriate treatment regimen [16, 17]. It is therefore worth noting that participants were confident in their submissions regarding the management of diabetes and hypertension.

Most of the THPs in this study based their diagnosis on the signs and symptoms reported by patients seen by them, while a few relied on ancestral spirits for diagnosis. A similar study conducted in Nkonkobe Municipality in South Africa reported that THPs relied on the signs and symptoms reported by their patients for diagnosis [18]. This finding may suggest that THPs in this study relied on the signs and symptoms reported by patients to affirm their diagnosis. Signs and symptoms (frequent urination, excessive sweating, frequent thirst, excessive desire to eat) reported by THPs in this study are in agreement with those signs and symptoms commonly reported in the scientific literature about diabetes and hypertension [19, 20]. Some of the THP's in this study stated with regards to a spiritual diagnosis that, upon receiving patients to their shrine "bidime" in "Tswana language" during consultations, ancestors revealed to them the problem troubling an individual and appropriate measures to be undertaken to improve his or her condition. This finding above is in agreement with another study which stated that ancestors have the power to heal [21]. Furthermore, indigenous epistemology suggests that an individual becomes ill as a result of weaknesses in his or her protective (spiritual) immunity [22].

Perceived causes (too much sugar and salt, excessive consumption of red meat and alcohol, and lack of regular exercises) of diabetes and hypertension described by THPs in this study are in agreement with the scientific findings commonly reported for diabetes and hypertension [23, 24]. Regarding perceived complications of diabetes and hypertension, the THPs specifically mentioned the following: erectile dysfunction, poor eyesight, wounds associated with diabetic

patients that do not get healed, leading to stroke and amputation, this being the last intervention for limb preservation in diabetic patients with foot ulcers [25]. A multi-ethnic cohort study in the USA revealed a diabetic retinopathy prevalence rate of 33.2% among the studied population [26]. Erectile dysfunction, as stated by THPs in this study, is one of the major complications associated with diabetic patients and agrees with scientific literature. The prevalence rates of erectile dysfunction reported among diabetic men conducted in the following countries were as follows: USA (more than 50%), Saudi Arabia (80-90%), Netherlands (41%) and Mexico (30-80%) [27].

Although most of the THPs were not ready to disclose information about the herbal formulation they used to manage the two diseases, some named the following herbs and plants: buffalo-thorn (mokgalo), eland's-pea (sebetebete), sutherlandia (lerumo-la-madi/phetola/mhetola), blue-gum tree (bluekom), red slangkop (sekaname), African potato (labatheka), star-flower (tshuko-ya-poo), aloe vera (mokgopha), dwarf buffalo-thorn (sekgalofatshe). To prepare a herbal mixture some said they took fresh aloe, a handful of dried powder form of star-flower, a handful of tlhokwa-la-tsela (yellow medicinal grass-like plant) and a secret plant (often given a funny term) known only to them. A mixture of the above-mentioned plants was poured into a pot and allowed to boil. The boiled herbal mixture is taken off the fire and allowed to cool off before they poured into a 2-litre clean bottle to be given to patients. Scientific findings have revealed the potency of some of the named plants reported in this study for regulating blood sugar levels and decreasing blood pressure in both humans and animals. Approximately sixty type 2 diabetic patients in India who were administered with a supplement (aloe vera gel powder, 100/200mg) daily over three months recorded a significant reduction in their blood glucose and blood pressure levels [28]. Crude leaf extracts of starflower (borago officinalis) administered in rabbits caused a decrease in both atrial force and rate of contractions in their hearts [29]. Experimental results revealed a decrease in intestinal glucose uptake ($p<0.001$ at 1-hour intervals) in diabetic wistar rats when the animals were administered with sutherlandia frutescens for over eight weeks [30]. In a similar study, an aqueous extract of African potato (hypoxis hemerocallidea) (100-800 mg/kg p.o) administered to streptozin diabetic rats caused a reduction in the animal's blood glucose concentrations (30.20% and 48.54%) [31]. In vitro studies using 0.2% 2, 2-diphenyl-2-picrylhydrazyl (DPPH) assay revealed antioxidant properties exhibited by acetone extracts of the root of elands pea (Senna italica) [32]. Buffalo-thorn (ziziphus mucronata), red slangkop (urginea sanguinea), blue gum tree (eucalyptus globulus), were also reported to be used by THPs in South Africa to manage diabetes and hypertension [33-35].

THPs in this study revealed that lifestyle modifications on the part of patients were a major contributor to manage these two diseases, with brisk walking having been established to be effective in reducing arterial blood pressures [36]. A study reported that hypertensive patients (under 8 weeks stress management programme) recorded a significant reduction in systolic blood pressures, even without taken their antihypertensive medications within that period [37]. THPs expressed confidence in their prescribed TM and were not aware of any side effects, with the dosage given depending on the severity of a patient's condition. This is in agreement with a similar study conducted in Kenya, where THPs stated that their prescribed herbal mixtures had no side effects [38]. Some of the THPs in this study were not against the concurrent use of TM and conventional orthodox medication by their patients. However, instructions were given regarding different times their prescribed medications should be taken to achieve the best possible health outcomes. Interestingly, studies reported that to avoid adverse effects regarding the use of both TM and conventional medications, these forms of medications should be taken at different times by a patient [39]. Some of the THPs in this study believed that extra care should be taken when prescribing medications for pregnant women, as strong herbal mixtures could affect the fetus. They gave an example of how some of their clients (women) who had taken birth control pills concurrently with their prescribed medications fell pregnant. Tswana THPs made it a priority to monitor the health conditions of their patients after they had given them medical assistance. In this study, some of the THPs who had the phone numbers of their clients called them to find out whether their health conditions had improved. Regarding the issue of collaboration between THPs and BHPs to assist in managing these two conditions, they were not against this initiative but bemoaned the lack of co-operation from BHPs. Similarly, a study reported the reluctance of BHPs in referring patients to THPs for cancer treatment in KwaZulu-Natal [40]. They confirmed the significance of collaboration between THPs and BHPs to improve diabetic and hypertensive care in South Africa. Most of the THPs were willing to learn to use scientific tools, such as a sphygnometer and glucometer, for diagnosing patients affected by these chronic conditions.

Limitations of the study: the study took place in two districts in the North West Province, and the findings, therefore, may not be generalized for the entire population of THPs in the North West

province and the rest of South Africa. Medicinal plants available in the two districts under study may not be found elsewhere in other parts of South Africa.

Implications of results: THPs in this study claimed that their prescribed medications had no side effects and should be researched to establish the efficacy and side effects of their herbal mixtures. A research carried out in South Africa revealed that a combination of prescribed herbal and conventional medications was effective against complications associated with antimicrobial therapy [41]. Conversely, a similar study reported that herbal medications could increase or decrease the pharmacological actions of prescribed drugs in patients with weak immune systems [42].

Conclusion

Most of the THPs in this study (regardless of their geospatial locations urban, traditional and farmland areas) believed that diabetes is a sugar disease and referred hypertension as a disease associated with the abnormal flow of blood in a patient's body. Some of the signs and symptoms associated with these two diseases mentioned by Tswana THPs agreed with scientific literature. Medicinal plants such as starflower (borago officinalis), African potato (hypoxis hemerocallidea) and elands pea (senna italica) used by Tswana THPs to manage diabetes and hypertension have been proven scientifically to be effective against them [30-32].

What is known about this topic

- The involvement of THPs in the management of diabetes and hypertension on the African continent;
- Many people on the African continent rely on TM with the assistance of THPs because it is a cheaper alternative compared to OCM;
- Possible side effects associated with OCM encourage people to patronize TM for these chronic conditions.

What this study adds

- Tswana THPs description of clinical features such as frequent urination, excessive sweating, frequent thirst associated with diabetes and hypertension agreed with scientific literature;
- Tswana THPs employed in this study (regardless of their geospatial locations urban, traditional and farmland areas) could be using the same treatment approaches and methods in the management of both diabetes and hypertension.

Competing interests

The authors declare no competing interests.

Authors' contributions

Both authors were involved in concept, design, analysis and interpretation of data. The final manuscript submitted to the journal was read thoroughly and approved by both authors.

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Tables

Table 1: socio-demographic characteristics of THPs purposely selected for this study

Table 2: major themes and sub-themes

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Table 1: socio-demographic characteristics of THPs purposely selected for this study

Variables	**Mean ± SD**	**n %**
Age(years)	42.87(13.69)	NS
Years of experience	11.29(10.58)	NS
Gender	Female	27(67.5)
	Male	12(30)
	Not specified	1(2.5)
Marital status	Cohabitation	2(5.0)
	Married	13(32.5)
	Single	22(55)
	Widow	1(2.5)
Religion	Christian	5(12.5)
	Traditional	15(37.5)
	Traditional and Christian	20(50)
Education	Nil	1(2.5)
	Primary school	5(12.5)
	Tertiary	11(27.5)
	High school	21(52.5)
	Other (middle school)	2(5.0)
Kind of practice:	Both divination and herbal	31(77.5)
	Divination	9(22.5)
Type of Practicing	Fulltime	38(95)
	Part time	2(5.0)
Place of practice	Home	40(100.0)
	Home and market	0(0.0)
	Office	0(0.0)
Registration (SATHPC)	No	4(10.0)
	Yes	36(90.0)
Registration (THA)	No	4(10.0)
	Yes	36(90.0)

Legend a: SATHPC (South African Traditional Health Practioners Council); National body; b: THA (Traditional Healers Association; Local association in respective

Table 2: major themes and sub-themes	
Theme 1: Perceptions towards diabetes and hypertension	Understanding diabetes and hypertension Is diabetes and hypertension curable or manageable Identifying a person with diabetes and hypertension Perceived causes of diabetes and hypertension
Theme 2: Treatment modalities for diabetes and hypertension	Ethnopharmacological interventions
Theme 3: Prescribing practices for diabetes and hypertension	Severity of a patient's condition, high/low
Theme 4: Effectiveness for prescribed medications	TM vs western medications
Theme 5: Concurrent use of prescribed medicines with western medications to avoid contraindications	Encouragements and instructions to follow when on these two medications Avoidance of taken TM and western medication
Theme 6: Feedback and monitoring	Feedback report from patients
Theme 7: Challenges faced in the management of diabetes and	Inaccessibility of medical tools for diagnosis
Theme 8: Recommendations to improve diabetic and hypertensive care in South Africa	Collaboration with biomedically health professionals The need for a two-way referral system of patients

CHAPTER 5

Findings from chapter 3 and chapter 4 revealed similarities in statements made by Zulu and Tswana THPs regarding the cultural understanding of both diabetes and hypertension. Regarding cultural understanding of diabetes some of the selected verbatim quotes made by Zulu THPs were as follows: “It is a sugar disease.”Female 1, GP1.
“Diabetes can be one of the high sugar levels or low blood sugar levels.”Female 3, GP2.
Statements made by Tswana THPs regarding cultural understanding about diabetes were as follows: "It is a sugar disease; the basic level of sugar is not the way is supposed to be in one's blood”. Female 1, GP1.
“It is a sugar disease”. Female3, GP4.
Regarding THPs cultural understanding about hypertension, statements made by Zulu THPs were as follows: “Diabetes and blood pressure (BP) are related. It is a norm that people who suffer from high BP are also affected by diabetes because of the imbalance between sugar and salt in the body”. Female 2, GP1.
Statements made by Tswana THPs in support of their cultural understanding about hypertension were as follows:
“Hypertension is when there is a lot of pressure in your blood system, your blood is not flowing according to a normal way”. Female 2, GP4.
Regarding the description of clinical features of diabetes as a disease, these were the statements made by Zulu THPs.
“People with BP or diabetes sweat a lot.”Male 3, GP4.
Loses weight, sweats a lot, eyes become affected too.”Female 3, GP1.
Tswana THPs description of clinical features of diabetes were as follows:
A person suffering from diabetes urinates now and then". Female 1, GP4.
Zulu THPs description of clinical features of hypertension were as follows:
“People with BP or diabetes sweat a lot.”Male 3, GP4.
Tswana THPs description of clinical features of hypertension were as follows:
“The person who suffers from hypertension has similar symptoms as the one with diabetes, but also sweating is the most common symptoms just like a TB patient. Just like diabetes a person suffering from hypertension has a very low sex desire. Hypertension sufferers are normally impatient and short-tempered as well”. Female 1, GP 1.
Regarding Ethnopharmacological preparations and treatment approaches employed by Zulu THPs to combat both diabetes and hypertension were as follows: We mix different herbs according to the level of illness. These are very bitter to taste but they help. However, we use different mixtures because we learn how to do so differently.”Female 1, GP1
“Reduce salt intake, drink lots of water, regular exercise, eat fruits (apples), spinach, other vegetables, and avoid using cooking oil or fat when cooking.”Male 3, GP5.
“Mixture of various herbs,‘amakhambi’,are used to control these conditions; also garlic is used to control these conditions.”Male 2, GP1“Aloe and garlic are used for this disease.”Male 4, GP4. Tswana THPs stated the following as the ethnopharmalogical preparations used to combat both diabetes and hypertension: “We use the following herbs, for both diabetes and hypertension, both diseases normally go together, meaning often you find a person suffering from diabetes also having hypertension as well. So we use ditserempepe, matlhare a se-rooiboom, aloe and mositakgomo”. Female 2, GP2.
"For treatment, I mix lekgala, and lerumo la madi, I also take mosibeletswane and boil it, and afterward I pour in two-litre bottle for the patient to drink at home". Male 1, GP4.
A critical analysis regarding statements made by Tswana and Zulu THPs revealed that there were no major differences regarding Zulu and Tswana THPs cultural understanding of diabetes and hypertension, description of clinical features , ethno pharmacological and treatment approaches used in the management of both diabetes and hypertension diseases. To conclude, Objectives 2, 3, 4 of this thesis were covered. The core objectives of the study were to determine similarities and differences the acquisition of knowledge,cultural understanding of diabetes and hypertension,description of clinical features of these two conditions and ethnopharmacological and treatment modalities employed by Zulu and Tswana THPs in the management of diabetes and hypertension. To build on chapter 3 and chapter 4, a comparative cross- sectional study using face-to-face interviews with the help of semi-structured questionnaire(Appendix VIII) were undertaken to establish similarities and differences in the methods and treatment approaches employed by Zulu and Tswana THPs in the management of diabetes and hypertension. The findings are published in the African Journal of Biomedical Research.

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Research Article

Management of Diabetes and Hypertension among Tswana and Zulu Traditional Health Practitioners: A Comparative Cross-Sectional Study Using a Mixed-Methods Approach

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ABSTRACT

Diabetes and hypertension contribute to a considerable burden of disease in sub-Saharan Africa (SSA), being largely due to poor diet habits, smoking and alcohol abuse. The study was aimed at providing evidence on the use of traditional medicine (TM) essential for managing these conditions by Zulu and Tswana traditional health practitioners (THPs). Data collection took place in the uMgungundlovu and uThukela Districts in KwaZulu-Natal (KZN) Province, and the Bojanala, Dr Ruth Sekgopomati Districts, in North-West Province, South Africa. Snowball sampling resulted in 863 THPs participating, 437 Zulus and 426 Tswanas face-to-face interviews were conducted using a semi-structured questionnaire to obtain qualitative and quantitative information about the objectives of the study. Most of Zulu and Tswana THPs acquired knowledge from a single source to manage diabetes and hypertension. The Zulu THPs acquired knowledge as a gift from birth while the Tswana's acquired knowledge from family members. Management was solely based on traditional knowledge, with the two groups having a similar cultural understanding of the two conditions and their clinical features, which were comparable to Orthodox Conventional Medicine (OCM) signs and symptoms. Treatment modalities mainly consisted of ethnopharmacological preparations of herbal mixtures concoctions and decoctions. There were similarities in the Zulu and Tswana THPs cultural understanding of these two diseases, descriptions of clinical features of diabetes and hypertension, and ethnopharmacological preparations used in their management. The findings are intended as a guide to developing a treatment framework that enables a common understanding of traditional practices to manage the two conditions.

Keywords: *Diabetes, Hypertension, Acquisition of Knowledge, Ethnopharmacological preparations*

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INTRODUCTION

Non-Communicable Diseases (NCDs), such as diabetes and hypertension, are significant risk factors for heart failures and stroke in patients affected by these chronic conditions (Pradeepa, 2013). At a high-level meeting held by the United Nations (UN) member states in 2011, NCDs were described as a threat to achieving the Millennial Development Goals (MDGs) due to their impact on the economy as a result of low productivity and premature deaths (Mpofu *et al.*, 2014). Available World Health Organization (WHO) data suggests a prevalence rate of 3-14.5% for diabetes and 46% for hypertension in sub-Saharan Africa (SSA) (Semenya and Potgieter, 2015).

Any person who has the gift of receiving spiritual instructions from the ancestral world and utilized traditional knowledge based on culturally inclined principles to heal diseases is known as a traditional healer (Sodi *et al.*, 2011). The South African Traditional Health Practitioners Act recognizes the following groups of THPs: herbalists (*izinyanga/amaxhwele*) specializes in the use of herbs and medicinal plants; diviners (*izangoma,umthandazi* or *amagqirha)* are mainly women who consult the spiritual realm to establish the cause of a disease; traditional surgeons (*iingabi*) are responsible for circumcisions, and female traditional birth attendants

(*ababelethis*i or *abazalisi*) who assist with pregnancy-related issues (Zuma *et al.*, 2016).

Studies in Africa have shown that THPs involvement in managing diabetes and hypertension use various herbal therapies, as is the case in Uganda for diabetes (Atwine and Hjelm, 2016). A similar study carried out in Tanzania revealed that two of the medicinal plants (*Cassia auriculate* and *Ricinus communis*) used by traditional healers to manage diabetes have been proven to be scientifically effective in address this chronic condition (Moshi and Mbwambo, 2002). In Zambia, THPs reported the use of herbal mixtures to manage hypertension (Goma *et al.*, 2016). In South Africa, a study by Peltzer *et.al* (2001) reported that THPs use herbal mixtures to manage diabetes (Peltzer *et al.*, 2001b) and hypertension (Peltzer *et al.*, 2001a). The practise of traditional healing is linked to the culture and environment within which THPs function (Agbor and Naidoo, 2016). THPs services are often well patronized in their local communities as their indigenous explanatory models of diseases are accepted and understood by the people they serve (Avhad *et al.*, 2013).

Within Africa, most studies explore THPs perspectives about managing diabetes and hypertension within a specific cultural environment. In Nigeria, a study explored the perspectives of THPs living in Edo Ekiti Region about managing diabetes (Akharaiyi *et al.*, 2017a), while in Tanzania, Kasole *et al*. (2019) investigated the THPs perspective in the Kilimanjaro region about managing diabetes (Kasole *et al*., 2019). In South Africa, a study was conducted to establish THPs perspectives in the Nelson Mandela Metropole about managing diabetes (Van Huyssteen *et al*., 2004) Similarly, researchers sought the perspectives of THPs in managing hypertension in the Northern Province (now Limpopo) of South Africa (Peltzer *et al.*, 2001a).

However, there is a paucity of information regarding comparison of the treatment approaches and methods used by THPs of two cultures in managing various diseases, including diabetes and hypertension, in Africa. The similarities and differences of treatment methodologies used by THPs in various cultures and environments are not well documented. Such comparison may assist in affirming the evidence base of practice that could lead to the standardization of treatment approaches. This study therefore aimed at comparing the perspectives of Tswana and Zulu THPs practising in their respective cultural environment regarding managing diabetes and hypertension. The specific objectives of the study were to establish: whether the Tswanas and Zulus THPs acquire specific training to manage the conditions; similarities and differences in their cultural understanding of the two conditions; similarities and differences in their description of the clinical features; similarities and differences in their ethnopharmacological and treatment approaches.

MATERIALS AND METHODS

Study design: The cross-sectional mixed-method approach entailed using both qualitative and quantitative data (Creswell, 2005) to enable a deep understanding of the research problem, their integration enabling important conclusions to draw conclusions (Johnson and Onwuegbuzie, 2004).

Study location: The study took place in the uMgungundlovu and uThukela Districts KwaZulu-Natal (KZN) Province and Bojanala, Dr Ruth Sekgopomati Districts of North-West provinces, South Africa.

Ethical approval: Ethical approval was received from the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal under reference number: BE 567/17.

Participants selection: Male and female THPs aged 18 years old and above were approached to participate in the face-to-face interviews using a researcher administered questionnaires. Those with experience in managing diabetes and hypertension were eligible for this study, with snowball sampling (Bryman, 2012) being used to identify potential participants. A sample size with a statistical power of 80% was computed using the following statistical parameters: Effect size equals 0,33type 1 error(α) equals 0,05 (the probability of falsely rejecting the null hypothesis equals to 5% and a type 2 error (β) equals 0.02 (the probability of falsely failing to reject the null hypothesis equals 20%). Based on the above parameters, a minimum sample size of 93 participants (THPs) was computed for each of 12 geospatial location in the four districts in KZN and North-West Provinces. To maintain the precision across the 12 selected geospatial locations (in urban, traditional or tribal and farm areas), a total sample size of 1,116 (93x12) participants was identified, with 558 in each province (Banerjee *et al.*, 2009), with 863 agreeing to participate, these being 437 Zulus and 426 Tswanas, representing 77.33% of the targeted population.

Assistance from the KZN and Tswana THPs associations resulted in initial contact being made with practitioners who referred the team to other THPs, as per the snowball sampling method (Bryman, 2012). The THP leaders of the district associations in both provinces explained the study to their members during their regular monthly meetings, at which those with relevant experience were identified.

Data collection: Quantitative and qualitative data were collected using a researcher administered questionnaire that was developed in English and translated into isiZulu and Tswana, with open and close-ended questions that were pilot-tested with THPs to determine its validity. Their socio-demographics were obtained, with questions exploring training and acquisition of knowledge, their cultural understanding of diabetes and hypertension, signs and symptoms, medical complications, treatment modalities and approaches, management challenges, and recommendations to improve diabetic and hypertensive care in South Africa. Face-to-face interviews were conducted by six research assistants who were fluent in both IsiZulu and Tswana. The THPs were visited in their homes, place of work and sometimes during their monthly meetings, with the study being conducted between September 2018 and September 2019.

Data Analysis: The Quantitative data analysis was carried out on SPSS version 20 (SPSS, 2011). Numerical values (age) and years of experience were expressed as mean± standard deviation while other parameters were expressed in

frequencies (n) and percentages (%). The qualitative data were thematically analyzed following (Tesch, 1990) recommendation of identifying themes in the raw transcribed data. Quotes are reported verbatim to substantiate the categorisation of the data, with member checking being done by providing the participants with the findings to establish data validity.

RESULTS

Traditional Health Practitioners demographics: Details of Zulu and Tswana THPs demographics are presented in Table 1. Zulu and Tswana THPs were on average age 47.43 ± 14.47 and 43.54 ± 13.66 respectfully. Zulu THPs were predominantly female (n=290, 66.40%) while the Tswana's were mainly male (n=214, 50. 23%). Nearly half (46.50%) of Zulu THPs had completed their primary level education, while over half (51.20%) of the Tswana practitioners had completed high school. Majority of both Zulu (n=270, 61.80%) and Tswana THPs (n=159, 37.30%) were single. Majority of Zulu THPs were practicing traditional religion (n=180, 41.20%) while majority of Tswana THPs (n=356, 83.60%) were Christians. The majority of Zulu THPs were divination and herbal practitioners (n=334 76.40%), while for the Tswana THPs, this category constituted (n=182, 42.7%). Most of the Zulu and Tswana were practising their profession at home (n=424, 97.00%) and (n=395, 92.70%) respectfully, the majority of both groups practising their profession full-time (Zulu: n=348, 79.60%; Tswana; n=339, 79.60%). The majority of the Tswana THPs were registered with THPCSA (n=336, 78.90%) compared to Zulu THPs (n=196, 44.90%). Majority of Tswana THPs (n=254, 59.60%) were registered with their respective local healers' associations, THA compared to Zulu THPs (n=71, 16.20%). The mean age of years of experience stood at 15.69± 11.68 and 18.68±11.35 for Zulu and Tswana THPs respectfully

Acquisition of knowledge and information about diabetes and hypertension diseases: Table 2 indicates how both groups acquired their knowledge to manage diabetes and hypertension, with most Zulu's regarding it as a gift from birth and being a calling, while most Tswana's were trained by a family member of other persons for both conditions.

The following statements were made by Zulu THPs regarding where they acquired knowledge to manage these two diseases:

"I was born with it". Zulu Female, THP 49.

"*I was trained by my mother who is a healer herself*" Zulu Female, THP 85.

"*I was trained by another healer*" Zulu Male, THP 434.

"*It is my calling, I spiritually determine client illnesses*" Zulu Female, THP 236.

"*I was trained by the Department of Health (DOH) through workshops*" Zulu Female, THP 254.

The majority of Tswana THPs acquired their knowledge to manage both diabetes and hypertension through training received from their family members (n=118, 27.70%) and noted the following:

"My mother was a 'sangoma' she trained me". Tswana Female, THP 227.

"I was taught by my grandfather". Tswana Male, THP 27.

"*I had a year and a half training from a traditional doctor*" Tswana Female, THP 220.

"*I was taught by a professional 'matwetwe'*" Tswana Female, THP 8.

Table 1.
Socio-demographic characteristics of Zulu and Tswana THPs

Characteristics	Variables	Zulu (437)		Tswana (426)	
		No.	%	No.	%
Age (YEARS)	18-29	53	12.10	87	20.40
	30-39	85	19.50	89	20.90
	40-49	94	21.50	105	24.70
	50-59	104	23.80	87	20.40
	60-69+	101	23.10	58	13.60
	Mean ±SD	47.43±14.47		43.54±13.66	
Gender	Male	147	33.60	214	50.20
	Female	290	66.40	212	49.80
Education	Nil	70	16.00	55	12.90
	Primary	203	46.50	105	24.60
	High School	152	34.80	218	51.20
	Tertiary	12	2.70	48	11.30
Marital status	Cohabiting	18	4.10	70	16.40
	Divorced	4	0.90	28	6.60
	Married	121	27.70	141	33.10
	Single	270	61.80	159	37.30
	Widowed	24	5.50	28	6.60
Religion	Christian	76	17.40	356	83.60
	Islam	1	0.20	N/A	N/A
	Traditional	180	41.20	61	14.30
	Christian & Traditional	64	14.70	N/A	N/A
	Islam & Traditional	1	0.20	N/A	N/A
	Other (Shembe, Zion, etc)	97	22.20	N/A	N/A
	None	18	4.10	9	2.10
Kind of practice	Divination	6	1.40	157	36.90
	Herbal	95	21.70	87	20.40
	Divination and Herbal	334	76.40	182	42.70
	Other	2	0.50	N/A	N/A
Place of practice	Home	424	97.00	395	92.70
	Market	10	2.30	22	5.20
	Office	2	0.50	9	2.10
	Other	1	0.20	N/A	N/A
Type of practice	Full-time	348	79.60	339	79.60
	Part-time	89	20.40	87	20.40
Registration (THPCSA)	Yes	196	44.90	336	78.90
	No	241	55.10	90	21.10
Registration (THA)	Yes	71	16.20	254	59.60
	No	366	83.80	172	40.40
Years of experience		15.69± 11.68		18.68±11.35	

Legend: SD (Standard Deviation); N/A (Not applicable).

Table 3 shows THPs cultural understanding of both diabetes and hypertension and indicates that (n=427, 85.60%) Zulu THPs and (n=426, 100.00%) of Tswana THPs described diabetes as a 'sugar disease', while they regarded hypertension as being similar to diabetes.

Table 2.
THPs acquisition knowledge for the management of both diabetes and hypertension.

Variable	Acquisition of Knowledge	Zulu (n=437) No. %	Tswana (n=426) No. %
Single Source of knowledge acquisition for diabetes management	Trained by the family member	31 (7.09%)	118 (27. 70%)
	Trained by another person	22(5.03%)	107 (25. 11%)
	A gift from my birth	211(48.24%)	84 (19.72%)
	It is my calling	87(19.91%)	52 (12.21%)
	I got professional training	46 (10.52%)	49 (11.50%)
	Other forms of training	2 (0.46%)	16 (3.57%)
	Declined to comment	2 (0.46%)	
Single Source of knowledge acquisition for hypertension management	Trained by the family member	3 (7. 55%)	118 (27.70%)
	Trained by another person	26 (5.95%)	107 (25.11%)
	A gift from my birth	219 (50.11%)	84 (19. 72%)
	It is my calling	71 (16. 25%)	52 (12.21%)
	I got professional training	57 (13. 04%)	49 (11.50%)
	Other forms of training	3 (0. 69%)	16 (3. 57%)
Multiple sources of Knowledge acquisition		36 (8. 28%) 26 (5. 95%)	

Table 3
THPs response regarding the cultural understanding of diabetes and hypertension.

Condition	Characteristics	Zulu (n=437) No. (%)	Tswana (n=426) No. (%)
Diabetes	Yes	427 (85. 60%)	426 (100. 0%)
	Declined to comment	10 (2.28%)	
Hypertension	Yes	426 (85. 40%)	426 (100. 0%)
	Declined to comment	11 (2.52%)	

The following statements were made by the THPs regarding their cultural understanding of diabetes.

"Sugar disease is when you sweat, get tired quickly and some have wounds that don't heal" Zulu Female, THP 189.

"*It's a sugar disease. It means there is an abnormal level of sugar in your blood, either higher or lower than the normal required level.*" Tswana Male, THP 28.

Regarding their cultural understanding of hypertension, most Zulu (n=426, 85.40%) and Tswana THPs (n=426, 100.00%) believe that it is similar to diabetes, as one condition leads to the other.

"*Hypertension and diabetes more or less the same*" Zulu Male, THP 8.

"*Hypertension is similar to diabetes*" Tswana Male, THP 226.

"Hypertension is when a person gets dizzy or has difficulties in breathing and gets tired quickly". Zulu Male, THP 124.

"*It is an illness that causes a person to have heart palpitations and feel weak*" Zulu Female, THP 263.

"*When your blood is not flowing the way it is supposed to flow, often when it does this, your heartbeat is also affected, sometimes it beats faster sometimes slower, and it is dangerous*" Tswana Female, THP 264.

Types of diabetes and hypertension

The majority of Zulu THPs (n=358, 81.92%) felt that there were different types of diabetes, these being high and low blood levels. Three quarters (n=330, 75. 50%) contended that there were two types of hypertension. Heart beating faster/slower than normal during breathing were regarded as the two major types by (n=330, 75.50%) by the Zulu THPs. On the contrary, all the Tswana THPs interviewed were of the opinion that there were not different types for both diabetes and hypertension. The THPs were aware of medical complications associated with diabetes and hypertension, as indicated in Table 4, with the two groups reporting similar problems. Regarding diagnosis, more Zulu THPs personally diagnosed both diabetes (n=364, 83.30%) and hypertension (n=372, 85.52%) than their Tswana counterparts.

Diagnosis of both diabetes and hypertension were based on spiritual diagnosis, BHPs assistance, and patients' signs and symptoms. Regarding spiritual diagnosis, one Zulu THP had this to say:

"I heard voices of my ancestors telling me what I should mix to heal a person with diabetes" Zulu Female, THP 10.

"*I diagnose spiritually with the help of ancestral spirits*'' Tswana Female, THP 374.

Some sought assistance from BHPs to diagnosed their patient before deciding on treatment:

"*There are several things I use, but I first refer the patient to a doctor to go check on their level of health before using certain things*". Zulu Female, THP 236.

"*I cannot diagnose therefore I tell to go to the clinic first*" Tswana Female, THP 185.

Some based their treatment on signs and symptoms:

"Am unable to detect diabetes, the patient need to first describe all the signs and symptoms they have such as always being hungry, weak erection than only after do I treat it". Zulu Male, THP 275.

"The person tells me the various signs, such as being tired quickly, and those having swollen feet are some of the signs that I check on a person". Zulu Male, THP 295.

Table 4
Perceived medical complications of both diabetes and hypertension

Variable	Characteristic	Zulu No. (%)	Tswana No. (%)
Perceived medical complications	Diabetes complications Declined to comment	425 (97. 25%) 12 (2.75)	422(99. 06%) 4 (0.94%)
	Types of diabetes complications	Wounds that do not heal, eyesight problems, itchy private parts, weight loss	Eyesight problem, amputations, death
	Hypertension complications Declined to comment	423 (96. 80%) 14 (3.20%)	420 (98. 59%) 6 (1.41%)
	Types of hypertension complications	Heart problems, difficult to breathe, stroke	Stroke, heart attack, can lead to death
Diagnosis	Personally diagnose diabetes	364 (83 30%)	279 (65.50%)
	Diagnosis by BHPs for diabetes	73(16.70%)	147(34. 50%)
	Personally diagnose hypertension	372 (85.52%)	276 (64, 80 %)
	Diagnosis by BHPs for hypertension	63 (14.48%)	150 (35. 20%)
	Based on reported signs and symptoms	N/A	2 (0.46%)

Legend: N/A (Not Applicable)

Table 5.
Identifying a person with diabetes and hypertension by Zulu and Tswana THPs

Characteristics	Variable	Zulu (n=437) No. (%)	Tswana (n=426) No. (%)
Used modern diagnostic instruments	Yes	19 (4.35%), 13 (2.97%)**	0(0.00%)
	No	416 (95.19%), 422 (97.03%)	426(100.00%)
Able to identify signs and symptoms	Identified diabetes Declined to comment	364 (83.30%) 73(16.70%)	279 (65.50%) 147(34.50%)
	Indications of diabetes	Easy tiredness, wounds do not heal, excessive hunger, swollen feet, lack of appetite	Dry mouth, frequent urination, impaired vision, erectile dysfunction, eating regularly, wounds do not healed
	Identified hypertension Declined to comment	372 (85.52%) 65(14.87%)	276 (64.80 %) 150(35.21%)
	Indications of hypertension	Feeling dizzy, difficulty breathing, easy tiredness, the heart beats very fast and in some instances beats very slow	Extremely shiny skin, swollen body, dimmed skin complexion, frequent feeling of dizziness

*Legend: **(use medical instruments for diagnosis of hypertension).*

Most Zulu and Tswana THPs did not use modern instruments for diagnosis purposes, except a few Zulu THPs (n=19, 4.35%) and (n=13, 2.97%) who employ these instruments for diabetes and hypertension respectively. Table 5 presents Zulu and Tswana THPs description of clinical features for both diabetes and hypertension, which were similar.

Table 7 presents types of prescribed medical preparations employed by both Zulu and Tswana THPs for the management of hypertension.

Types of medications for diabetes and hypertension

Table 8 presents types of prescribed medical preparations used to manage diabetes and hypertension, these being concoctions and decoction. Most Zulu THPs used concoction (n=396, 90.61%) for their herbal mixtures preparations, while the Tswana THPs preferred decoction (n=372, 85. 52%). 'Other forms' used by Zulu THPs holy water and fat from a lion. In this study, the standard doses for adults were not more than half cup size of 250 millilitres(mls) for adults and three teaspoons (15 mls) for children, irrespective of the recommended time for patients to take these forms of medications. The Zulu and Tswana THPs had prescribed dosage for adults and children diabetic and hypertensive patients, with over 80% subscribing to these standards for both conditions.

They indicated that the dosage amount of the ingredients used depending on the individual patients' requirements and issues such as the bitterness of the herbal mixtures. Both groups preferred the oral route of administration for their herbal preparations. The preparations methods to manage diabetes and hypertension were similar:

"*Use a handful of Aloe Vera a handful of leaves of Insukumbilii (Senecio serratuloides) and a handful of roots of Ugobho (Gunnera perpensa). The medicinal plants are transferred to a pot and boiled together for about an hour or two. The boil herbal mixture allowed to settle down. The boiled herbal mixture is poured into a 1 or 2-litre clean plastic bottle to be given to patients*". Zulu Male, THP 432.

"*To prepare a herbal mixture Take a hand full of every sebetebete, then mokgopha (always fresh, we normally don't dry it because it is always available irrespective of a season, cut a leave to a size of a palm of a hand), sekaname, labatheka and motsitsana herb s/he is prescribing for the patient, put into the pot, then pour about 2.5 – 3 litres of water (be it hot or cold) into the pot allow it to boil for 30 minutes. Then leave to cool down and pour it into a 2 litre bottle for the patient to take the treatment home and drink as ordered by the healer "*. Tswana Female, THP 181.

Table 6.
Medicinal plants effective in the management of diabetes.

isiZulu name	Tswana name	Scientific name	Common English name	Parts used	Phytochemical constituents
Inhlaba	Mokgopha	*Aloe vera*	Aloe	Leaves	Tannins, Saponins and Flavonoids (Arunkumar and Muthuselvam, 2009, Raphael, 2012)
Inkomfe	Labatheka	*Hypoxis hemerocallidea*	African potato	Root	Phytostreols, Norlignaneglycosidehypoxoside, Aglycon rooperol(Owira and Ojewole, 2009, Nair *et al.*, 2007)
Inkalane	N/A	*Aloe arborescens*	Mountain bush aloe	Leaves	Sinapic acid, Chlorogenic acid & Aloin (Lai *et al.*, 2016)
Intshungo	N/A	*Momordica foetida*	Bad-smelling	Leaves	Flavonoids, Foetidin (Ndam et al., 2014, Marquis *et al.*, 1977)
Indumbahlozi ye avocado	N/A	*Persea americana*	Avocado	Leaves, fruit, seeds	Saponins, Tannins, Flavonoids(Antia *et al.*, 2005, Ojewole and Amabeoku, 2006)
Dagga	N/A	*Cannabis sativa*	Medicinal cannabis	Leaves	Cannabinol, delta-9-tetrahydro cannabidiols(Atakan, 2012)
N/A	Mokgalo	*Ziziphus mucronata*	Buffalo thorns	Leaves	Phenol, Flavonoids, Proanthocyanidins (Olajuyigbe and Afolayan, 2011, Ibrahim *et al.*, 2012)
N/A	Sengaparile	*Harpagophylum procumbens*	Devils claw	Roots	Harpagoquinones, Flavonoids, Phytosterols, Amino acids (Mncwangi *et al*., 2012, Mahomed and Ojewole, 2004, Kondamudi *et al*., 2016, Gruenwald, 2002)
N/A	Tlhokwa letsela	*Dianthus basuticus*	Lesotho carnation	Roots	Alkaloids, Tannins, Saponins, Cardiac glycosides (Ashafa and Kazeem, 2015, Kazeem and Ashafa, 2015)
N/A	Lerumo-la-madi/ Phetola/ Mhetola	*Sutherlandia frutescens*	Cancer bush	Bark, leaves	Flavonoids, Saponins, Triterpernoids, Pinitol (Aboyade *et al*., 2014, Daghman, 2016, Chadwick *et al*., 2007, Van Wyk and Albrecht, 2008)

Legend: N/A (Not applicable)
NB: Recommended plants and their corresponding isiZulu or Tswana names are specific to the study areas in KZN and North-West Provinces.

Table 7.
Medicinal plants effective in the management of hypertension.

isiZulu name	**Tswana name**	**Scientific name**	**Common name**	**Parts used**	**Phytochemical constituents**
Insukumbilii	N/A	*Senecio serratuloides*	Two-day cure	Leaves	Alkaloids, Flavonoids, Phenols(Tata *et al*., 2019, Gould *et al*., 2015, Fawole *et al*., 2009)
Imbozisa	N/A	*Plectranthus hadiensis*	Hairy spur flower	Leaves, Roots	Flavonoids, Alkaloids, Phenols, Tannins, Saponins, Glycoside, Cardiac glycosides, Phenolic acids(Menon *et al*., 2012, Mothana *et al*., 2010)
Ugalga	Konofole	*Allium sativum*	Garlic	Bulbs	Allicin, Diallyl, Disulphide, S-allyl cysteine and Diallyl trisulfide(Mikaili *et al*., 2013, Nwokocha *et al*., 2011)
N/A	Sekaname	*Urgine singuinea*	Sea onion	Bulbs	Salicylic acid, Phloroglucinol(Marx *et al*., 2005, Naidoo *et al*., 2004, Majinda *et al*., 1997)
N/A	Sebetebete	*Senna italica*	Italian senna	Leaves, seeds, roots	Flavonoids, Phenols(Mokgotho *et al*., 2013, Masoko *et al*., 2010)
N/A	Tsuko ya poo	*Borago officinalis*	Starflower	Leaves	Pyrrolizidine alkaloids,Licosamin, Sopinin, Sopindian(Asadi-Samani *et al*., 2014)
Ugobho	N/A	*Gunnera perpensa*	River pumpkin	Roots	Tannins, Phenols, Flavonoids(Maroyi, 2016)
Inhlaba	Mokgopha	*Aloe vera*	Aloe	Leaves	Tannins, Saponins and Flavonoids(Arunkumar and Muthuselvam, 2009, Raphael, 2012)

Legend: N/A (Not applicable)NB: Recommended plants and their corresponding isiZulu or Tswana names are specific to the study areas in KZN and North-West Provinces.

Zulu and Tswana THPs advised their patients to consume foods rich in fruit and vegetables, with the Zulu practitioners advising the consumption of orange, watermelon, apple, guava, spinach, carrots, beetroot and peas. The Tswana THPs recommended peas, beans, spinach, lettuce, cucumber, cabbage and banana. They both advised their patients to avoid

fatty-foods and a high salt intake and to exercises regularly for the effective long-term management of these two chronic conditions.

Perceived side effects, concurrent treatment options and recovery: The THPS were of the opinion that their formulations had very few side effects (Figure 1) and made the following statements:

"*Processed medications have bad side effects, while our medications are natural products*" Zulu Female, THP 6.

"*Our products are natural hence no side effects*" Tswana Male, THP 2.

"*Not following instructions of my prescribed herbal mixtures can cause side effects*" Zulu Male, THP 81.

The following are the statements made by Zulu and Tswana THPs regarding the concurrent use of TM and western medications:

"*I advise them to take them at different times*" Zulu Female, THP 251.

"*Not advisable, our medicine clash with western medications*". Zulu Male, THP 267.

"*Take African medicine and western medicines at different times*". Tswana Female, THP 96.

"*African medicine is too strong, it can wash western medicines*". Tswana Male, THP 360.

Table 8
Types of medical preparations and prescribed dosage

Variable	Tribes	Characteristics	Diabetes No. (%)	Hypertension No. (%)
Herbal treatment options	Zulu (n=437)	Concoction	396 (90.61%)	389 (89.02%)
		Decoction	20 (4.58%)	22(5.03%)
		Other forms	7 (1,60%)	5(1.14%)
		Concoction/Decoction	6 (1.37%)	7(1.60%)
		Concoction/other forms	1 (0.23)%	14(3.20%)
		Declined to comment	7 (1.60%)	
	Tswana (426)	Concoction	389 (89.02%)	389 (89.02%)
		Decoction	22 (5.03%)	22 (5.03%)
		Other forms	5 (1.14%)	5 (1.14%)
		Concoction/Decoction	7 (1.60%)	7 (1.60%)
		Declined to comment	14 (3.20%)	14 (3.20%)
Prescribed dosage	Zulu (n=437)	Standard dose adults & children	362 (82.84%)	362 (82.84%)
		Abnormal dose	47 (10,76)	47 (10.76)
		Declined to comment	28 (6.41%)	28 (6.41%)
	Tswana (n=426)	Standard dose adults & children	411 (96.4%)	411(96.4%)
		Abnormal dose	15 (3.52%)	15(3.52%)

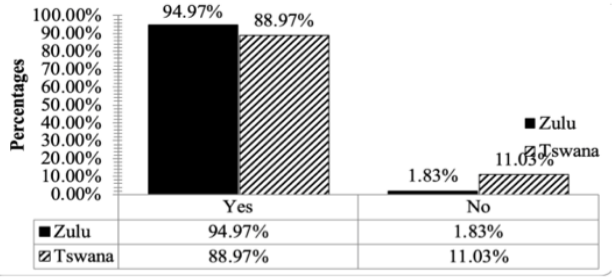

Figure 1
Perceived side effects and concurrent treatment options

Table 9 presentes the Zulu and Tswana THPs views about the recovery of diabetic or hypertensive patients under their care. Most of the Zulu THPs (n=368, 84.21%) were of the opinion that a patient could recover under three months, compared to Tswana THPs, of whom (n=277, 65.02%) felt that it would take more than three months.

Recommendations to improve diabetic and hypertensive care in SA

The referral of patients to THPs by biomedical health practitioners was reported to be minimal, indicating a one-way referral system (THPs sending patients to the clinic/hospital for diagnosis) regarding disease management (Table 10). The THPs made recommendations about improving diabetic and hypertensive care in South Africa, with most being in favour of collaborating with BHPs. They were interested in acquiring equipment, such as sphygmomanometers and glucometers, to help manage these conditions, and indicated the need for further educational training to assist them to acquire the latest information.

Table 9.
Estimated duration of recovery of diabetic and hypertensive patients under treatment.

Variable	Tribes	Characteristics	Diabetes N (%)	Hypertension N (%)
Duration of recovery under treatment	Zulu (n=437)	< 3 months	368 (84.21%)	368 (84.21%)
		> 3 months	32 (7. 32%)	32 (7.32%)
		Depends on patients' condition	20 (4. 58%)	20 (4.58%)
		No time frame	1 (0. 23%)	1 (0.23%)
		Declined to comment	16 (3.66%)	16 (3.66%)
	Tswana (n=426)	< 3 months	149 (34.98%)	149 (34.98%)
		> 3 months	277 (65.02%)	277 (65.02%)

Table 10.
THPs recommendations to improve diabetic and hypertensive care in South Africa.

Characteristics	Tribes	Variable	N (%)
Patients referred to THPs by BHPs	Zulu (n=437)	Yes	16(3.66%)
		Declined to comment	2(0,46%)
		No	419(95.88%)
	Tswana (n=426)	Yes	0(0.00%)
		No	426(100.00%)
Recommendations for improving treatment	Zulu (n=437)	Collaboration with BHPs	165 (37.75%)
		Collaborations and equipment	9 (2.06%)
		Equipment, collaboration with BHPs & training	247 (56.52%)
		Declined to comment	16 (3.66%)
	Tswana (n=426)	Collaboration with BHPs	399 (93.66%)
		Equipment	27 (6.34%)

DISCUSSION

The number of practitioners included in this study, their age and gender distribution is regarded as representative of the population of THPs in the two provinces who provide diabetes and hypertension management, providing credibility to the results. The use of quantitative and qualitative questions enabled the respondents to select from a range of options and provide comments to substantiate their responses.

Regarding their acquisition of knowledge to manage the two conditions, majority of the Zulu and Tswana THPs obtained it from family members and training, while others regarded their insight as a gift from birth, a calling, for which they did not have any formal training. The Zulu THPs acquisition of knowledge without training is similar to the findings of a study conducted in Zambia and Tanzania, where the THPs also indicated that it was a gift by birth (Vandebroek *et al*., 2004), is regarded as a calling made by the spirit of a deceased close relative (Matsika, 2015). Those trained by a family member who was a practising THP are similar to studies conducted among THPs in the Bolivian Andes Mountains, the Philippines and Cameroun, where practitioners acquired their knowledge from family members (Molina *et al*., 2015, Vandebroek *et al*., 2004). Some Tswana THPs acquired their knowledge to manage these two diseases through training from another person, with the literature indicating that this takes places through initiations (secret rituals) where a teacher (master healer) decides when the apprentice trainee THP is ready to start practising (Vandebroek *et al*., 2004).

The Zulu and Tswana THPs had a similar cultural understanding about these two diseases, with most describing diabetes as a sugar 'disease', this being findings of studies conducted elsewhere in (Frimpong and Nlooto, 2019, Peltzer *et al*., 2001c). Generally, THPs were of the opinion that diabetes and hypertension were similar, as one condition leads to the other, with studies conducted in the United States of America reporting that 73.6% of diabetic patients aged 18 years and above have hypertension (Khangura *et al*., 2018). Similarly, a study conducted in Cape Town South Africa revealed that 289 (26.54%) of 1089 diabetic and hypertensive patients who seeks medical care from community health centres(CHCs) had both conditions (Steyn *et al*., 2008). The Zulu and Tswana THPs described hypertension as a disease where the heart beats slower or faster than normal, which leads to difficulty in breathing.

When asked whether there are different types of both diabetes and hypertension, the majority of the Zulu THPs noted different types of diabetes, this being based on patient's sugar levels being either too high or too low and regarded breathing faster or slower than normal as the two types of hypertension. However, all the Tswana THPs interviewed contended that diabetes and hypertension were not divided into different types. The Zulu understanding of diabetes is in line with the scientific literature in terms of types 1 and 2, where the body's ability to produce insulin impacts on its ability to regulate sugar levels (Solis-Herrera *et al*., 2018). From OCM has also divided hypertension into primary and secondary, is the former being an elevation of blood pressure due to environmental and lifestyle factors, such as smoking, stress and alcohol abuse, while latter is caused by toxicities and congenital diseases (Kokubo *et al*., 2015).

Regarding their ability to diagnose the two conditions, the majority of Zulu and Tswana THPs stated that they could personally diagnose them based on spiritual divination, some said they refer patients to the clinic/hospitals for diagnosis before they start their treatment options and a few relied on medical knowledge-based or signs and symptoms reported by their patients. Spiritual diagnoses occur with ancestral assistance, mainly occurring through the performance of rituals to obtain knowledge and appease the patients' ancestral spirits as a favour to treat the condition (Matsika, 2015). This generally entails the THPs 'throwing the bones', through which the spirits give guidance about the problem and its possible causes, as well as the appropriate treatment regimen to relieve them of the medical condition (Mawere, 2011). Some THPs referred their patients to the local clinic to obtain a diagnosis before treating them. This referral behaviour was reported in a study conducted in Kenya, where patients were required to obtain a diagnosis from the local hospital before they were prescribed herbal mixtures by THPs (Chege *et al*., 2015). A few Zulu THPs based the diagnosis on their knowledge of the signs and symptoms of diabetes, as was reported in research conducted in Nigeria (Akharaiyi *et al*., 2017b). A few mainly Zulus THPs mainly use of modern instruments, such as glucometer and sphygmomanometer to test sugar levels, some having had formal training from tertiary institutions and the Department of Health (DOH).

Both groups of THPs indicated signs and symptoms for diabetes, such as tiredness, wounds that do not heal, excessive hunger, swollen feet, lack of appetite, that are the same as those reported in the scientific literature (Ramachandran, 2014). Likewise their signs and symptoms for hypertension, such as feeling dizzy, difficulties in breathing, easy tiredness, a rapidly beating heart or one that beats very slowly (Middeke *et al*., 2008). Almost all the Zulu and Tswana THPs indicated if not managed appropriately, diabetes and hypertension could be disastrous to the health of a patient (Zhuo *et al*., 2013,

Hodgson and Cai, 2001, Ogah and disease, 2006, Nathan, 1993).

Treatment modalities used by Tswana and Zulu THPs to manage diabetes and hypertension were based on non-pharmacological and ethnopharmacological interventions, these being prescribed herbal mixtures, mainly in the forms of concoctions and decoctions. The herbal mixtures were made by boiling parts (leaves, roots, bulbs and bark) of identified potent medicinal plants, either fresh or dried forms. The majority of Zulu THPs prescribed concoction, while the Tswana THPs prescribed decoction to manage these two conditions. Similar studies conducted in Nigeria and Kenya also revealed that THPs prescribed herbal mixtures in the forms of concoctions and decoctions to the managing diabetes (Akharaiyi *et al*., 2017b, Chege *et al*., 2015). Some of these medicinal plants, especially *Aloe vera* and *Allium sativum,* which was mentioned by Zulu and Tswana THPs, are also used by Ayurveda practitioners to manage both chronic conditions (Modak *et al*., 2007), and have been proven scientifically to be effective. For example, a randomized control trial (RCT) study conducted in India revealed that 3167 diabetic patients who were administered with a diet containing *Aloe vera* leaves normalised their blood glucose within five years (Kim *et al*., 2009, Agarwal, 1985). Similarly, a double-blind parallel randomized placebo control trial involving 50 hypertensive patients who were administered with aged *Allium sativum* extract in Australia experienced normalized blood pressure within 12 weeks (Ried *et al.*, 2010).

In this study, most Zulu and Tswana THPs did not prescribe more than half cup a (standard cup size of 250 millilitres) for adults and three teaspoons (15 mls) for children, irrespective of the recommended time for patients to take these forms of medications. This information is important for future studies to establish whether the THPs are prescribing the correct doses of the herbal mixtures.

Most Zulu and Tswana THPs in this study claimed that their prescribed herbal preparations were highly effective and had no side effects, which requires further investigation. An experimental study conducted in Ghana revealed that an anti-hypertensive polyherbal formulation with *Persea americanna* and *Vernonia amygdalina* administered was declared non-toxic and safe to be used by humans, based on positive laboratory results when haematological (significant increase in white blood cells and liver function tests(significant decrease in albumin levels) conducted on a mice within 45 days after the animal was administered with the polyherbal formulation (Koffuor *et al.*, 2011). Conversely, a study conducted in the Democratic Republic of Congo indicated that a decoction of *Quassia africana* used as an antihypertensive herbal therapy exhibited high toxicity against MRC-5 cells, which is unsafe for human consumption (Muganza *et al.*, 2012). THPs in this study were not against their patients taking their prescribed herbal preparations concurrently with western forms of medications but were of the opinion that they should be taken at different times to mitigate the effects of possible contraindications. A study conducted by Dharmananda (2000) recommended that for patients take herbal preparations and western forms of medications at different times to avoid the effect of herb-orthodox conventional medicines (OCM) interactions, which could pose a threat to the health of a patient (Dharmananda, 2000).

Regarding nonpharmacological interventions, Zulu and Tswana THPs stressed the need for exercises and to avoid fatty and salty foods on the part of patients, which is similar to OCM, Ayurveda, Traditional Chinese Medicine(TCM), Unani and Japanese Kampo medicine practitioners, who support the use of exercises as means to prevent and manage these chronic conditions (Bhikha, 2007, Kujala, 2006, Elder, 2004, Covington, 2001). The Zulu and Tswana THPs advised their patients to consume food rich in fruit and vegetables, specifically bananas by the latter, with the American Urological Association (AUA) listing the fruit as one of the top 10 bladder friendly foods that prevent frequent urination (www.urologyhealth.org). The OCM and Ayurvedic literature recommend the consumption of fruit and vegetables to effectively control blood sugar levels (Naik *et al*., 2015, Mann and Aune, 2010, Elder, 2004, Bazzano *et al*., 2003).

In this study, most of the Zulu THPs were of the opinion that a diabetic or hypertensive patients under their care could have their health restored in less than three months, while the majority of Tswana THPs indicated that it would take more than three months. From the OCM perspectives, both diabetes and hypertension are lifestyle diseases and cannot be completely cured in patients affected by these chronic conditions (Stults and Jones, 2006, Govindarajan *et al*., 2006).

The Zulu and Tswana THPs indicated some of the challenges they faced in managing diabetes and hypertension as the lack of scientific, tools such as glucometer and sphygmomanometer for diagnostic purposes, and limited training, for which they requested training. Both groups were willing to work with BHPs and bemoaned the lack of co-operation from these practitioners. A study in KZN reported that patients were referred by THPs to BHPs for cancer treatment, but that the latter did not refer patients back to them for any conditions (Nkosi and Sibiya, 2018). Bagwana (2015) argued that for the effective management of diseases in the South African context, there must be effective collaboration between BHPs and THPs, which could only be achieved through mutual respect among both practitioners (Bagwana, 2015).

This findings from this could lead to the development of a framework that will assist THPs to effectively manage diabetes and hypertension. It will also provide a base to identify areas for research, such as the manifestation of side effects, dosages, develop and regulate standard formulations, and contra-indications due to concurrent use of western medication. It will also provide a platform for BHPs to understand the role that THPs play in disease diagnosis and treatment, given that spiritual factors play a role in diagnosing the conditions and identifying their underlying causes. The findings suggest that the THPs have a common understanding of the causes and management of the two conditions., with the similarities/differences in their remedies indicating that most Zulu and Tswana THPs using *Aloe vera* as a major component to manage these conditions. Regarding dosage, most Zulu and Tswana THPs were not prescribing more than more than half cup size of 250 millilitres (mls) and three teaspoons (15 mls) for both adults and children respectfully. Based on the information provided above regarding commonalities in Zulu

and Tswana THPs understanding about the causes and management of these diseases including prescribing practices the development of a framework to standardize methods and treatment approaches is essential for the provincial associations to be aware of what their members are using to manage both diabetes and hypertension. More importantly, for the industry to self-regulate which will motivate formal research into the medicinal properties of the formulations but with intellectual property protection to THPs. Lastly, it will assist researchers to obtain credible information from patients who seek THPs treatment care options for randomised control trial (RCT) purposes.

A number of limitations are noted that may affect the ability to generalise the finding to other THPs in both provinces and across South Africa, this being that the study took place in two districts in each of the North West and KZN Provinces. This study relied on self-reporting from THPs and did not include the perspectives of their patients regarding the efficacy or non-efficacy of the prescribed herbal mixtures. Moreover, laboratory experiments were not conducted to ascertain whether herbal mixtures are without side effects and do not pose any health risk. Also, there may be inaccuracies in the data due to its transcription from isiZulu and Tswana languages into English. However, these limitations are not considered serious enough to affect the main findings of this study.

In conclusion, most Zulu and Tswana THPs acquired their knowledge from a single source, with the majority of Zulu's regarding it as a gift from birth, while the majority of Tswana THPs were trained by a family member. Also, most of the Zulu and Tswana THPs described diabetes as a 'sugar disease' in their culture, and were of the opinion that diabetes and hypertension are similar, as one condition leads to the other. There were similarities in the description of clinical features for both conditions, the most common being: frequent urination, excessive hunger and getting tired easily, difficulties in breathing and feeling dizzy, these being similar to that found in the scientific literature. Ethnopharmacological preparations used for management were mostly decoction and concoction, with *Aloe vera* as a major constituent. Owing to the similarities and differences in the acquisition of knowledge and training to manage the two diseases, similarities in their cultural understanding, description of clinical features and ethnopharmacological preparations, the findings could assist in developing an interventional tool to assist Zulu and Tswana THPs to manage both conditions. The tool is currently under investigation by the researchers.

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CHAPTER 6

Findings from chapter 3, 4 and 5 and an adapted modified Ayurveda treatment guidelines for both diabetes and hypertension (Appendix XIX and Appendix XX) led to the development of a modified interventional tool to be used by Zulu and Tswana traditional health practitioners in the management of diabetes and hypertension. The final version of the manuscript is presented in chapter 6. It has been arranged and submitted following the author's recommendations of the *Indian Journal of Traditional Knowledge*. The manuscript is presently under review with the registration number:IJTK-1020. This chapter addresses objective 5 of the study.

Development of a modified interventional tool for the management of diabetes and hypertension among Tswana and Zulu Traditional Health Practitioners in South Africa.

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Abstract

Introduction: Orthodox Conventional Medicine (OCM) and Ayurveda literature suggest the availability of treatment guidelines used by practitioners in these two healthcare systems in the management of diabetes and hypertension. African Traditional Medicine (ATM) has been involved in the management of chronic diseases, namely diabetes, and hypertension; however, practitioners of this Traditional Medicine (TM) do not have documented guidelines. This study aimed at the development of a modified interventional tool based on information collected among Tswana and Zulu Traditional Health Practitioners (THPs) in the management of diabetes and hypertension in their respective local communities.

Methods: An approach consisting of four steps was used to develop a modified tool for the management of diabetes and hypertension by THPs. Step 1 consisted of an extensive OCM and Ayurveda literature search which led to an interventional tool (Ayurveda treatment guidelines for both diabetes and hypertension) to be modified. Step 2 involved the use of Focus Groups Discussions (FGDs) and face-to-face interviews to find the perspectives of Tswana and Zulu THPs in the management of diabetes and hypertension. An analytical approach was used in Step 3 to develop a modified interventional tool adapted from the Ayurveda guidelines in step 1 and findings from Tswana and Zulu traditional health practitioners in step 2. Expert opinions were sought in step 4 to ensure the validity of the developed interventional tool.

Results: A modified interventional tool was developed and adapted from the Ayurveda and OCM treatment guidelines for the management of diabetes and hypertension based on

cultures of Tswana and Zulu THPs. Recommendations and suggestions from experts were used to validate the developed modified interventional tool.

Conclusion: This interventional tool will assist Tswana and Zulu THPs in the management of diabetes and hypertension within Traditional African communities.

Keywords: Diabetes; Hypertension; Ayurveda; Orthodox conventional medicine; Traditional Health Practitioners; Interventional tool.

Introduction

Orthodox Conventional Medicine (OCM) and Ayurveda (originated from India) health traditions have developed standard treatment guidelines for both diabetes and hypertension that helps their practitioners to treat patients affected by these chronic conditions [1-4]. Diabetes and hypertension are a major threat to the health and cause of considerable illness and premature deaths [5], with African governments spending large sums of money to provide health care services to combat them [6]. The causes of illness, and therefore the types of healing needed, are understood differently across the continent, with one method of healing and treatment not necessarily being appropriate for all cultures. To provide people with the type of healing, at an accessible location, by someone who speaks their language and understands their traditions is an important component of ensuring wellbeing. There is, therefore, the need to understand the treatment provided by Tswana and Zulu Traditional Health Practitioners (THPs) to the communities they serve. These developed guidelines for diabetes and hypertension management were informed by Ayurveda treatment guidelines for these two diseases [3,4], with the content being based on the information provided by Tswana and Zulu THPs in North -West and Kwa Zulu-Natal Provinces in South Africa, respectively. They also include relevant information from OCM literature regarding managing diabetes and hypertension[1,2], with scientific studies supporting the use of some of the plants in managing these chronic conditions [7,8]. Based on the findings of the use of TM by THPs of the Tswana and Zulu cultures for the management of diabetes and hypertension in South Africa [9,10], and the ongoing problems with managing diabetes and hypertension in many rural communities where access to OCM is often limited [11], has resulted in the need to explore treatment options that are culturally appropriate and cost-effective. However, the absence of standardized and formalized Tswana and Zulu treatment guidelines for THPs indicated the

need to identify their various options within the context of OCM as well as Ayurveda practices. OCM diabetes and hypertension management practices have been extensively researched and form the basis of most medical school curriculum [1,2]. Ayurveda remedies have a long history of use and instruction in formal institutions on the Indian sub-continent but are less widely used globally, although it is increasingly being acknowledged as an important alternative to OCM.

While there is no formal institutional instruction of the Tswana and Zulu forms of TM, there is a growing body of evidence about their use of medicinal plants to manage diabetes and hypertension [9,10]. Medicinal plants are widely used by THPs, although the benefits of their use have not been supported by scientific literature, with research being needed to identify any medicinal properties. These guidelines are intended for THPs who want to provide the optimal treatment formulations for diabetes and hypertension, and for other health practitioners who want to understand the role they play in their patients' care options. It is anticipated that they will assist in delivering primary health care in indigenous communities where many people rely on TM due to its accessibility, affordability and cultural acceptance [12]. Furthermore, it is anticipated that they will increase the confidence of the general population in TM methods and approaches, and provide people with options to treat their chronic conditions [13,14].

The guidelines also provide recommendations for further research that will lead to a formal standardized blueprint document for managing diabetes and hypertension across South African cultures. It is anticipated that they will provide evidence to encourage African governments to include TM as part of their public health care services for improved recognition and acceptance and to be implemented in both the OCM and TM systems. Besides, it will assist researchers to develop a curriculum for the training of THPs to deliver quality and affordable care to those who seek their services [15].

Methods

Step 1 OCM and Ayurveda literature search about the management of diabetes and hypertension

An extensive literature search was conducted from Google scholar, the web of science, Pub-med and Cochrane library electronic databases [16] to find out the relevant information about

the management of diabetes and hypertension from OCM and Ayurveda perspectives which led to adapted Ayurveda treatment guidelines for both diabetes and hypertension. Specific keywords used to search were Ayurveda and diabetes, Ayurveda and hypertension, Ayurveda guidelines used in the management of diabetes and hypertension, medicinal plants used in Ayurveda for both diabetes and hypertension and OCM guidelines used in the management of diabetes and hypertension. A literature review is an appraised summary of other research relevant to a study to be conducted in a specific area of interest [17]. Research articles with the needed information relevant to our study were appropriately referenced in the main text of the manuscript.

Step 2 A study conducted in different phases with Tswana and Zulu THPs to find their perspectives about the management of diabetes and hypertension

A study was conducted in both KwaZulu- Natal and North West provinces (**Figure 1**) to find out the perspectives of THPs in managing diabetes and hypertension in two phases.

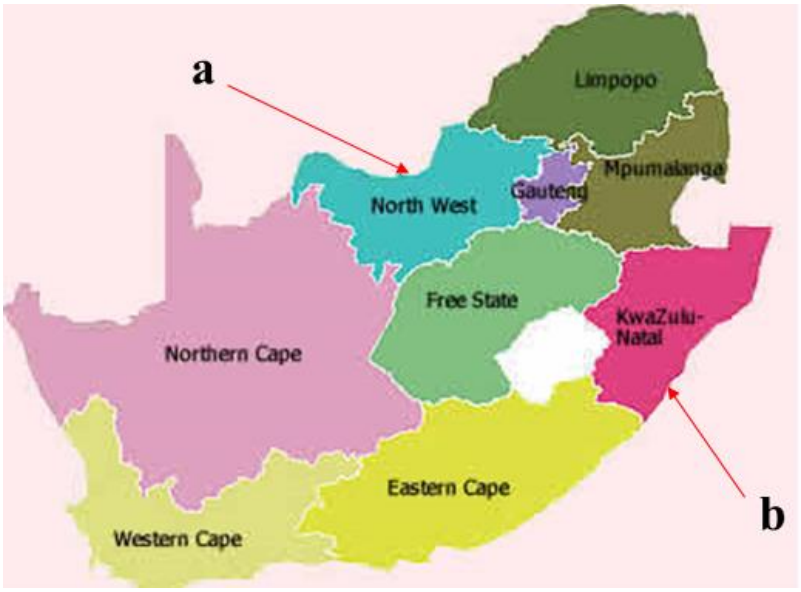

Figure 1. Map of South Africa showing study areas with red arrows **a**: North-West; **b** KwaZulu-Natal[18]

Phase 1A was carried out about the management of diabetes and hypertension, using an interview guide among THPs, in the three geospatial areas (urban, traditional or tribal and

farm areas) in both KwaZulu- Natal and North-West provinces. 67 THPs in KwaZulu- Natal and 40 from North West provinces voluntarily took part in the study.

Phase 1B A researcher administered questionnaire was conducted using face-to-face interviews about the management of diabetes and hypertension among Tswana and Zulu THPs in the three geospatial areas (urban, traditional or tribal and farm areas) in both KwaZulu- Natal and North-West provinces. 437 THPs in KwaZulu-Natal and 426 THPs in North West provinces voluntarily took part in this study.

THPs perspectives about managing diabetes and hypertension were sought in these broad topics concerning the objectives of our study:

- THPs cultural understanding about diabetes and hypertension diseases
- Identifying a person with diabetes and hypertension (signs and symptoms)
- Perceived causes of diabetes and hypertension
- Complications of diabetes and hypertension
- Treatment modalities
- Prescribing practices
- Effectiveness of prescribed TM
- Concurrent use of TM and OCM
- Contraindications of medications
- Feedback and monitoring of patients
- Challenges faced in managing these two diseases
- Recommendations to improve diabetic and hypertensive care in South Africa

Step 3 Analytical approach employed for the development of diabetes and hypertension guidelines to be used by Tswana and Zulu THPs

To develop treatment guidelines for both diabetes and hypertension to be used by Tswana and Zulu THPs, an analytical approach was undertaken to develop a modified interventional tool adapted from Step 1 based on the findings from step 2 [1,2]. Reported statements by Tswana and Zulu THPs employed in our previous studies (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs) that were in agreement with

disseminated information (signs and symptoms causative factors, medical complications and non-pharmacological management of these two diseases) from OCM and Ayurveda perspectives formed the basis of our developed guidelines to be used by Tswana and Zulu THPs in managing both diabetes and hypertension[3,4] . More importantly, taken into consideration how certain medicinal plants made the list and were included in documented Ayurveda treatment guidelines for both diabetes and hypertension[3,4] , medicinal plants are known to Tswana and Zulu THPs reported in our survey (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs) and scientifically proven to be effective against diabetes and hypertension (cross-referenced with literature) have been included in the ethnopharmacological sections of our developed guidelines to be used by Tswana and Zulu THPs.

Step 4 Validation of the developed diabetes and hypertension guidelines to be used by Tswana and Zulu THPs by experts and practitioners in the field of OCM and Ayurveda health traditions

Experts' opinion were sought to ensure the validity of the interventional tool to be used by Tswana and Zulu THPs in the management of these two diseases.

Results

Step 1 OCM and Ayurveda literature search about the management of diabetes and hypertension

An adapted Ayurveda treatment guideline for both diabetes and hypertension [3,4] served as a reference which led to the development of an interventional tool to be used by Tswana and Zulu THPs in the management of diabetes and hypertension.

Step 2 A study conducted in different phases with Tswana and Zulu THPs to find their perspectives about the management of diabetes and hypertension

Data collected from the above-mentioned broad topics (Step 2 under the methodology section) were in line with the objectives of our study. Findings from our previous studies (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs) compared to adapted modified Ayurveda treatment guidelines for both diabetes and

hypertension [1,2] led to the development of an interventional tool to be used by Tswana and Zulu THPs in the management of diabetes and hypertension.

Step 3 Analytical approach employed for the development of diabetes and hypertension guidelines to be used by Tswana and Zulu THPs

Using an analytical approach and based on the information obtained from *Step 1* and findings from (*Step 2*) these guidelines to be used by Tswana and Zulu THPs for the management of diabetes (**A**) and hypertension (**B**) were developed.

These developed guidelines (**A**. Diabetes) and (**B**. Hypertension) for both diabetes and hypertension to be used by Tswana and Zulu THPs, will be translated into Tswana and isiZulu languages and then distributed to the offices of relevant traditional healers association in both KwaZulu-Natal and North-West provinces.

A. Developed diabetes guidelines to be used by Tswana and Zulu THPs

Diabetes

Brief history

Aratus of Cappodonia first introduced the term 'diabetes' in 81-133 AD in Greece, meaning 'a siphon' (or run through), this being an apt description of diabetes, as he realized that an affected person never stops drinking water. A physician named Sushruta and a surgeon named Charaka identified the two types of diabetes that became known as Type 1 and Type 2 [19-21]. Thomas Willis of Great Britain coined the term 'Mellitus' in 1675, literally meaning 'honey-sweet' when he discovered the sweetness of both the blood and urine in patients. Another British national in 1776 discovered that the cause of the urine and blood sweetness of diabetic patients was their high levels of blood sugar [22,23]. Research carried out by Claude Bernard (French National) in 1857 confirmed that diabetes is caused by an excess in glucose production, and paved the way for its research in medicine [22]. The treatment of diabetes in humans improved substantially with the development of appropriate medication from the early part of the 19th century. These medications insulin, metformin, a thiazolidinedione,

pramlintide, and alogliptin were highly effective in managing diabetes because of their specific pharmacological actions [24].

Prevalence

Diabetes is one of the leading causes of human death [25], with Africa currently spending 7% of its annual healthcare budget on managing the disease [26], and an estimated 34.2 million people in sub-Saharan Africa (SSA) being likely to be affected by 2040 [26]. Type 2 diabetes, which affects adults, accounts for approximately 95% of all cases in SSA, with 5% being Type 1, which affects children [27].

Brief introduction

Diabetes is a disease associated with abnormal blood glucose levels that are commonly referred to as a '*sugar disease'*. Humans need constant blood glucose levels to maintain healthy living, with upper and lower limits, above and below which causes problems in the body. Blood glucose is a kind of sugar that is obtained from consuming foods high in carbohydrates and fruit. The food that a person eats is broken down into tiny pieces with the help of acids and enzymes that are produced by the body, which enables the components of the food to be released into forms that the body and absorb and use. These components include minerals, vitamins, fats and sugar, the last one being released as glucose. This glucose is absorbed by the intestines and moves through the body in the blood system to the cells with the help of insulin, the levels of which also need to be regulated by the body. Blood glucose is important as it gives the body the energy it needs to go about the daily activities, including for the brain, with additional energy often being required for activities that use up extra energy, such as running [28,29]. Presented in **Table 1** is the summary of blood glucose levels in humans.

Table 1. Blood glucose Levels[30]

Target levels by Type	Upon waking	Before meals (pre-prandial)	At least 90 minutes after meals (postprandial)
Non-diabetic	N/A	4.0 to 5.9 mmol/L	under 7.8 mmol/L
Type 2 diabetes	N/A	4 to 7 mmol/L	under 8.5 mmol/L
Type 1 diabetes	5 to 7 mmol/L	4 to 7 mmol/L	5 to 9 mmol/L
Children with type 1 diabetes	4 to 7 mmol/L	4 to 7 mmol/L	5 to 9 mmol/L

Legend: mmol/L (millimoles per litre); N/A(Not Applicable)

Causative factors of diabetes

THPs should note that factors that cause diabetes are often diet-related, with diets that consist of too many carbohydrates, which mean that the body is unable to use up all the energy provided by the food that is eaten, specifically food high in starch (bread, cereal, and potatoes) and too much fat. Vegetables, other than potatoes, have much fewer carbohydrates than starches and are therefore much better at not overloading the blood system with too much glucose. Besides, the lack of regular and sufficient exercise results in the body not spending the energy it consumes, building up muscles that are needed for general wellbeing, or generally being healthy. The following are some of the major causative factors for diabetes:

- too much sugar intake
- using too much salt
- too much consumption of fatty foods
- excessive consumption of red meat
- lack of exercises

Signs and symptoms of diabetes

The following are the signs and symptoms of diabetes:

- frequent urination
- often sweating
- often thirst
- wounds that turn septic and will not heal
- often feeling hungry and wanting to eat
- unexpected weight loss

- shortness of breath, problems with breathing
- eyesight problems

Diagnosing diabetes

THPs are encouraged to identify specific signs and symptoms when diagnosing diabetes and to refer them to the nearest clinic or hospital to test for the condition before they start implementing their treatment options. The correct diagnosis is important, as the person may or may not have the disease, and the wrong treatment may affect their health and wellbeing. Under treating could result in the person getting very ill, while over-treating could cause unintended health problems.

Complications of diabetes

THPs should know that when not treated or managed, diabetes can lead to these complications:

- poor eyesight,
- Wounds that do not heal, leading to amputation.
- stroke
- erectile dysfunction
- breathing complications
- uncontrolled weight loss
- dehydration due to excessive water loss

Managing diabetes

As diabetes is caused by poor diet and a lack of exercises, THPs should advice patients to eat food rich in vegetables that do not contain too much starch, and regular consumption of fruits, and to participate in regular exercises to keep them healthy.

Managing diabetes using plant preparations

THPs can use the following plants (**Table 2**) to prepare herbal mixtures for their patients, these being the commons ones reported for use among their local professionals. Some of these plants that have been proven scientifically to be effective in managing diabetes, these being indicated by the names of the people who have conducted the studies. However, please

note that the plants, or the names by which they are referred to, may be specific to the study areas in KwaZulu-Natal and North-West Provinces.

Table 2. Medicinal plants effective in the management of diabetes.

isiZulu name	Tswana name	Scientific name	Common English name	Parts used	Phytochemical constituents
Inhlaba	Mokgopha	*Aloe vera*	Aloe	leaves	Tannins, Saponins, and Flavonoids[31,32]
Inkomfe	Labatheka	*Hypoxis hemerocallidea*	African potato	root	Phytostreols, Norlignaneglycosidehypoxoside, Aglycon rooperol[33,34]
Inkalane	N/A	*Aloe arborescens*	Mountain bush aloe	leaves	Sinapic acid, Chlorogenic acid, and Aloin[35]
Intshungo	N/A	*Momordica foetida*	Bad-smelling	Leaves	Flavonoids,Foetidin[36,37]
Indumbahlozi ye avocado	N/A	*Persea americana*	Avocado	Leaves, fruits, seeds	Saponins,Tannins,Flavonoids[38,39]
Dagga	N/A	*Cannabis sativa*	Medicinal cannabis	Leaves	Cannabinol,delta-9-tetrahydrocannabidiol[40]
NA	Mokgalo	*Ziziphus mucronata*	Buffalo thorns	Leaves	Phenol, Flavonoids, Proanthocyandins[41,42]
NA	Sengaparile	*Harpagophylum procumbens*	Devils claw	Roots	Harpagoquinones, Flavonoids, Phytosterols, Amino acids[43-46]
NA	Tlhokwa Letsela	*Dianthus basuticus*	Lesotho carnation	Roots	Alkaloids, Tannins, Saponins, Cardiac glycosides[47,48]
NA	Lerumo-la-madi/ Phetola/ Mhetola	*Sutherlandia frutescens*	Cancer bush	Bark, leaves	Flavonoids, Saponins, Triterpernoids, Pinitol[49-52]

Legend: N/A (Not applicable). NB: Recommended plants and their corresponding isiZulu or Tswana names are specific to the study areas in KZN and North-West Provinces.

Mode of preparation: Concoction and decoction

The mode of preparation of herbal mixtures might differ from one THP to the other. Basically, THPs prepare herbal mixtures from a single or a combination of some of these medicinal plants (fresh/dried powdered forms) using different parts of identified medicinal plants. THPs are strongly advised to prepare herbal mixtures made up of three or more

medicinal plants because polyherbal formulations have been proven to be more effective than single herbs in Ayurvedic medicine.[53]

Example: To prepare a herbal mixture a few said they took fresh aloe (*Aloe vera*), a handful of dried powder form of Tshuko-ya-poo (*Borago officinalis*), a handful of tlhokwa-la-tsela (*Dianthus basuticus*) and a secret plant (often given a funny term) known only to them. A mixture of the above-mentioned plants was poured into a pot and allowed to boil. The boiled herbal mixture is taken off the fire and allowed to cool off before they poured into a 2-litre clean bottle to be given to patients (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs).

Route of administration: Oral forms mainly liquids (herbal mixtures).

Dispensing herbal mixtures

THPs are encouraged to prepare herbal mixtures using relevant plants as their baseline, but including other plants and herbs that could boost the immune system, as these will helps people to fight diseases in general [54]. Medicinal plants available to THPs that are regarded as being effective to manage diabetes, based on the successes achieved with their clients, should be given in the necessary consideration, with the dosage be carefully explained to patients in detail to ensure that they understand when and how to take them. This is necessary for the following reasons:

- To avoid health problems that may arise when people use OCM and herbal preparations, the two preparations needed to be taken at different times of the day to avoid the chance of their affecting each other, as has been shown by scientific research [55].
- Patients need to be encouraged to take the prescribed dosage, and the THPs should consult them over the phone if necessary to monitor their health status.
- As doses tend to be determined by age and weight, children should not be given the same dose as adult patients.
- Care needs to also be taken for preparations prescribed to older patients (60 years and above) due to a weakened kidney as a result of old age [56].

- A pregnant woman should be referred immediately to the nearest health care facility to check the effect on the herbal preparations on the unborn child [57].

Dosage

The prescribed dosage quantity administered to adults and children should be based on the potency of the chosen medicinal plants and success rate achieved, using the same cup or tablespoon measurements, depending on the age and weight of the patients.

- For adults, the prescribed dosage of herbal mixtures (quantities) in millilitres (mls) by THPs (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs) were not more than half of a standard South African cup size (250 mls), irrespective of the number of times and when (before or after meals) the mixture was taken during the day.
- For children, the maximum recommended dosage was not more than 3 teaspoons (15mls) (South African standard teaspoon size) within a day.

These above herbal mixture quantities (in mls) have been suggested to scientific researchers to find out if patients are at any health risk, and the results of the studies will be made available as soon as they are available. This will allow the quantities to be adjusted to ensure that the patients benefit from the most suitable doses.

General recommendations

THPs need to manage their patients' overall wellbeing as well as treat diabetes to ensure long-term optimal health. Ensuring that patients maintain healthy lifestyles is an important part of them having a sense of control over and being responsible for their condition. As diabetes is often associated with other conditions, THPs are advised to manage their patients holistically, and to, therefore, consider the following:

- Encourage their patients to manage their weight by not consuming sugary beverages, eating very little fried fatty food, and eating lots of fruit and vegetables.
- Encourage children to be physically active, and to take part in activities both at school and when at home and not to spend too much time sitting at home.

- Monitor their patients' blood and sugar levels regularly to prevent complications
- Limit the consumption of alcohol and stop smoking, as these have been shown to help with managing diabetes [58,59].
- People with diabetes need to exercise regularly to manage their weight and any associated conditions such as hypertension and to ensure that they are generally healthy.
- Pregnant women should be encouraged to enroll in the antenatal course at a local health care facility to ensure a healthy pregnancy and prevent diabetes complications.
- Patients using OCM medications at the same time as herbal mixtures should be encouraged to take a prescription from qualified health care providers.

B. Developed hypertension guidelines to be used by Tswana and Zulu THPs.

Hypertension

Brief history

The literature suggests that in ancient times, physicians relied on the quality of an individual's pulse felt by gentle palpation to determine the condition of a cardiovascular system. In modern times, an Irish-Indian physician, Dr. Frederick Akbar Mahomed, who worked in Guy's hospital in London, identified conditions related to this disease that became known as 'essential hypertension' or high blood pressure (BP). He stated that high blood pressure was more prevalent in older patients and that various organs (heart, kidney, and brain) could be affected [by 60]. In the 20th century, the invention of the mercury sphygmomanometer helped physicians to check the BP of patients without struggling to establish the diastolic and systolic pressures using the stethoscope. Hypertension was not considered as a disease until the untimely death of the 32nd president of the USA, Franklin D. Roosevelt, who died of disease-related complications due to negligence on the part of his personal physician, who did not regard him as ill, despite recording a BP of ~220/120. Franklin D. Roosevelt's autopsy report enabled his successor, Harry Truman, to sign the National Heart Act Law of 1948, which paved the way for extensive research into heart

diseases. The first major study related to heart diseases (Framingham heart study) conducted in the United States of America (USA) established that strokes and heart failure were linked to hypertension. As late as the 1960's, the medical community was still finding it difficult to combat this chronic condition, as the medications available were ineffective due to poor health outcomes recorded with their use. The development of these medications (ACEI, β blockers, calcium channel blockers) has assisted greatly in combating this chronic condition[60].

Prevalence

An estimated 9.4 million deaths due to hypertension are reported annually around the world [14]. The available literature suggests a prevalence rate for hypertension of 38% among the studied population in sub-Saharan Africa (SSA)[14]. An estimated amount of US $11.6 billion was spent on cardiovascular diseases and its related complications in Africa in the year 2000 [61].

Brief introduction

For effective blood circulation to take place within the body, the pressure is required to move blood through the body from the heart to the brain and other parts repeatedly so that the body can function. This pressure is called blood pressure (BP), which has upper and lower levels, with too much pressure resulting in the arteries becoming hard over time. This makes blood circulation difficult and it becomes difficult for the heart to pump blood effectively due to the weakened heart muscle, this process leading to hypertension (hyper meaning 'above' the normal tension). It is difficult for people to know if they have the disease, which is why in the medical field it is known as the 'silent killer' [62]. It is often associated with diabetes and conditions associated with unhealthy lifestyle, obesity, and stress, and needs ongoing management to prevent premature mortality and ongoing ill-health.

Classification of hypertension[63]

Table 3. Classification of hypertension

Stage	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	< 120	< 80
Optimal	120–129	80–84
High normal	130–139	85–89
Grade 1	140–159	90–99
Grade 2	160–179	100–109
Grade 3	≥ 180	≥ 110
Isolated systolic	≥ 140	< 90

Legend: mmHg (millimeters of mercury).

Causative factors of hypertension

THPs should note that hypertension is a lifestyle disease and that some choices, such as eating foods rich in fat, excessive alcohol intake, smoking and a lack of exercise. The major causative factors for hypertension are:

- stress,
- thinking too much,
- eating too much salt
- eating fatty foods
- excessive alcohol intake
- sedentary lifestyles

Signs and symptoms of hypertension

The following signs and symptoms are likely to be observed:

- sweating easily
- anxiety
- shortness of breath
- low sexual desire
- ill-tempered

- unstable body temperature

Diagnosing hypertension

Hypertension can be difficult to diagnose, as patients may present with symptoms that could also be associated with other conditions. It is therefore recommended for THPs to refer patients to the nearest clinic or hospital to confirm a diagnosis of hypertensive, and to do this before any treatment is provided to assist patiently.

Complications of hypertension

THPs should note that when not treated or managed properly, hypertension can lead to the following major complications:

- nerve damage
- heart diseases
- stroke
- erectile dysfunction
- sexual dysfunction on the part of women

Managing hypertension

Knowing that hypertension is caused by poor lifestyle choices, such as drinking too much alcohol, smoking and lack of exercise means that THPs can advise their patents about what lifestyle changes can be made to reduce the BP levels. As the effects of lifestyle changes can take time to reduce hypertension, medication or plant preparations may be required to reduce pharmacologically the BP levels in human beings.

Managing hypertension using plant preparations

THPs can use some of the following plants (**Table 4**) to prepare herbal mixtures for their patients. Some have been tested scientifically and shown to be effective in the management of hypertension.

Table 4. Medicinal plants effective in the management of hypertension.

isiZulu name	Tswana name	Scientific name	Common name	Parts used	Phytochemical constituents
Insukumbilii	N/A	*Senecio serratuloides*	Two-day cure	Leaves	Alkaloids, Flavonoids, Phenols[64-66]
Imbozisa	N/A	*Plectranthus hadiensis*	Hairy spur flower	Leaves, Roots	Flavonoids, Alkaloids, Phenols, Tannins,Saponins, Glycoside, Cardiac glycosides, Phenolic acids[67,68]
Ugalga	N/A	*Allium sativum*	Garlic	Bulbs	Allicin, Diallyl, Disulphide, S-allyl cysteine and Diallyl trisulfilde[7,69]
NA	Sekaname	*Urgine singuinea*	Sea onion	Bulbs	Salicylic acid, Phloroglucinol[70-72]
NA	Sebetebete	*Senna italica*	Italian senna	Leaves, seeds, roots	Flavonoids, Phenols[73,74]
NA	Tsuko ya poo	*Borago officinalis*	Starflower	Leaves	Pyrrolizidine alkaloids,Licosamin, Sopinin, Sopindian[75]
Ugobho	N/A	*Gunnera perpensa*	River pumpkin	Roots	Tannins, Phenols, Flavonoids[76]
Inhlaba	Mokgopha	*Aloe vera*	Aloe	Leaves	Tannins, Saponins, and Flavonoids[31,32]

Legend: N/A (Not applicable). NB: Recommended plants and their corresponding isiZulu or Tswana names are specific to the study areas in KZN and North-West Provinces.

Mode of preparation: Concoction and decoction

To prepare a herbal mixture a few THPs said they took fresh inhlaba (*Aloe vera*), a handful of leaves of Insukumbilii (*Senecio serratuloides*) and a handful of roots of Ugobho (*Gunnera perpensa*). The medicinal plants are transferred to a pot and boiled together. The boiled herbal mixture is poured into a 1 or 2-litre clean plastic bottle to be given to patients.

THPs are strongly advised to prepare herbal mixtures made up of three or more medicinal plants because polyherbal formulations have been proven to be more effective than single herbs in Ayurvedic medicine.[53]

Route of administration: Oral forms mainly liquids (herbal mixtures).

Dispensing herbal mixtures

THPs are encouraged to prepare herbal mixtures using some of these plants as their baseline together with other plants and herbs that could boost the immune system because a strong immune system of a patient helps him or her to fight diseases [54]. Medicinal plants available to THPs that are regarded as being effective to manage diabetes, based on the successes achieved with their clients, should be given in the needed consideration. Herbal mixtures dosage should be explained to patients in reasonable detail.

- To avoid health problems that may arise with the concurrent use of OCM and herbal preparations by patients seen by THPs, the medication prescribed by OCM practitioner and the medication prescribed by a THP should be taken at different times of the day. Scientific research has shown that to avoid possible OCM medications and herbs interactions that could affect the health of a patient these forms of medications should be taken at different times [55].
- THPs need to ensure that their patients adhere to and comply with their prescribed dosage and should consult them over the phone if necessary to keep track of the progress of their health status.
- Children should not be prescribed dosage recommended for adult patients, and their age and weight need to be taken into consideration.
- THPs should be careful with the dosage prescribed to older patients (60 years and above) due to a weakened kidney as a result of old age [56].
- Pregnant woman taking THP prescribed herbal preparations should be referred immediately to the nearest health care facility to check the effect on the herbal preparations on the unborn child [57].

Dosage

The prescribed dosage quantity administered to adults and children should be based on the potency of the chosen medicinal plants and success rate achieved, using the same cup or tablespoon measurements, depending on the age and weight of the patients.

- For adults, the prescribed dosage of herbal mixtures (quantity in mls) by THPs (personal communication: FGDs and face-to-face interviews with Tswana and Zulu THPs) were not more than half of a standard South African cup size (250 mls), irrespective of the number of times and when (before or after meals) the mixture was taken during the day.
- For children, the maximum recommended dosage was not more than 3 teaspoons (15mls) (South African standard teaspoon size) within a day.

These above herbal mixture quantities (in mls) have been suggested to scientific researchers to find out if patients are at any health risk, and the results of the studies will be made available as soon as they are available. This will allow the quantities to be adjusted to ensure that the patients benefit from the most suitable doses.

General recommendations

THPs need to be mindful of how to manage the wellbeing of hypertensive patients other than simply ethnopharmacological preparations. Ensuring that patients maintain healthy lifestyles is an important part of enabling them to have some sense of control over and responsibility for their condition. As hypertension is often associated with other conditions THPs are advised to manage their patients holistically, and therefore, consider the following:

- Parents should be encouraged to send their children to a medical doctor who is an expert in managing hypertension in children for regular blood pressure monitoring.
- Parents of children with high BP should be encouraged to help their children achieve a healthy body weight to manage and avoid complications associated [77].
- Parents need to feed their children a diet with lots of fruit, vegetables, and low-fat meat, and limit the intake of sugar-based drinks and fast-foods.
- Parents should make sure that their children take part in sports-related activities such as running and swimming in schools.
- Adults should be encouraged to monitor their blood and sugar levels regularly.
- Adults should watch their weight by limiting fatty food and sugary drinks and asking for advice about a healthy diet.

- Adults should be encouraged to limit the consumption of alcohol and the cessation of smoking. Scientifically moderate alcohol intake and smoking cessation have been proven to be effective in managing hypertension[78,79].
- Adults and children need to take time to exercise regularly throughout the week.
- Adults and children should be encouraged to participate in stress-free activities that are available in their areas, be it joining social groups, or spending time on their own.
- Pregnant women should be given the needed attention by encouraging them to enroll in the antenatal course in a local health care facility to check the effect on the herbal preparations on the unborn child [57].
- Patients using OCM concurrently with herbal mixtures should be encouraged to take a prescription from qualified health care providers.

Step 4 Validation of the developed diabetes and hypertension guidelines to be used by Tswana and Zulu THPs by experts and practitioners in the field of OCM and Ayurveda health traditions

The developed modified interventional tool for the management of diabetes and hypertension to be used by Tswana and Zulu THPs was validated by these experts (PD, NJ, SS, SK, and UL) in the field of OCM and Ayurveda health traditions. Initials are used to hide the identities of these experts. The experts' comments and recommendations regarding the developed modified interventional tool to be used by Tswana and Zulu THPs in the management of both diabetes and hypertension have been incorporated into the tool for its enrichment. Find below are the summary of experts' comments:

Expert 1 (PD): The tool is very good and will be easily followed by the healers once translated into their languages!!! I went through the document and found just typo and spacing mistakes. The researcher needs to consult the plant scientists to give him the English names of the plants.

Expert 2(NJ): I have gone through the treatment protocol suggested by the research scholar for treating Diabetes and HT by applying both Indian Ayurvedic System as well as the

African system. The approach should only to maintain the blood sugar within the normal range as the same in the case of HT (Systolic /Diastolic). Good initiative and further research is needed.

Expert 3(SS): The recommendation given in the draft is although good and can be considered. However, it can be improved a bit by referring to the attached documents.

https://mohfw.gov.in/sites/default/files/Guidelines%20and%20Training%20Mannual%20on%20Integration%20of%20%20Ayurveda%20in%20NPCDCS.pdf

http://www.ccras.nic.in/sites/default/files/viewpdf/faq/HYPERTENSION.pdf

E**xpert 4(SK)**: The guidelines developed for the traditional healers/ practitioners to manage diabetes and hypertension are looking interesting. In my opinion, there should be added some more plants used for the treatment of diabetes and hypertension. Moreover, their method of preparation and form of intake like dry powder, decoction, tincture, etc. should be included in these guidelines.

Expert 5(UL): An expert opinion report on the study entitled "Development of a modified interventional tool for the management of diabetes and hypertension among Tswana and Zulu Traditional Health Practitioners in South Africa" by Ebenezer Kwabena Frimpong.
There is no mention of Ayurvedic Formulations in the entire report. Please refer to Ayurvedic Formulary of India (AFI) and search the formulations used for Diabetes. *Gymnema sylvestre* (gurmar) is extensively used in the management of diabetes in the Indian sub-continent. There is no mention of that in the report, although the candidate has referred Central Council for Research in Ayurvedic Sciences (CCRAS).

- Inclusion of the map of the actual site where the survey has been carried out should be included in the report.
- Physiological part of hypertension and diabetes physiology inclusion is required in the report. This will help the candidate to understand the gap between the traditional system of medicine and modern medicine and bridge the gap between them.
- Correlation of the plant material used in the management of disease with their constituents:

The identified plant material used for the management of diabetes and hypertension should correlate with their constituents. The candidate is advised to go through the photochemistry of the plants with the disease.

Discussion

Generally, an extensive literature search into OCM and Ayurveda health traditions [1-4] led to adapted Ayurveda treatment guidelines for both diabetes and hypertension which served as a reference for the development of an interventional tool for the management of diabetes and hypertension[3,4] to be used by Tswana and Zulu THPs. Development of this interventional tool was made possible based on findings from research carried out in both North West and KwaZulu-Natal provinces involving Tswana and Zulu THPs in two different phases. Phase 1 was carried out using a semi-structured interview guide for FGDs while face-to-face interviews using semi-structured questionnaires were employed in Phase 2 for data collection.

Commonalities in the responses of Tswana and Zulu THPs employed in our previous studies (personal communication: FGDs and face-to-face interviews) compared to an adapted Ayurveda treatment guidelines for both diabetes and hypertension led to the development of these treatment guidelines for both diabetes (**A**)and hypertension (**B**) to be used by Tswana and Zulu THPs. Interestingly, practitioners of OCM, Ayurveda and TM traditions have their understanding of diabetes and hypertension diseases, which sets the framework of their management. According to OCM, diabetes mellitus (DM) consist of a group of metabolic diseases that are influenced by hyperglycemia (high blood sugar) as a result of defects in insulin secretion, action or both [80]. The summary of the pathophysiology of diabetes are as follows: food taken inside humans are broken down into smaller units. Carbohydrates and sugary foods are broken down into glucose. The glucose produced serve as an energy source for the body. Insulin which is a hormone secreted by the beta cells of the pancreas is responsible for the regulation of glucose in the blood. To maintain glucose levels in the body, insulin is needed to inhibit the breakdown of glycogen, stimulate the transportation of glucose to the fat tissues and muscles and storage glucose in the form of glycogen. Insulin defect and insensitivity of its receptors play a major role in the formation of diabetes because of poor regulation of glucose in the human body[81]. There are two major types of diabetes

from OCM perspectives; Type 1: characterized as a result of autoimmune destruction of insulin-producing pancreatic β-cells that affects glucose metabolism in peripheral tissues [82] while Type 2 is described by insulin resistance and/or abnormal insulin discharge, either of which may dominate [83]. Diabetes from an Ayurvedic perspective is caused by an aggravation of the Kapha (mucus) and vitiates meda dhatu (fat) in the body. Diabetes occurs because of a disorder of Kapha, which spreads throughout the system. The Kapha mixes with fat before entering the urinary system, which interferes with normal urine excretion [84]. Under Ayurvedic traditions, diabetes is divided into four types namely: Kapha type: urine mostly clear, white cold and odorless, almost resembling water; Pitta**:** urine characterized by smell and tastes like a solution of alkali. Vata type**:** characterized by urine with muscle fat; Juvenile diabetes: as a result of unhealthy practices of /or sins committed by a child's parents in the past. [84]. Tswana and Zulu THPs (personal communication: FGDs and face-to-face interviews) refer diabetes as a sugar disease mainly caused by poor diets (excess intake of sugar, excess intake of salt and regular consumption of fatty foods. The major types have been high or low sugar levels in humans. Regarding the causative factors for diabetes, all three health traditions including THPs (personal communication: FGDs and face-to-face interviews) acknowledge similar causative factors of diabetes, these being diet-related such as high intake of sugar-based soft drinks, excessive consumption of fatty foods and low fiber diet [85,86].

The health professions (OCM, Ayurveda, and THPs) have identified several similar signs and symptoms, specifically frequent urination, excessive thirst and sweetness of urine [84,87,88]. Regarding diagnosis, OCM practitioners use various scientific testing methods. Firstly, Fasting Plasma Glucose (FPG), this test is conducted, when an individual must have fasted for at least 8 (overnight) but not more than 16 hours to obtain correct laboratory results. Also, blood glucose (more than 126 mg) should be observed in the blood samples (2 or more times) on different days [89]. Secondly, Oral Glucose Tolerance Test (OGTT**),** this test is also conducted when a random plasma glucose test (RPGT) reveals 160-200 mg/dl and serves as the basis for a person to be confirmed as diabetic [89,90]. Thirdly, a random plasma glucose test (RPGT), this test does not use fasting as a measure and can be conducted at any time. Blood glucose of 200 mg/dl or more must be observed, with the test only being valid when it has been reconfirmed by FPG or OGTT [89]. Last but not the least, glycosylated hemoglobin

(HgA1c) this diagnostic criterion was developed by an expert committee on diabetes which indicates how well blood sugar levels (>6.5%) have been controlled in 3 months. This test requires the person to have fasted for at least 8 but not more than 16 hrs. It is conducted when the RPGT and OGTT are 160-200mg/dl and 110-125 mg/dl respectively and is used to evaluate a body's response to glucose [89]. Interestingly, to clinically diagnose diabetes, the Ayurveda practitioners and THPs (personal communication: FGDs and face-to-face interviews) rely mainly on the knowledge and the description of the signs and symptoms by patients seen by them. Similar major complications of diabetes have been identified by the OCM practitioners, Ayurveda practitioners and THPs (personal communication: FGDs and face-to-face interviews), the common ones being poor eyesight, diabetic wounds that are difficult to heal and erectile dysfunction [84,91-93]. There is an acknowledgment by OCM, Ayurveda, and THPs (personal communication: FGDs and face-to-face interviews) about the importance of eating fruit and vegetables and exercising regularly to manage their weight and general wellbeing [54,88,94,95]. While the OCM practitioners rely on pharmacological preparations such Metformin, sulfonylureas, acarbose, thiazolidinediones, gliflozin [96,97], the Ayurveda and THPs (personal communication: FGDs and face-to-face interviews) use mainly medicinal plant/herbal preparations *Momordica charantia*, *Pterocarpus marsupium* and *Trigonella foenum graecum* which have been proven scientifically to possess anti-hyperglycemic potentials [98]. Medicinal plants employed by THPs in managing diabetes (personal communication: FGDs and face-to-face interviews) included in our developed guidelines (**A** and **B**) have been cross-referenced with literature to examine its anti-diabetic potential. For example, experimental results revealed the effect of *Aloe vera* in the reduction of blood sugar levels of type 1 and type 2 diabetic rats[99]. In this study, Zulu and Tswana THPs (personal communication: FGDs and face-to-face interviews) mentioned the preparation of herbal mixtures using *Aloe vera* in the management of both diabetes and hypertension. Interestingly, a decoction of *Aloe vera* is used in Ayurvedic medicine for the management of diabetes[100]

From OCM perspectives, BP can be measured through various standardized mechanisms that enable a comparative understanding of the systolic and diastolic pressure measurements. The arm cuff band method is still used in many health settings with a mercury barometer gauge and stethoscope, although these have been replaced by more reliable digital methods.

Hypertension is characterized by>140 mmHg systolic and/or >90 mmHg diastolic pressure [101]. The pathogenic mechanism involves an elevation of cardiac output (CO) or total peripheral vascular resistance (TPR), with both being elevated in most hypertensive patients [102].

The pathophysiology of hypertension entails the following: First, the Autonomic nervous system: in regulating blood pressure, the autonomic nervous system plays a significant role, with an increase in peripheral sensitivity to norepinephrine in hypertensive patients. In addition, hypertensive patients are susceptible to a higher rate of responsiveness to stressful stimuli in their daily activities[103] Secondly, Sodium and water excretion: retaining sodium and water results from an unhealthy relationship between pressure and sodium excretion due to a reduced renal blood flow while a steadily rise of angiotensin causes an increase in blood pressure[103]. Thirdly, the role of vasodilators: potential vasodilators, such as bradykinin and nitroxide, help to regulate blood pressure[104]. The deactivation of bradykinin by angiotensin-converting enzymes (ACE) leads to an increase in blood pressure[104]. Last but not the least, Renin-angiotensin system: the secretion of renin from juxtaglomerular apparatus associated with the kidney leads to the conversion of a substrate renin (angiotensinogen) to angiotensin I. Angiotensin I, which is physiologically inactive, is quickly converted to Angiotensin II, specifically in the lungs. This potential vasoconstrictor, such as Angiotensin II, causes an increase in blood pressure[104]. The major types being primary which is not associated with any causative factor likely to be caused by a combination of environment and genetic factors) and secondary: caused by another medical condition [105].

Hypertension from an Ayurvedic perspective is characterized by the inclusion of all the three doshas, heart and blood vessels. Observation of signs and symptoms of hypertension is a result of disturbance of Vata dosha which stimulates and regulates mana [106]. Types of hypertension in Ayurveda is not clearly defined. Hypertension from the THPs (personal communication: FGDs and face-to-face interviews) perspectives is referred to as a disease like diabetes, as one condition leads to the other. They described hypertension as a disease associated with stress, and an individual thinking too much is highly likely to acquire this disease. The major types being low or high depending on the rate at which an individual's heartbeats during breathing. An individual heart beats faster than normal means he or she

has high hypertension while a heart beats slower than normal corresponds to low hypertension.

OCM, Ayurveda, and THPs (personal communication: FGDs and face-to-face interviews) practitioners have all indicated that poor dieting (high intake of salty food and fatty foods) as major causative factors for hypertension [106-108]. Similar signs and symptoms are known to OCM, Ayurveda practitioners and THPs (personal communication: FGDs and face-to-face interviews) with the common ones being (excessive sweating, shortness of breath and headache)[106,109]. To diagnose a patient, OCM practitioners make use of scientific testing methods: 24-hour ambulatory blood pressure monitoring, liver function tests, electrocardiography, urine sample to detect protein, blood, and glucose, serum electrolytes [110]. Ayurveda practitioners and THPs (personal communication: FGDs and face-to-face interviews) rely mainly on the knowledge of the description of the signs and symptoms reported by patients seen by them. The major complications identified by OCM, Ayurveda, and THPs (personal communication: FGDs and face-to-face interviews) are a stroke, heart diseases, erectile dysfunction [106,111]. To manage hypertension OCM, Ayurveda and THPs acknowledge the significance of eating fruit, vegetables, and exercising regularly to manage stress and hypertension. While OCM practitioners rely on pharmacological preparations Angiotensin-converting enzymes inhibitors (ACEI) e.g. lisinopril; β blockers e.g. atenolol; α blockers e.g. doxazosin; calcium channel blockers (CCB) e.g. verapamil; nifedipine; vasodilators e.g. methyldopa[61], the Ayurvedic and THPs (personal communication: Focus Groups Discussions and face-to-face interviews) use mainly ethnopharmacological preparations with some of the following plant constituents Sarpagandha (*Rauwolfia serpentine*), Jatamansi (*Nardostachy jatamansi*), Arjuna (*Terminalia arjuna*), Gurmar (*Gymnema sylvestre*) and Rasona (*Allium sativum*) [112-114]. These above mentioned medicinal plants are also part of Ayurvedic formulations listed for diabetes and hypertension in Ayurveda and have been listed in Ayurvedic Formulary of India (AFI)[115].

These medicinal plants (*Allium sativum*, *Urgine singuinea, and Senna italica*) used by Zulu and Tswana THPs (personal communication: FGDs and face-to-face interviews) in the management of hypertension, have been cross-referenced with literature to establish their anti-hypertensive potential. For example, a study conducted in Nigeria shown a reduction in

blood pressure and heart rates of both hypertensive and normotensive rates when both experimental animals were administered with *Alluvium sativum* extracts [7].

Regarding prescribing practices available literature suggests a standard prescribed dosage to be followed to dispense medicinal drugs for patients in both OCM [1,2] and Ayurveda [3,4] health traditions. Conversely, information is scarce regarding a standard to be followed by THPs in different cultures to dispense their herbal mixtures. Findings from our previous studies (personal communication: FGDs and face-to-face interviews) have revealed that averagely Tswana and Zulu THPs were prescribing not more than half of a standard South African cup size (250 mls) to an adult patient, irrespective of the number of times and when (before or after meals) the mixture was taken during the day. With regards to prescribed dosage for children, averagely it was not more than 3 teaspoons (15mls) (South African standard teaspoon size) within a day.

The consistency in the prescribed methods employed by Tswana and Zulu THPs is a significant information that will assist scientific researchers to use the same quantity in mls of herbal mixtures prescribed to adults and children by Tswana and Zulu THPs as a standard to conduct further studies in order to determine whether the quantities (mls) need to be adjusted to ensure that the patients seen by them benefit from the most suitable doses. The outcome of this study will be useful in the subsequent updated versions of our developed guidelines.

OCM and Ayurveda health traditions experts opinion regarding this developed diabetes and hypertension guidelines to be used by Tswana and Zulu THPs sought after their validation process was taken into consideration that led to the final draft of this interventional tool.

Recommendations

To ensure that the above-developed guidelines make a positive impact on the health care delivery system in the various communities, the following must be taken into consideration:

- OCM/TM collaboration regular experts meetings supervised by the Department of Health (DOH) and Department of Science and Technology (DST) representatives to address issues raised by Tswana and Zulu THPs unwillingness to disclose the constituents of their herbal mixtures. Signing of intellectual property (IP) agreement

between the DST legal experts and THPs will help OCM researchers to obtain samples of herbal mixtures to conduct scientific research through in vivo, in vitro and randomized control trials (RCT) studies to make a meaningful contribution to subsequent updated versions of the developed guidelines.

- The major stakeholders in the health sector insurance companies, DOH, BHPs, THPs, OCM/TM researchers and the media(print and electronic) must be involved in the future process of an updated form of these developed guidelines.
- Leaders of the various traditional healers association in the provinces should make sure that THPs update their knowledge about the use of these guidelines through regular interactive educational workshops.
- The DOH should conduct regular checks to ensure that THPs adhere to the usage of these guidelines in the management of diabetes and hypertension and offer incentives to THPs who are very co-operative in this great initiative.

Conclusion

We have achieved our aim of developing diabetes and hypertension guidelines to be used by Tswana and Zulu THPs based on their perspectives in managing these two diseases. We strongly believe that these developed guidelines for both diabetes and hypertension will be of great assistance to THPs in both KwaZulu-Natal and North-West provinces in managing these two diseases in our various communities where people find it difficult to access clinics and OCM due to poor economic conditions.

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CHAPTER 7

This chapter highlights the key findings of this study,it provides general conclusion,strengths and limitations and recommendations for future studies.

7.1 Synthesis

The aim and objectives of this study have been accomplished and the findings reported in five articles that have either been published, are under journal review or submitted to peer-reviewed journals. The review article published and presented in chapter 2 has given some understanding into the use of TM by people with the assistance of THPs to manage diabetes and hypertension on the African continent [1]. A prevalence rate of 17-84% of TCAM has been reported regarding the use among the studied population in Africa, with the application of main herbs and medicinal plants to manage both diabetes and hypertension [1]. The published articles presented in chapters 3, 4 and 5 address Objectives 1, 2, 3 and 4 of this study. Generally, across the two cultural environments studied, the acquisition of specific knowledge by the Tswana and Zulu THPs to manage both diabetes and hypertension were not standardized. This is in agreement with other studies in African, which described how THPs in the various countries acquired their knowledge used in their profession. In Tanzania, 41 THPs in Kilosa and Handeni districts stated that they acquired knowledge through ancestral spirits, other family members and apprenticeship (training) from other THPs [2]. Similarly, 27 THPs who were interviewed in the five regions of Limpopo Province, namely stated that they acquired their management knowledge from ancestral spirits [3].

Regarding the cultural understanding of both diabetes and hypertension, the Zulu and Tswana THPs described diabetes as a 'sugar' disease and hypertension as a disease associated with stress. Furthermore, they were both of the opinions that the two diseases were the same, as one condition leads to the other. A study carried out in the USA revealed that Type 1 (30%) and Type 2 (50-80%) diabetes patients were also diagnosed with hypertension [4]. The Zulu and Tswana THPs in this study mentioned the following: excess sugar intake, using too much salt, excessive consumption of fatty foods, eating too much red meat and lack of exercises, as some of the causes of diabetes. Regarding hypertension, they mentioned the following as some of the causes: stress, eating too much sugar and salt. Their causes are in agreement with OCM and Ayurveda literature regarding both diabetes and hypertension[5-8].

In this study, the Zulu and Tswana THPs reliance on spiritual guidance from ancestral spirits for diagnostic purposes are in agreement with studies that described the concept of healing from an African perspective [9]. Bhikha and Glynn(2013) argued that in ATM, there is a

constant relationship between human beings and the spiritual realms and that the main underlying cause of a person acquiring a disease could be disobeying instructions from the ancestral spirits. To be able to heal a person from any disease, a THP must know the probable causes from both the physical world and spiritual realms [9]. Also, for diagnostic purposes, some Zulu and Tswana THPs relied mainly on the knowledge of the signs and symptoms of diabetes and hypertension. This agrees with a similar study conducted in Nigeria, where THPs reported that they relied on the signs and symptoms of diabetes indicated by patients to diagnose diabetes [10]. There was no significant difference in the description of clinical features (signs and symptoms) regarding diabetes and hypertension among Tswana and Zulu THPs. A few THPs reported that they refer their patients to the clinic/hospital to confirm whether they had diabetic or hypertensive. This is in agreement with a similar study conducted in Kenya, which revealed that some THPs relied on BHPs in a clinic to confirm whether a patient is diabetic or not [11].

The common signs and symptoms reported by Tswana and Zulu THPs for diabetes were dryness of the mouth, frequent urination, excessive thirst, excessive hunger, wounds difficult in healing and impaired vision. The signs and symptoms agree with OCM and Ayurveda health traditions presented in the literature [12,13]. Regarding hypertension, the common signs reported by Tswana and Zulu THPs include the following: sweating easily, anxiety, ill-tempered and shortness of breath. These are in concurrence with the signs and symptoms for hypertension reported in the OCM and ayurvedic literature [14,15].

Regarding medical complications associated with both diabetes and hypertension, the Zulu and Tswana THPs were of the opinion that both diabetes and hypertension, if not managed well, could lead to serious medical complications that will be disastrous to the health of affected individuals. Frequently cited medical complications for diabetes by the Tswana and Zulu THPs in this study were: poor eye-sight, erectile dysfunction, wounds that do not heal, leading to amputation, and that of hypertension: heart diseases, stroke, and nerve damage. The available scientific literature agrees with the statements made by the Zulu and Tswana THPs regarding the medical complications of both conditions [16,17]

Non-pharmacological and Ethnopharmacological methods and treatment approaches used by the Tswana and Zulu THPs were similar in this study, who recommended fruit, vegetables and medicinal plants, such as apples, banana, spinach , *Aloe vera* and garlic found in their

socio-cultural environment, for managing diabetes and hypertension. The Zulu and Tswana THPs stressed the significance of exercises to manage these chronic conditions, in agreement with an argument posed by Mulatu and Berry (2001), who stated emphatically that a good understanding of people cultural background aids in a better understanding of the sickness and health of an individual [18].

Regarding ethnopharmacological preparations, the Tswana and Zulu THPs use mainly medicinal plant/herbal preparations (concoctions or decoctions) to manage diabetes and hypertension. Similarly, studies across Africa revealed THPs were prescribing herbal mixtures to their patients for the two conditions [10,11,19,20]. While the Tswana and Zulu THPs were using medicinal plants grown in their localities to manage these two conditions, *Aloe vera* and *Allium sativum* were commonly mentioned as being effective. Experimental studies carried out in India revealed a reduction in blood glucose levels and HbA1c when alloxan-induced diabetic rabbits were administered with *Aloe vera* leaf extract after 21 days [21]. Similarly, experimental research carried out in Kuwait within four weeks reported a reduction in the BP of rats that were administered with aqueous extract of allium sativum [22]. It was difficult for Zulu and Tswana THPs to reveal the constituents of their herbal mixtures, with Ndhlahala *et al*. (2009) indicating that the resort to secrecy as a way of protecting their indigenous knowledge [23]. Regarding the non-pharmacological treatments prescribed by the Zulu and Tswana THPs in their practices, they stressed the significance of a good dieting rich in fruit and vegetables, and the need for regular exercises, which is similar to OCM and Ayurveda practitioners [15,24-28]. In addition, America, Japan, Canada, India, South Africa have standard treatment guidelines for both diabetes and hypertension that recommend the consumption of fruit, vegetables and exercises [29-32].

Regarding prescribed herbal mixtures for their patients, the Tswana and Zulu THPs contended that their herbal mixtures were made of natural products and were therefore free from side effects, which was not the case for OCM medications. Findings from a similar study conducted in Ghana revealed that THPs believed herbal mixtures were free from side effects [33]. In contrast, a study conducted in Democratic Republic of Congo reported that decoctions of *Quassia africana,* which was used as antihypertensive herbal therapy, exhibited high toxicity against MRC-5 cells, which is unsafe for human consumption [34]. Furthermore, a clinical assessment study conducted in Scotland demonstrated that a patient

suffered from hyperkalemia and heart failure due to prescribed herbal medications that contained substantial quantities of cardiac glycosides [35]. The assertion by the Zulu ad Tswana THPs that their prescribed herbal mixtures were without side effects cannot be verified due to the limited availability of studies that prove otherwise [34,35]. This is the reason why the WHO has requested African Governments to consider standardization of TM for its acceptance and recognition in a broader scientific community [36].

To avoid contraindications, the Tswana and Zulu THPs believed that OCM and herbal mixtures should be taken at different times of the day. Chen, X.-W. *et al.*(2012) emphasize the need for patients on both western and herbal medications to take them at different times [37]. Regarding the prescribed dosage of herbal mixtures quantity in millilitres (mls), the Tswana and Zulu THPs in this study recommended not more than half (0.5) a standard South African cup size (250 mls) for adult patients, irrespective of the number of times (before or after meals) within a day. Regarding children, the maximum recommended dosage by THPs in this study was not more than three teaspoons (15ml) (South African standard teaspoon size) within a day. These quantities of herbal mixtures will serve as the baseline for future studies to be carried out by scientific researchers through laboratory methods (using animal models). Further, it will be useful in randomized control trials (RCTs) to ascertain whether these recommended prescribed pose a health risk to patients. Studies will indicate the need to adjust the prescribed quantities (mls) for their patients. Most THPs were in support of collaborating with BHPs to assist in managing diabetes and hypertension in various societies. This is in an agreement with a study conducted in the Kilosa and Handeni Districts in Malawi, where most THPs involved in managing malaria were in support of collaboration with BHPs [2].

An interventional tool was developed based on the findings from chapter 3, 4 and 5 using adapted Ayurveda treatment guidelines for both diabetes and hypertension [38,39] to address objective 5 of this study. The developed tool can be used by Tswana and Zulu THPs to manage diabetes and hypertension and was validated by experts involved in their management. The tool captured relevant information about causes, signs and symptoms, steps to follow in diagnosing a patient, complications of diabetes and hypertension, and the pharmacological and non-pharmacological approaches to be adopted to manage the two

diseases. Recommendations and suggestions have been offered to suggest that the THPs consider the advice provided in the tool to assist them to manage the two diseases.

7.2 General Conclusions

This study established that the majority of Zulu THPs acquired their knowledge as a gift from birth, while a majority of Tswana THPs acquired their knowledge via family members. Zulu and Tswana THPs had similar cultural understandings of both diabetes and hypertension. Frequently cited Signs and symptoms were weight loss, sweating easily, shortness of breath, feeling dizzy, and difficulties in breathing, excessive hunger and eyesight problems for both diabetes and hypertension, which agree with the scientific literature. Ethnopharmacological modalities and treatment approaches used by the Zulu and Tswana THPs to manage both diabetes and hypertension diseases were mainly the use of herbal mixtures with *Aloe vera* as a major constituent. Also, the following medicinal plants: *Hypoxis hemerocallidea, Persea americana, Sutherlandia frutescens* and *Harpagophylum procumbens* were used by both groups of THPs to manage the two conditions and have been proven scientifically to be effective against them. Commonalities in the responses of the Zulu and Tswana THPs regarding their cultural understanding of both conditions, the description of their clinical features as well as the ethnopharmacological preparations led to the development of a framework from an adapted and modified Ayurveda treatment guidelines for diabetes and hypertension. The developed tool was validated by experts and practitioners involved in managing the two both diabetes and hypertension. All the experts who validated the interventional tool to assist Zulu and Tswana THPs were of the opinion that the developed tool could be easily followed by THPs. Suggestions and recommendations have been communicated to the DOH to ensure that THPs consider adopting these guidelines to mitigate the effects of these chronic conditions.

7.3 Strengths and limitations of the study

A mixed-method approach utilizing both qualitative and quantitative data was employed in this study. This study established some similarities in Zulu and Tswana THPs cultural understanding of diabetes and hypertension, description of clinical features for both diabetes and hypertension and ethnopharmacological preparations employed by them in the

management of these two diseases. First, the study was carried out in both uMgungundlovu and uThukela Districts in KwaZulu-Natal Province, and Bojanala, Dr Ruth Sekgopomati Districts, North-West Province, South Africa. Therefore the findings may not be generalized for the entire population of THPs in KwaZulu-Natal and North West provinces and the rest of South Africa. Secondly, in both Phase 1 and Phase 2 of the study, Zulu and Tswana THPs were not willing to disclose the medicinal plants and constituents of their herbal mixtures employed by them in the management of these two diseases. Thirdly, this study was carried out to gather self-report from only Zulu and Tswana THPs who took part in this study. Perceptions of patients seen by Zulu and Tswana THPs in this study concerning the efficacy or non-efficacy of prescribed herbal mixtures were not sought. Moreover, experiments were not conducted in the laboratory by researchers to ascertain whether herbal mixtures employed by THPs in this study are without side effects and does not pose any health risk to human beings. For last, there may be impreciseness in the clarification of facts because of transcription of verbatim quotes by THPs in isiZulu and Tswana languages which were translated into English. However, these limitations do not affect the main findings of this study.

7.4 Recommendations

To effectively manage diabetes and hypertension in South Africa, the collaboration between THPs and BHPs should be given greater attention, with research having indicated the former's willingness to refer patients to the latter for medical attention [40,41]. However, research has shown BHPs averseness to collaborate with THPs, citing concerns regarding their treatment methods and approaches, as well as the safety and efficacy of their prescribed herbal mixtures[2]. It is therefore recommended that BHPs make a greater effort to work with THPs, as they are often the first point of call in delivering primary health care to the indigenous population across the African continent. Collaboration between BHPs and THPs is essential for managing diseases, with the proposed guideline (**Figure 1**) being provided to support this effort.

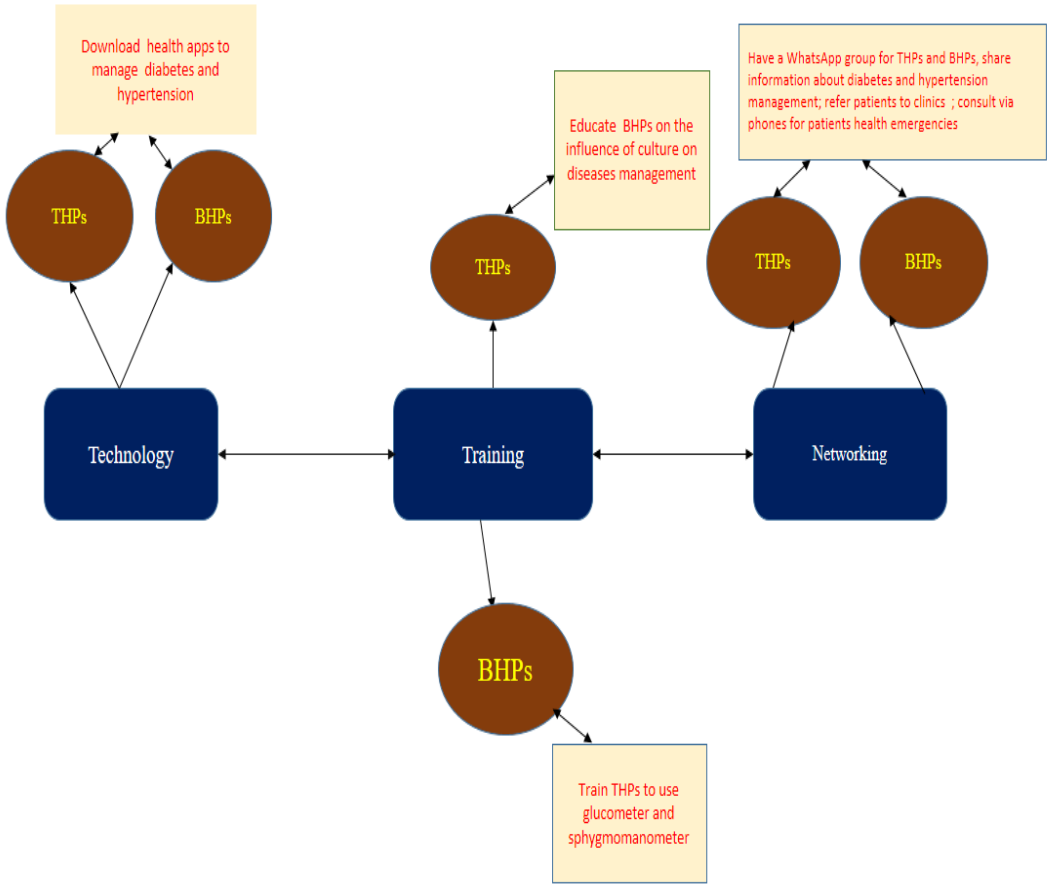

Figure 1. A graphical view showing suggested effective collaboration between BHPs and THPs.

Training BHPs to become acquainted with the use of herbal therapies and their applications could be conducted by THPs, who could provide them with instruction about cultural appropriate methods for managing diseases to demystify their perceptions about TM methods and practices (**Figure 1**). Drozd (2000) and also Mulatu&Berry (2001), stressed the significance of knowing the influence of culture in chronic disease management [18,42].

Studies conducted in South Africa, Trinidad and Tobago revealed that BHPs exhibited poor knowledge about the use of herbal therapies and their associated risks to treat diseases [43,44]. Clement *et al.* (2005) suggested the need to assist BHPs to increase their knowledge about natural products and their applications, as well as the risk associated with their use[6]. They suggested the need for medical school's curriculum to include herbal medications and their application to manage the disease during BHPs training, and to develop herbal pharmacopoeia to assist them to improve their knowledge about natural products[6]. Likewise,

THPs should also be given appropriate training by BHPs about how to use basic tools, such as a glucometer and sphygmomanometer, for diagnosing diabetes and hypertension respectively. The use of technology, such as downloading health apps on digital platforms that are associated with disease management, and sharing treatment modalities ideas via social media (Facebook, WhatsApp) between BHPs and THPs in the same community should be encouraged, as it will benefit both health professionals and their patients, as indicated in **Figure 1**.

To ensure high quality research into TM and encourage its acceptability by the broader scientific community, the WHO TM committee suggested the need for member countries to mitigate some of the major challenges encountered by this health tradition, such as limited research data on, and a lack of funding and expertise to conduct quality research into TM, as well as insufficient mechanisms to regulate TM providers [45]. Furthermore, the lack of standardized herbal products and validation of TM through quality scientific research is a major setback for this health tradition [46].

The proposed guideline (**Figure 2**) serves as the baseline reference document for TM research-related activities in South Africa and beyond, and should be given the needed consideration by WHO member countries.

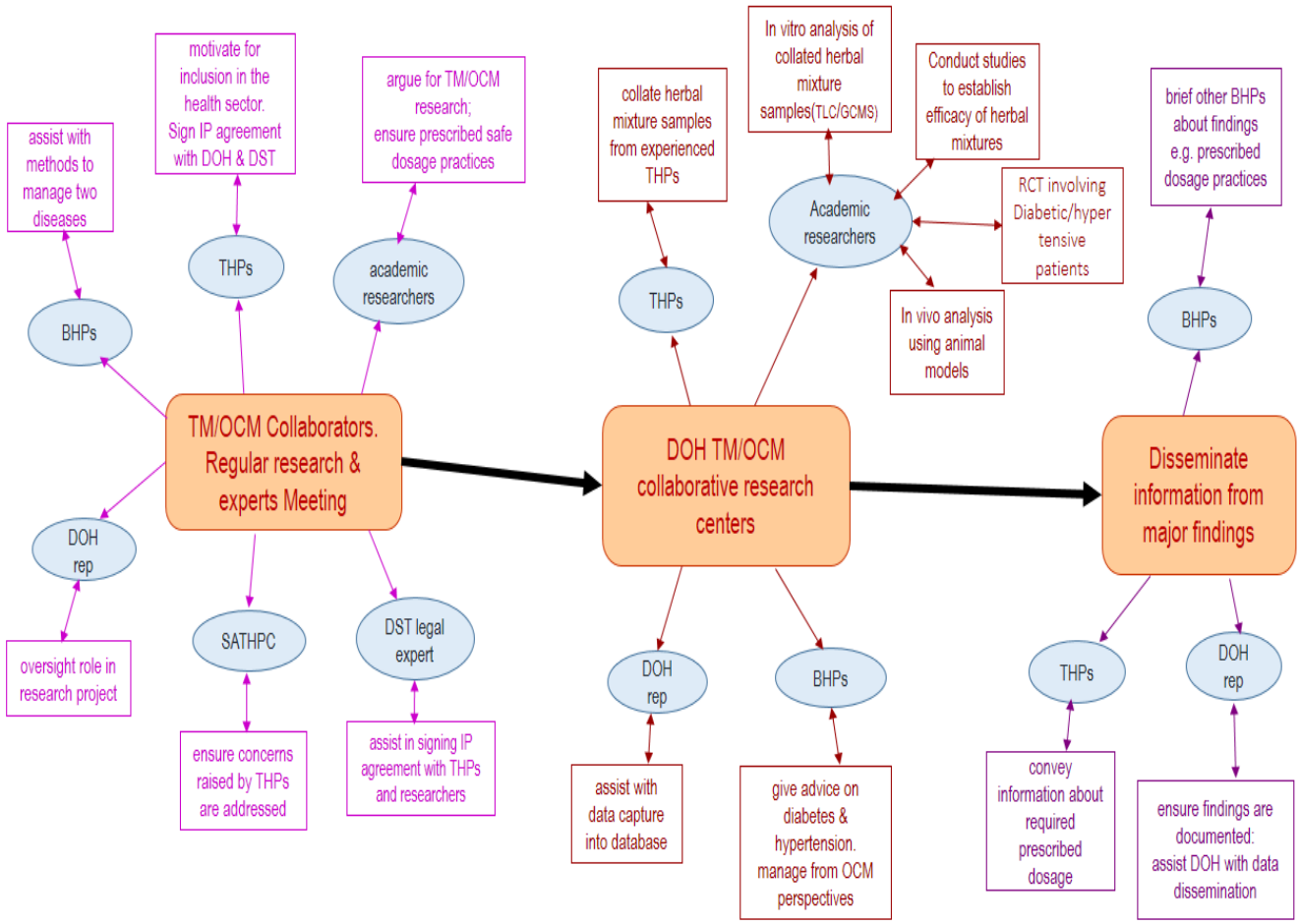

Figure 2. A graphical view showing proposed guidelines for effective TM/OCM collaborative research.

In this study, Zulu and Tswana THPs were reluctant to provide information about the medicinal plants and composition of herbal mixtures they use to manage diabetes and hypertension for fear of losing it to the scientific community, which might commercialize it and make a profit out of their knowledge. More than 40 years after the Alma Ata declaration [47], which paved the way for TM recognition as a significant health tradition for the advancement of primary health care delivery system, commitment to extending intellectual protection to traditional knowledge has not been given the consideration it needs by the World Intellectual Property Organization (WIPO) [48]. In this regard, countries across the world may need to ensure that laws are enacted to protect indigenous knowledge. Tangwa (2007) stressed the need for extensive research into TM to clarify its therapeutic qualities

and ensure its protection through intellectual property (IP) laws [49]. It is therefore recommended that the South African government enact laws to protect indigenous knowledge systems, which is the cause of worry to Zulu and Tswana THPs interviewed in this study.

Generally, Zulu and Tswana THPs in this study believed their prescribed herbal mixtures had no side effects as they were made from natural products. The THPs believed that to avoid clashing contraindications, their patients should take their prescribed herbal mixtures and conventional medications at different times of the day. While a study conducted in South Africa revealed the compatibility of conventional and herbal medicine to act against diseases [50], another study found that herbal medicines may enhance or decrease pharmacological actions in older patients with weak immune systems [51]. It is recommended that further analysis (**Figure 2**) of the bioactive compounds isolated from the herbal mixtures should be tested for their biological activities to determine the efficacy of lowering the blood pressure and glucose levels in animal models and clinical trials in humans. Clinical laboratory analysis of blood and serum obtained from patients seen by THPS in this study should be tested for biochemical markers of toxicity and efficacy to determine the safety of the prescribed herbal mixtures. *In vitro* cell line work performed on defined cell lines could assist in determining the toxicity of the herbal mixtures on human cell lines.

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APPENDICES

APPENDIX I: BREC Approval letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

07 February 2018

Mr EK Frimpong (215068623)
School of Health Sciences
College of Health Sciences
pharmeben@gmail.com

Dear Mr Frimpong

PROTOCOL: Development of a framework for the standardization of management of diabetes and hypertension: The case of Tswanas and Zulus of South Africa. **Degree: PhD**
BREC Ref No: BE567/17

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 14 September 2017.

The study was provisionally approved pending appropriate responses to queries raised. Your response received on 19 January 2018 to BREC correspondence dated 08 December 2017 has been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given **full ethics approval** and may begin as from 07 February 2018.

This approval is valid for one year from **07 February 2018.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its next meeting taking place on **13 March 2018.**

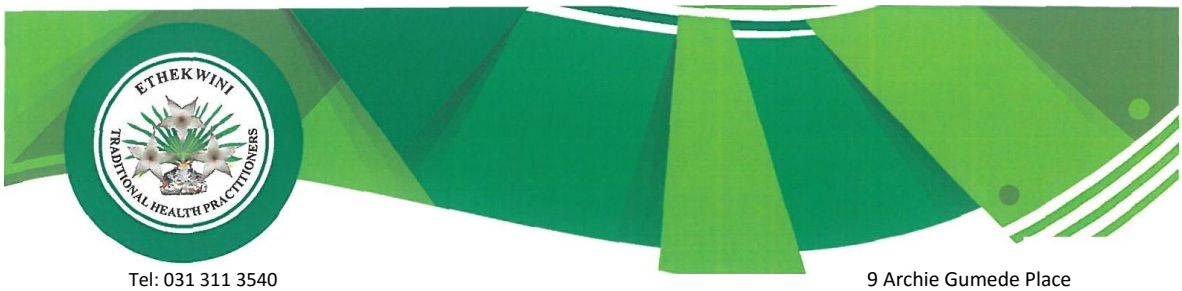
We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor V Rambiritch
Deputy Chair: Biomedical Research Ethics Committee

cc: nenep1@ukzn.ac.za Nlooto@ukzn.ac.za

APPENDIX II: Letter of authorization to work with THPs from KZN traditional healers associations



Tel: 031 311 3540

9 Archie Gumede Place

Durban

4000

1J/22/2017

Cell:082 8342002

Dear Sir/Madam

RE: LETTER OF ACKNOWLEDGEMENT: AUTHORITY TO WORK WITH TRADITIONAL HEALTH PRACTIONERS

This letter serves to confirm that Ms Zabalazile Makhoba and her team of EThekwini Traditional Health Practitioners (ETHP'S) are given authority to work with Westville team in finding perspectives about the management of diabetes and hypertension in North West and in KZN.

Msawenkosi Cele

Secretary General

ETHP

celemsa3ogmail.com

APPENDIX III: Letter of authorization to work with THPs from North West traditional healers associations

Boitekong

Bojanala District Municipality

Rustenburg

To whom it may concern

The community of Boitekong and surrounding villages. After, consultation with Mr Ebenezer Frimpong. We have agreed to work with him and assist in any way possible in his research.

More over we would like to thank him for the opportunity afforded to us by his project. May this lead to a fruitful relationship and empower us.

Yours in community development

(SIGNED)

E. Theshwa

Sekhing

Dr Ruth Segomotso Mompati Taung

8584

To whom it may concern

We the community of Sekhing, in the area of Taung under Dr Ruth Segomotso Mompati District municipality, pledge our support to Mr. E. Frimpong.

We will work with him in his research and will assist in any way we can

Regards

(SIGNED)

K. ESSAU

APPENDIX IV: Certificate of Ethics

TRREE

Zertifikat
Certificat
Certificado
Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants

Clinical Trials Centre
The University of Hong Kong

Certificat de formation - Training Certificate

Ce document atteste que - this document certifies that

Ebenezer Frimpong

a complété avec succès - has successfully completed

Introduction to Research Ethics

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

July 24, 2017
CID : 5ALBYmp8Jm

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

FMH Continuing Education Program (5 Credits)
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Foederatio Pharmaceutica Helvetiae FPH Programmes de formation continue
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[REV : 20170310]

APPENDIX V: Interview guide employed in FGDs in English

1. What are diabetes and hypertension in isiZulu or Tswana culture? Are these two diseases curable?
2. How do you recognize a person suffering from diabetes and hypertension?
3. How do you manage diabetes and hypertension?
4. How effective are your prescribed medications? Are there any side effects?
5. Do you advise your patients to take your medication together with western medication? Do you take into account contraindications?
6. How do you monitor the health outcomes of your patients?
7. What are some of the challenges you faced in managing diabetes and hypertension?
8. What should be done to improve diabetic and hypertensive care in South Africa

APPENDIX VI: Interview guide employed in FGDs in isiZulu

1. Ngokwesintu, cela uchaze ukuthi yini isifo sikashukela nesomfutho wegazi?
2. Umbona ngani umuntu onesifo sikashukela noma onesifo somfutho wegazi?
3. Umelapha kanjani umuntu onesifo sekashukela nonesifo somfutho wegazi?
4. Ngabe imithi yakho iyabasiza yini abantu abanesifo sikashukela kanye nesomfutho wegazi?
5. Uyazivumela yini iziguli zakho ukuthi zisebenzise imithi yabelaphi bezizwe ngenkathi zisasebenzisa imithi yakho? Ngabe uyakwazi ukubona uma isigula kungefanele ithatha imithi ethile?
6. Uqapha kanjani isimo sempilo seziguli zakho?
7. Iziphi izinkinga ohlangambezana nazo uma welapha isifo sikashukela nesomfutho wegazi?
8. Yikuphi okuphakamisayo okungaphucula ukwelapha kwesifo somfutho wegazi nesifo sikashukela la eNingizimu Afrika?

APPENDIX VII: Interview guide employed in FGDs in Tswana

1. Bolwetse ba sukiri le ba kgatelelo ya madi le bo bitsa eng ka setso? A malwetse ka bobedi a alafega?
2. O bona jang motho yo o tshwerweng ke bolwetse ba sukiri le ba kgatelelo ya madi?
3. O alafa jang bolwetse ba sukiri le ba kgatelelo ya madi?
4. Melemo ya gago ya kalafi e dira go le kae/go fitlhelela fa kae? A e ka bakela molwetse malwetse mangwe?
5. A o gakolola balwetse ba gago go tsaya melemo ya gago gammogo le melemo ya sekgowa? A o ela tlhoka gore melemo ka bobedi e ka thulana?
6. O tlhokomela jang ditlamorago/dipholo tsa kalafi mo molwetseng?
7. Ke dikgwetlho di feng tse o kopanang natso mo kalafing ya bolwetse ba sukiri le kgatelelo ya madi?
8. Ke eng se se ka dirwang gore Afrika Borwa a tokafatse tlhokomelo ya bolwetse ya bolwetse ba sukiri le kgatelelo ya madi?

APPENDIX VIII: Semi-structured questionnaire used for face-to-face interviews in English

APPENDIX VIII: Semi-structured questionnaire used for the face-to-face interviews

Demographic data

1. Age by the end of the year (Full years): ……

2. Gender:

Male	
Female	

3. Marital Status:

Single	
Married	
Living with a partner	
Divorced	
Widow/Widower	

4. Ethnicity:

Zulu	
Tswana	
Others (Specify)	

5. Religious denomination:

Traditional	
Christian	
Islamic	
None	
Others (Specify	

6. Educational level:

Nil	
Primary	
High school	
Tertiary	
Others (Specify	

7. Kind of practice

Herbalist(inyanga)	
Divination (spiritual/sangoma)	
Both divination(sangoma) and herbalist(inyanga)	
Others (Specify)	

8. Place of practice:

Office/Shop	

Home	
Market	
Others (Specify)	

9. Do you work as a full time or part-time?

…….

10. If part-time, what else do you do for your living?

…….

11. Are you registered with South African Healers Traditional Council?

Yes	
No	

12. Are you registered with any Traditional Healers Association?

Yes	
No	

If yes, please name the association that you are part of……

13. How long have you been in this profession?

……

14. How many diseases other than diabetes or hypertension do you treat/heal? Please list them……

Questions for Objective 1

15. A. Where did you get knowledge and information about diabetes as a disease?

Trained by the family member	
Trained by other person	
A gift from my birth	
It is my calling	
I got a professional training	
Other (Specify)	

Please explain more on your answer above?

…….

15.B. Where did you get knowledge and information about hypertension as a disease?

Trained by the family member	
Trained by other person	
A gift from my birth	
It is my calling	
I got a professional training	
Other (Specify)	

Please explain more on your answer above?

…….

……
……..

Questions for Objective 2

16. A.What is diabetes in your culture? Please explain your answer……..
……
…….

16.B. What is hypertension in your culture? Please explain your answer……..
……
…….

Questions for Objective 3

17. A. Are you able to identify a person with diabetes in your profession?

Yes	
No	

Please explain your answer (signs and symptoms):
……
…

17B. Are you able to identify a person with hypertension?

Yes	
No	

Please explain your answers (signs and symptoms):
……
……

18A. Do you use modern instruments to test diabetes?

Yes	
No	

Please explain your answer:
…….

18B. Do you use modern instruments to test hypertension?

Yes	
No	

Please explain your answer:
……

19. A. Are there different types of diabetes?

Yes	
No	

Please explain your answer:

……..……..

19.B. Are there different types of hypertension?

Yes	
No	

Please explain your answer:

……..

20A. Does diabetes have any danger in your culture?

Yes	
No	

Please explain your answer:…….

20B. Does hypertension have any danger in your culture?

Yes	
No	

Please explain your answer:

……..

Questions for objective 4

21 A. What herbs/animals or minerals do you use to treat and combat diabetes? Please list

…….....

…….....

21 B. If you do not use herbs/animals or minerals please list what you use for diabetes

……..

21 C. What herbs/animals or minerals do you use to treat and combat hypertension? Please list

.....

21D. If you do not use herbs/animals or minerals please list what you use for hypertension……..

22 A. What types of medical preparations do you use for diabetes?

Concoctions	

Decoctions	
Other forms	

Please explain your
answer:…….

22 B. What types of medical preparations do you use for hypertension?

Concoctions	
Decoctions	
Other forms	

Please explain your
answer:……..

23 A. What is the dosage do you recommend to your patient/s with diabetes from medical preparations listed above?
.....
.....
……
……...
23 B. What is the dosage do you recommend to your patient/s with hypertension from medical preparations listed above?
……
……..
……
……..

24 A. For how long do you treat a patient suffering from diabetes?
……
……

24 B. For how long do you treat a patient suffering from hypertension?
……
…….

25. Does your prescribed medicines possess any side effects?

Yes	
No	

Please explain your answer.
……
……..
……
……..
……

26. Have you ever received a patient referred by biomedically trained
doctors?.....

27 A. Do you consider dietary regimen in the management of diabetes?

Yes	
No	

Please explain your answer……..

27 B. Do you consider dietary regimen in the management of hypertension?

Yes	
No	

Please explain your answer……..

28 A. Do you recommend any lifestyle changes to your diabetic patients?

Yes	
No	

Please explain your answer:
……

28B. Do you recommend any lifestyle changes to your hypertension patients?

Yes	
No	

Please explain your answer:
……

.....
.....

29. Do you allow your patients to use concurrently medicines prescribed by biomedically trained doctors with your traditional medical preparations?

Yes	
No	

Please explain your answer:
……..

30 A. What is the difference between the way biomedically trained doctors and traditional healers treat diabetes?
……
…….
……
….

30 B. What is the difference between the way the way biomedically trained doctors and traditional way treat hypertension?

……
…....
……
…....

31. What advice can you give to the person living with diabetes or/and hypertension?

……
……..

32 A. What do you think should be done to improve treatment and healing for diabetes by THPs?

……
…….
……
…….

32 B. What do you think should be done to improve treatment and healing for hypertension by THPs?

……
…….

APPENDIX VIV: Semi-structured questionnaire used for face-to-face interviews in isiZulu

Le mibuzo yenzelwe ukuthola indlela abalaphi bendabuko abanakekela ngayo isifo sikashukela nomfutho wegazi

Imininingwane yocwaningo.

1. Iminyaka egcwele: ……

2. Ubulili :

Owesilisa	
Owesifazane	

3. Isimo somshado:

Angishadanga	
Ngishadile	
Ngihlalisene	
Ngihlukanisile	
Umfelokazi/Umfelwa	

4. Ubuhlanga:

UmZulu	
UmTswana	
Obunye (Cacisa)	

5. Uhlobo lwenkolo:

Isintu/Usiko	
UmKhrestu	
UmMozilemu	
Ayikho	
Enye (Cacisa)	

6. Amazinga lwemfundo:

Awekho	
Amabanga aphansi	
Amabanga aphezulu	
Imfundo yaseNyuvesi	
Amanye (Cacisa)	

7. Uhlobo lokwelapha

Amakhambi	
Ngokomoya	
Ngokomoya namakhambi	
Okunye (Cacisa)	

8. Indawo yokwelaphela:

Ehhovisi/Esitolo	
Ekhaya	
Emakethe	
Enye (Cacisa)	

9. Usebenza usuku lonke noma ingxenye yosuku?

……
..

10. Uma usebenza ingxenye yosuku ikuphi okunye okwenzayo kokuziphilisa?

……
..

11. Ubhalisile kwinhlangano yabelaphi bendabuko baseMzansi Afrika?

Yebo	
Cha	

12. A. Ikhona yini enye inhlangano yabelaphi bendabuko obhalise kuyo?

Yebo	
Cha	

12. B. Uma ikhona kucelwa ukuba udalule igama layo leyo nkampani ……

……
….

13. Mingakhi iminyaka usebenza njengomelaphi wendabuko?

……..

14. A. Zikhona yini ezinye izifo ozelaphayo ngaphandle kwesifo sikashukela nomfutho wegazi? Kucelwa ukuba uzisho.

Imibuzo ngokwenhloso yoku- 1

15. A. Waluthola kuphi ulwazi ngesifo sikashukela?

Ngaqeqeshwa ilungu lomndeni	
Ngaqeqeshwa omunye umuntu	
Isipho engazalwa naso	
Ubizo	
Ngaqeqeshwa ngokusemthethweni	
Okunye (Cacisa)	

Kucelwa uchaze ngempendulo yakho.
……...

15. B. Waluthola kuphi ulwazi ngesifo somfutho wegazi?

Ngaqeqeshwa ilungu lomndeni	
Ngaqeqeshwa omunye umuntu	
Isipho engazalwa naso	

Ubizo	
Ngaqeqeshwa ngokusemthethweni	
Okunye (Cacisa)	

Kucelwa uchaze ngempendulo yakho.

……

……

……

Imibuzo ngokwenhloso yoku- 1

16. A. Siyini isifo sikashukela ngokwesiko lakho? Cela uchazisise.

……

……

……

16. B. Siyini isifo somfutho wegazi ngokwesiko yakho? Cela uchazisise.

…….....

.....

.....

Imibuzo ngenhloso yesi- 3

17. A. Uyakwazi ukubona umuntu onesifo sikashukela ngokomsebenzi owenzayo?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho?

……

……

……

17.B. Uyakwazi ukubona umuntu onesifo somfutho wegazi ngokomsebenzi owenzayo?

Yebo	
Cha	

Kucelwa ukuba uchaze impendulo yakho:

……...

……

……
…

18. A. Uyabusebenzisa yini ubuchwepheshe besimanje ukuhlola isifo sikashukela?

Yebo	
Cha	

Kucelwa ukuba uchaze impendulo yakho:

……
…

……
...

18. B. Uyabusebenzisa yini ubuchwepheshe besimanje ukuhlola isifo somfutho wegazi?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……
.

……...……
…

19. A. Kungabe zikhona izinhlobo zesifo sikashukela?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……..

……

……
…

19. B. Kungabe zikhona yini izinhlobo zesifo somfutho wegazi?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

…….……
….

……
..

20. A. Ngokwesiko lakho bukhona yini ubungozi besifo sikashukela?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho :
.....

……
……
……

20. B. Ngokwesiko lakho bukhona yini ubungozi besifo somfutho wegazi?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:
……..

……
…

Imibuzo ngenhloso yesi- 4

21. A. Yimaphi amakhambi noma izilwane ozisebenzisayo ukwelapha isifo sikashukela?

.....
..

21. B. Uma ungawasebezisi amakhambi noma izilwane ukwelapha lesifo usebenzisani?

.....
....

21. C. Yimaphi amakhambi noma izilwane ozisebenzisayo ukulapha umfutho wegazi?

……....
....

21. D. Uma ungawasebezisi amakhambi noma izilwane ukwelapha lesifo usebenzisani?

……
…

22. A. Yiluphi uhlobo lomuthi olisebenzisayo ukwelapha ushukela?

Ukuxuba izinhlobo zamakhambi/inyamazane	
Ukucaphuna amanzi omuthi/ amafutha esilwane	
Ezinye izindlela (Cacisa)	

Kucelwa uchaze impendulo yakho:
……

22. B. Yiluphi uhlobo lomuthi olisebenzisayo ukulapha umfutho wegazi?

Ukuxuba izinhlobo zamakhambi	
Ukucaphuna amakhambi	
Ezinye izindlela (Cacisa)	

23. A. Singakanani isikali osisebenzisayo ukwelapha isifo sikashukela?

……
…

23. B. Singakanani isikali osisebenzisayo ukwelapha umfutho wegazi?

……
…

……
…

24. A. Ngabe kuthatha isikhathi esingakanani ukwelapha umuntu enesifo sikashukela?

.....……
…….....

……
…

24. B. Ngabe kuthatha isikhathi esingakanani ukwelapha umuntu onesifo somfutho wegazi?

……..…….
…….

……
…

25. Bukhona yini ubungozi noma izinkinga ezibakhona uma umuntu esebenzisa amakhambi?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho

..... **.....**
.....……
……

……
.

……
.

26. Kuyenzeka udokotela udlulisele isiguli kuwe?

27. A. Ikhona yini indlela oyikhuthazangayo abantu abanesifo sikashukela ukuthi badle ukudla okunempilo?

Yebo	
Cha	

Kucelwa ukuba uchaze impendulo yakho.

.....

....

……

…

27. B. Ikhona yini indlela okhuthazangayo abantu abanesifo somfutho wegazi ukuthi badle ukudla okunempilo?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……

…

……

…

28. A. Uke uphakhamise umbono kuziguli zakho ezinesifo sikashukela ukthi zingaphila kanjani ngendlela enempilo?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……

…

……
…

28. B. Uke uphakhamise umbono kuziguli zakho ezinesifo somfutho wegazi ukthi zingaphila kanjani ngendlela enempilo?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……
…

……
…

29. Uyazivumela yini iziguli zakho ukuthi zisebenzise imithi yabelaphi bezizwe ngenkathi zisasebenzisa imithi yakho?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho

…….....
....

……
…

30. A. Ngabe ukhona yini umehluko phakathi kwabelaphi basemazweni (besilingu) nalabo abesintu ekwelapheni ushukela?

Yebo	
Cha	

Kucelwa uchaze impendulo yakho:

……
…

……
…

30. B. Kungabe ukhona yini umehluko phakathi kwabelaphi basemazweni nalabo abesintu ekwelapheni umfutho wegazi?

……
…

……
…

31. Yisiphi iseluleko ongasinika umuntu ophila nesifo sikashukela okanye umfutho wegazi?

……
…

……
…

32. A. Yikuphi okuphakamisayo ukuphucula ukwelapha isifo sikashukela eNingizimu Afrika ngokwesiko?

.....

……
.

32. B. Yikuphi okuphakamisayo ukuphucula ukwelapha isifo somfutho wegazi eNingizimu Afrika ngokwesiko?

…….....
....

.....
....

APPENDIX X: Semi-structured questionnaire used for face-to-face interviews in Tswana

Demographic data
Malotle a demokerafi

Please kindly provide answers to the questions below tick the most suitable options.
Tsweetswee araba dipotso tse di fa tlase, o tshwae dikarabo tse maleba go ya ka wena

1. Age by the end of the year (Full years):

Dingwaga tsa gago ka botlalo fa ngwaga ono o fela …….

2. Gender

Bong

Male *Motona/Rre*	
Female *Monamagadi/Mme*	

3. Marital Status:

Maemo a nyalo

Single *Moitshodi/Monosi*	
Married *Nyetse/Nyetswe*	
Living with a partner *Ke nna le molekane*	
Divorced *Tlhadilwe*	
Widow/Widower *Motlholagadi/Moswagadi*	

4. Ethnicity

Lotso:

Zulu	

Mozulu	
Tswana *Motswana*	
Others (Specify) *Tse dingwe (di bolele)*	

5. Religious denomination:

Bodumedi

Traditional *Jwa setso*	
Christian *Mokeresete*	
Islamic *Mo-Islamo*	
None *Ga ke gope*	
Others (Specify) *Tse dingwe (di bolele)*	

6. Educational level:

Thutego

Nil *Ga bo yo*	
Primary *Poraemari*	
High school Sekolo-segoloe	
Tertiary *Go feta Materiki/Yunivesithi*	
Others (Specify) *Tse dingwe (di bolele)*	

7. Kind of practice

Mofuta wa bongaka

Herbal *Ngaka ya mesunkwane*	
Divination (spiritual) *Ngaka ya ditaola/badimo*	
Both divination and herbal *Ngaka ya mesunkwane le ditaola*	
Others (Specify) *E mengwe (e bolele)*	

8. Place of practice:

Lefelo la tirelo

Office/Shop *Ofisi/Kantoro/Lebenkele*	
Home *Legae*	
Market *Mmaraka*	
Others (Specify) *Gongwe gosele (Go bolele)*	

9. Do you work as a full time or part-time

A o bereka ka Motlha-otlhe kgotsa ka Motlha-orileng?

……..

10. If part-time, what else do you do for your living?

Fa o bereka motlha-orileng fela, ke tiro efe e nngwe e o itshidisang ka yona?.....

11. Are you registered with South African Healers Traditional Council?

A o ikwadisitse le Lekgotla la Dingaka tsa Setso la Afrika Borwa?

Yes *Ee*	
No *Nnyaa*	

12. Are you registered with any Traditional Healers Association?

A o ikwadisitse le Lekgotla lengwe fela la Dingaka tsa Setso?

Yes *Ee*	
No *Nnyaa*	

If yes, please name the association that you are part of……

Fa karabo e le "Ee" bolela lekgotla le o le ikwadiseditseng……

13. How long have you been in this profession?

Ke dingwaga di le kae o ntse o le mo profešeneng eno ya bongaka?……..

14. How many diseases other than diabetes or hypertension do you treat/heal? Please list them……

Ke malwetse a makae a o kgonang go a alafa ntle le bolwetse ba sukiri le ba kgatelelo ya madi?.....

Questions for objective 1

Kaedi ya potso-therisano ya Morerwana 2

15. A. Where did you get knowledge and information about diabetes as a disease?

O bone jang kitso le tshedimosetso ka bolwetse ba sukiri?

Trained by the family member *Ka katisitswe ke o mongwe wa balelapa*	
Trained by other person/ *Ke katisitswe ke mongwe fela*	
A gift from my birth/ *Ke neo ya tsalo*	
It is my calling*/ Ke pitso ya me*	
I got a professional training/ *Ke neilwe katiso ya profeshene*	
Other (Specify) / *Go gongwe (tlhalosa*)	

Please explain more on your answer above? *Ka kopo tlhalosa go le gontsi mabapi le karabo ya gago e e fa godimo*…….

15.B. Where did you get knowledge and information about hypertension as a disease? *O bone jang kitso le tshedimosetso ka bolwetse ba kgatelelo ya madi?*

Trained by the family member *Ka katisitswe ke o mongwe wa balelapa*	
Trained by other person/ *Ke katisitswe ke mongwe fela*	
A gift from my birth/ *Ke neo ya tsalo*	
It is my calling*/ Ke pitso ya me*	
I got a professional training/ *Ke neilwe katiso ya profeshene*	
Other (Specify) / *Go gongwe (tlhalosa*)	

Please explain more on your answer above? ? *Ka kopo tlhalosa go le gontsi mabapi le karabo ya gago e e fa godimo* …….

……
…

Questions for objective 2

Kaedi ya potso-therisano ya Morerwana 1

16. A.What is diabetes in your culture? Please explain your answer?

Bolwetse ba sukiri ke eng/bo bidiea eng go ya ka setso sa gago? Ka kopo tlhalosa karaba ya gago……..

……

16.B. What is hypertension in your culture? Please explain your answer

Bolwetse ba kgatelelo ya madi ke eng/bo bidiwa eng ka setso sa gago? Ka kopo tlhalosa karabo ya gago?……..

……
…

Questions for objective 3

Kaedi ya potso-therisano ya Morerwana

17. A. Are you able to identify a person with diabetes in your profession? *A o kgona go supa motho yo o tshwerweng ke bolwetse ba sukiri mo profesheneng ya lona?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer (signs and symptoms): *Ka kopa tlhalosa karabo ya gago (matshwao le ditshupo)*

……?

……

17B. Are you able to identify a person with hypertension? *A o kgona go supa motho yo o tshwerweng ke bolwetse ba kgatelelo ya madi mo profesheneng ya lona?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answers (signs and symptoms): *Ka kopa tlhalosa karabo ya gago (matshwao le ditshupo)*

……
……

18. A. Do you use modern instruments to test diabetes? *A le dirisa didiriswa tsa sesheng go tlhatlhoba bolwetse ba sukiri?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Ka kopo tlhalosa karabo ya gago* …….

18.B. Do you use modern instruments to test hypertension? *A le dirisa didiriswa tsa sesheng go tlhatlhoba bolwetse ba kgatelelo ya madi?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Ka kopo tlhalosa karabo ya gago* ……

19. A. Are there different types of diabetes? *A gona le mefuta e e farologaneng ya bolwetse ba sukiri?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago*……..……..

19.B. Are there different types of hypertension? *A gona le mefuta e e farologaneng ya bolwetse ba kgatelelo ya madi?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhaloda karabo ya gago*……..

20.A. Does diabetes have any danger in your culture? *A bolwetse ba sukiri bo kotsi go ya ka setso?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

…….

20. B. Does hypertension have any danger in your culture? ? *A bolwetse ba kgatelelo ya madi bo kotsi go ya ka setso?*

……

Please explain your answer: *Tlhalosa karabo ya gago*

Questions for objective 4

Kaedi ya potso-therisano ya Morerwana 4

21. A. What herbs/animals or minerals do you use to treat and combat diabetes? Please list *O dirisa mere/diphologolo kgotsa diminerale di feng go alafa bolwetse ba sukiri? De neele ka kopo*

…….....
....

……
…

21. B. If you do not use herbs/animals or minerals please list what you use for diabetes

Ga o sa dirise mere/diphologolo kgotsa diminerale, neela se o se dirisang go alafa bolwetse ba sukiri

……

21. C. What herbs/animals or minerals do you use to treat and combat hypertension? Please list

O dirisa mere/diphologolo kgotsa diminerale di feng go alafa bolwetse ba ba kgatelelo ya madi? De neele ka kopo

.....

21.D. If you do not use herbs/animals or minerals please list what you use for hypertension

Ga o sa dirise mere/diphologolo kgotsa diminerale, neela se o se dirisang go alafa bolwetse ba kgatelelo ya madi

……..

22. A. What types of medical preparations do you use for diabetes?

O dirisa metswako e feng ya kalafi ya bolowetse ba sukiri?

Concoctions	*Motswako ya mere e e farologaneng*
Decoctions	*Dipitsana*
Other forms	*Mekgwa e mengwe*

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

…….

22.B. What types of medical preparations do you use for hypertension?

O dirisa metswako e feng ya kalafi ya bolowetse ba kgatelelo ya madi?

Concoctions	*Motswako ya mere e e farologaneng*
Decoctions	*Dipitsana*

Other forms	*Mekgwa e mengwe*

Please explain your answer *Tlhalosa karabo ya gago ka kopo*

……

23. A.What is the dosage do you recommend to your patient/s with diabetes from medical preparations listed above?

Ke seelo se se kae sa motswako wa kalafi se o laelang balwetse ba gago ba sukiri go se tsaya?

.....
....

23.B. What is the dosage do you recommend to your patient/s with hypertension from medical preparations listed above?

Ke seelo se se kae sa motswako wa kalafi se o laelang balwetse ba gago ba kgatelelo ya madi go se tsaya?

……..

24. A. For how long do you treat a patient suffering from diabetes?

Balwetse ba sukiri ba tsaya kalafi ya bona sebaka se se kana kang??

……

24.B. For how long do you treat a patient suffering from hypertension?

Balwetse ba kgatelelo ya madi bona ba tsaya kalafi ya bona sebaka se se kana kang?

……
…25. Does your prescribed medicines possess any side effects?

A kalafi ya lona e na le go ka bakela molwetse makoa a mangwe a a riling/ side effects?

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer. *Tlhalosa karabo ya gago ka kopo*

……
…

26. Have you ever received a patient referred by biomedically trained doctors?.....

A o kile wa nna le molwetse o a rometsweng ke ngaka ya sekgoa ko go wena?.....

27. A. Do you consider dietary regimen in the management of diabetes?

A o akaretsa le mefuta/mekgwa e e rileng ya go ja mo tlhokomelong ya bolwetse ba sukiri?

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

……
..

27. B. Do you consider dietary regimen in the management of hypertension? *A o tsaya tsiya mekgwa ya dijo tse di rileng mo tlhokomelong ya bolwetse ba kgatelelo ya madi?*

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

……..

28. A. Do you recommend any lifestyle changes to your diabetic patients?

A o tshitsinyetsa balwetse ba gago ba sukiri go latela mekgwa e e rileng ya maitsholo?

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

……

28.B. Do you recommend any lifestyle changes to your hypertension patients?

A o tshitsinyetsa balwetse ba gago ba kgatelelo ya madi go latela mekgwa e e rileng ya maitsholo?

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

……
..

29. Do you allow your patients to use concurrently medicines prescribed by biomedically trained doctors with your traditional medical preparations?

A o letlelela balwetse ba gago go tsaya kalafi ya setso le ya sekgoa ka nako e le nngwe?

Yes/ *Ee*	
No/ *Nyaa*	

Please explain your answer: *Tlhalosa karabo ya gago ka kopo*

……
…

30. A. What is the difference between the way biomedically trained doctors and traditional healers treat diabetes?

Mokgwa wa dingaka tsa setso wa go alafa bolwetse ba sukiri o farologana jang le wa dingaka tsa sekgoa?

……

……
….

30. B. What is the difference between the way the way biomedically trained doctors and traditional way treat hypertension?

Mokgwa wa dingaka tsa setso wa go alafa bolwetse ba kgatelelo ya madi o farologana jang le wa dingaka tsa sekgoa?

……
….

……
…

31. What advice can you give to the person living with diabetes or/and hypertension?

Ke kgakololo e feng e o ka e neelang motho yo o nang le bolwetse ba sukiri kgotsa/le jwa kgatelelo ya madi?

……

32. A.What do you think should be done to improve treatment and healing for diabetes by THPs?

O akanya gore go ka dirwa eng go tokafatsa kalafi le phodiso ya bolwetse ba sukiri ke THPs?

……

32. B. What do you think should be done to improve treatment and healing for hypertension by THPs?

O akanya gore go ka dirwa eng go tokafatsa kalafi le phodiso ya bolwetse ba kgatelelo ya madi ke THPs?

……
…

APPENDIX XI: Information letter in English

Traditional Healers Association

Province…….

Date……..

Dear Sir/Madam,

REQUEST FOR RESEARCH PARTICIPATION

My name is Frimpong Ebenezer Kwabena from UKZN, School of Health Sciences, and Discipline of Pharmaceutical Sciences with student ID number 215068623. Contacts: pharmeben@gmail.com (0630439675);nlooto@ukzn.ac.za (031 2607030. Please members of your organization are humbly being invited to consider participating in a study that involves research about development of a framework for the standardization of treatment management of diabetes and hypertension amongst traditional healers in both KwaZulu-Natal and North West provinces.

The study is expected to enroll 1,116 participants; 558 THPs each in both KwaZulu-Natal and North West provinces. It will involve the following procedures: Focus Group Discussions (FGDs) among traditional healers in both KwaZulu-Natal and North West provinces in phase 1. A researcher administered Face-to-Face interviews with traditional healers in both KwaZulu-Natal and North West provinces will be carried out in phase 2. Data will be collected six days a week. The duration of your participation if you choose to enrol and remain in the study will be an hour. The study is funded by the College of Health Sciences (CHS) scholarship.

The study may not involve risks or uneasiness; it will be of great benefit to traditional healers about the management of diabetes and hypertension diseases. No name, no ID of participants will be disclosed to third party or displayed on questionnaires and data collection forms.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number_____).

In the event of any problems or concerns/questions you may contact the researcher at pharmeben@gmail.com (0630439675) or the UKZN Biomedical Research Ethics Committee, contact details as follows:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: BREC@ukzn.ac.za

Phindile Nene, Postgraduate Officer, School of Health Sciences, Westville Campus

031 2608280, Nenep1@ukzn.ac.za

Supervisor: Dr. Manimbulu Nlooto at nlooto@ukzn.ac.za, contact number 031 2607030

I hope that permission will be granted in good faith.

Yours Sincerely,

Ebenezer Frimpong

APPENDIX XII: Consent to participate in English

I (……..) have been informed about the study entitled "Development of a framework for the standardization of management of diabetes and hypertension: The case of Tswanas and Zulus of South Africa by (provide name of researcher/fieldworker).

I understand the purpose and procedures of the study (add these again if appropriate).

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at (provide details).

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609

APPENDIX XIII: Information letter in isiZulu

Traditional Healers Association

Province…….

Date……..

Ngiyabingelela

Isicelo sokuba nibe inxenye yocwaningo

Igama lami ngingu Frimpong Ebenezer Kwabena ngiqhamuka esikhungweni semfundo ephakeme yaKwaZulu Natal, enxenyeni yezempilo egxile kakhulu ezifundweni kwezemithi okubalwa ukwakhiwa kwayo nokusetshenziswa kwayo, inombolo yami yasesikoleni ithi 215068623. Ngiyatholakala kule imeyili adilesi pharmben@gmail.com nakulenombolo ethi 063 043 9675, enye ithi 031 260 7030 ne imayili yakhona ethi nlooto@ukzn.ac.za

Amalunga enhlangano ayacelwa ngenkulu intobeko ukuba abambe iqhaza ocwaningweni lokuthuthukiswa kwenzela okwelashwangayo isifo sikashukela ne BP phakathi kwabelaphi bendabuko ezifundazweni ezimbili okungesa-kwaZulu Natal nesase nyakatho nentshonalanga yezwe iNorth West.

Kulindeleke ukuba abaholi bendabuko ababalelwa enkulungwaneni, nekhekhulu neshumi nesithupha (1116) okusho ukuthi inxenye engangesigamu sabo bazophuma KwaZulu Natal enye inxenye ibuye eNyakatho nentshonalanga. Esigabeni sokuqala salolucwaningo luzo hlanganisa abelaphi bendabuko ngokwehlukana kwabo bexoxe ngezindlela zokwelapha esigabeni sokuqala. Esigabeni sesibili bese kuba inkulumo esanhlolo khono ezophathwa umholi wocwaningo phakathi kwakhe nabelaphi abasuka ezifundazweni zombili lolucwaningo luzothatha izinsuku eziyisithupha kodwa umelaphi ngamunye limuthathe isikhathi esingangehora.

Izindleko zocwaningo zixhaswe umfundaze ophuma ekolishi lezempilo. Lolucwaningo alunabungozi, kodwa futhi sinethemba ukuthi luzoba inzuzo enkulu kubelaphi bendabuko ekukwazini ukwelapha isifo sikashukela ne BP.

Amagama abantu abazoba inxenye azogcinwa eyimfihlo, akuzukufuneka ngisho umazisi. Ucwaningo lubhekisiswe nayisikhungo semfundo ephakeme yaKwaZulu Natali ukuthi lungahlukumezi amalungelo abantu.

Uma kukhona imibuzo ekhona ungaxhumana nomphathi wocwaningo kule imayili ethi pharmben@gmail.com noma kwinombolo yocingo ethi 063 043 9675.

APPENDIX XIV: Consent to participate in isiZulu

ISIVUMELWANO (Hlela njengoba kudingeka)

Mina (.....) ngazisiwe ngocwaningo olunesihloko esithi "Ukuthuthukiswa kohlaka lokumiswa kokujwayelekile kwesifo sikashukela kanye nomfutho wegazi ophakeme":

Odabeni lama Tswana nabe Zulu ase Ningizimu Africa ngo (Faka igama lomcwaningi)

Ngiyayiqonda inhloso nezinqubo zocwaningo (engeza futhi lokhu uma kufanele)

Nginikezwe ithuba lokuphendula imibuzo mayelana nalolu cwaningo futhi ngithole izimpendulo ngokweneliseka kwami

Ngiyavuma ukuthi ukubamba iqhaza kwami kulolu cwaningo kungokuzithandela ngokuphelele futhi ngingahoxisa nganoma yisiphi isikhathi ngaphandle kokuthinta noma yikuphi ukwelashwa noma ukunakekelwa engivame ukukuthola

Ngatshelwa nganoma yisiphi isinxephezelo noma ukwelashwa okutholakalayo uma kwenzeka ngilimala ngenxa yezinqubo ezihlobene nokufunda

Uma ngineminye imibuzo / ukukhathazeka ephathelene nocwaningo ngiyaqonda ukuthi ngingaxhumana nomcwaningi ku- (hlinzeka imininingwane)

Uma nginemibuzo noma ukukhathazeka ngamalungelo ami njengomhlanganyeli ocwaningweni, noma uma ngithinta isici socwaningo noma abacwaningi ngingaxhumana ne:

Biomedical Research Ethics Administration

Research Office, Westville Campus

Govern Mbeki Building

Private Bag X
54001
Durb
an
40
00
KwaZulu-Natal, SOUTH
AFRICA
Tel :27 31 2604769 – Fax: 27 31 2604609

APPENDIX XV: Information letter in Tswana

Karolo X: Leqephe la tlhaiso-leseling

Mokhatlo oa Boholo ba Baetlohi

Porofense …….

Letsatsi……..

Mohlomphehi,

KOPO EA HO NKA KAROLO HO DIPATLISISONG

Lebitso laka ke Frimpong Ebenezer Kwabena ketswa UKZN, Sekolo sa Mahlale a Bophelo, le Karolo ea Saense ea Bongaka with nomoro boitsebahatso ea moithuti 215068623. Boikopanyo: pharmeben@gmail.com (0630439675);nlooto@ukzn.ac.za (031 2607030. Ke kopa litho tsa mokhatlo oa hau li memeloe ka boikokobetso hore li nahane ka ho nka karolo lipatlisisong tse kenyelletsang lipatlisiso mabapi le nts'etsopele ea moralo oa taolo ea kalafo ea lefu la tsoekere le khatello ea mali har'a lingaka tsa setso liprofinseng tsa KwaZulu-Natal le North West.

Phuputso e lebelletsoe ho ngolisa barupeluoa ba 1,116; Li-558 THPs ka bomong liprofinseng tsa KwaZulu-Natal le North West. E tla kenyelletsa lits'ebetso tse latelang: Lipuisano tsa Sehlopha sa Bareki (FGDs) har'a lingaka tsa setso liprofinseng tsa KwaZulu-Natal le North West mohatong oa 1. Mofuputsi ea tsamaisanang le lipotso tsa bongaka ba sefahleho le ba bongaka ba liprofinse tsa KwaZulu-Natal le North West o tla etsoa mohato oa 2.

Lintlha li tla bokelloa ka matsatsi a tšeletseng ka beke. Nako ea ho nka karolo ha u khetha ho ingolisa le ho lula thutong e tla ba hora. Boithuto bona bo tšehelitsoe ke borutehi ba College of Health Science (CHS).

Lithuto li kanna tsa se kenye likotsi kapa ho hloka botsitso; e tla ba molemo haholo ho lingaka tsa setso mabapi le taolo ea mafu a lefu la tsoekere le khatello ea mali. Ha ho lebitso, ha ho na boitsebahatso ea barupeluoa e tla hlahisoa ho motho oa boraro kapa ho bonts'oa liphatlalatsong tsa lipotso le liforomo tsa pokello ea tsebo.

Boithuto bona bo lekotsoe ka litekanyetso tsa boitšoaro bo bile bo amohetsoe ke Komiti ea Litekanyetso tsa Boithuto tsa Bongaka ea UKZN (nomoro ea tumello_____).

Ketsahalong ea mathata kapa ho tšoenyeha / lipotso tseo u ka ikopanye le mofuputsi ho tsona

pharmeben@gmail.com (0630439675) kapa Komiti ea Litekanyetso tsa Boithuto tsa Bongaka ea UKZN, lintlha tsa puisano ka tsela e latelang:

TSAMAISO EA DIPATLISISO TSA BONGAKA

Ofisi ya Diplatlisiso, Khamphase ya Westville
Moaho wa Govan Mbeki
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA

Mohala: 27 31 2604769 - Fekse: 27 31 2604609

Lengolo-tsoibila: BREC@ukzn.ac.za

Phindile Nene, Mohlanka wa baithuti, Sekolo sa Mahlale a Bophelo, Khamphase ya Westville

031 2608280, Nenep1@ukzn.ac.za

Mohlokomeli: Dr. Manimbulu Nlooto at nlooto@ukzn.ac.za, Mohala 031 2607030

Ke ts'epa hore tumello e tla fanoa ka tumelo e ntle.

Oa hau ka hlompho,

Ebenezer Frimpong

APPENDIX XVI: Consent to participate in Tswana

SEBOPEHO (Fetola joalo ka ha ho hlokahala)

Nna (……..) ba tsebisitsoe ka phuputso e bitsoang "Ntlafatso ea moralo oa maemo a taolo ea lefu la tsoekere le khatello ea mali: Nyeoe ea Tswanas le Zulus ea Afrika Boroa ka (fana ka lebitso la mofuputsi / mosebetsi oa masimong).

Ke utloisisa sepheo le lits'ebetso tsa boithuto (eketsa tsena hape haeba ho loketse)

Ke filoe monyetla oa ho araba lipotso ka thuto mme ke bile le likarabo tsa khotsofalo ea ka.

Ke phatlalatsa hore ho nka karolo ho ithuteng hona ho ithaopa ka boithatelo le hore nka tsoa ka nako efe kapa efe ntle le ho ama kalafo kapa tlhokomelo eo ke neng ke tla ba le tokelo ea ho e fumana.

Ke tsebisitsoe ka puseletso leha e le efe e fumanehang kapa kalafo ea bongaka haeba ke lemetse ka lebaka la lits'ebetso tse amanang le thuto

Haeba ke na le lipotso kapa ho tšoenyeha kapa lipotso tse amanang le thuto ke utloisisa hore nka ikopanya le mofuputsi ho (fana ka lintlha).

Haeba ke na le lipotso kapa ho tšoenyeha ka litokelo tsa ka ke le karolo ea thuto, kapa haeba ke amehile ka karolo e 'ngoe ea thuto kapa bafuputsi, nka ikopanya le:

TSAMAISO YA MOTSE EA DIPATLISISO TSA BONGAKA
Ofisi ya Diplatlisiso, Khamphase ya Westville
Govan Mbeki Building
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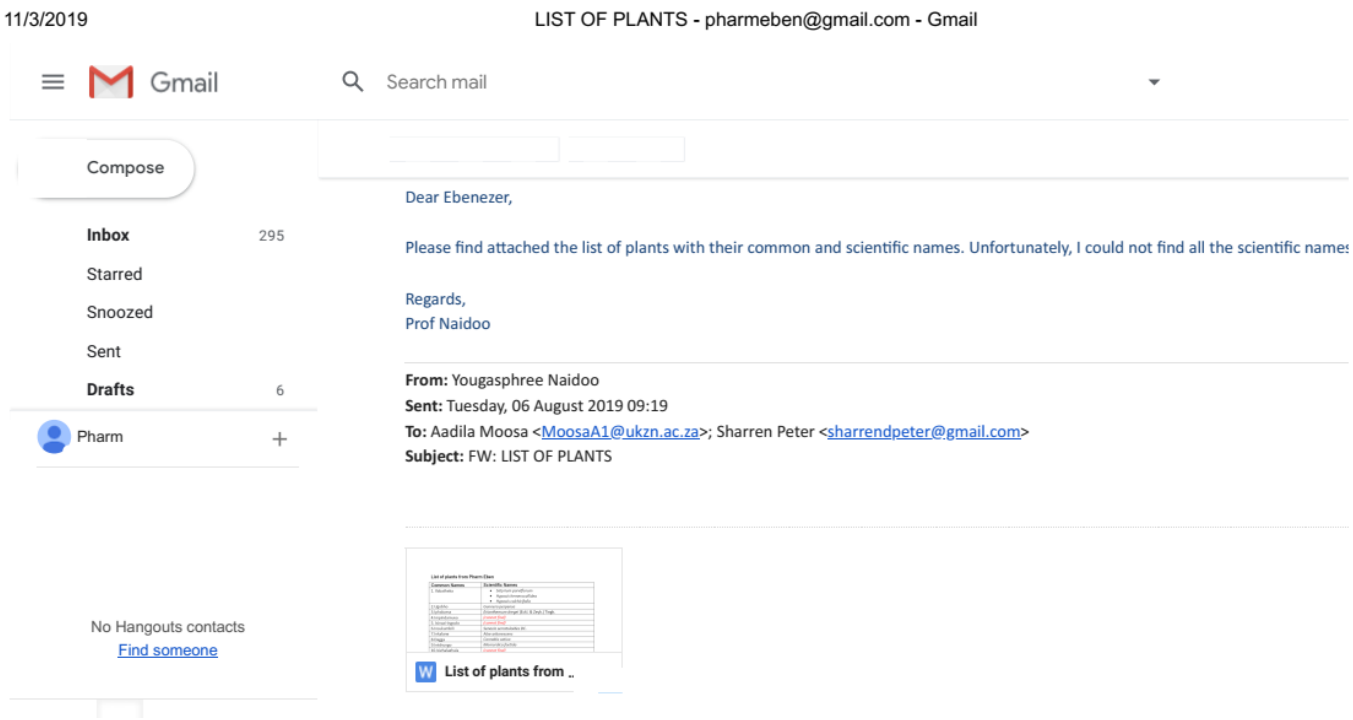
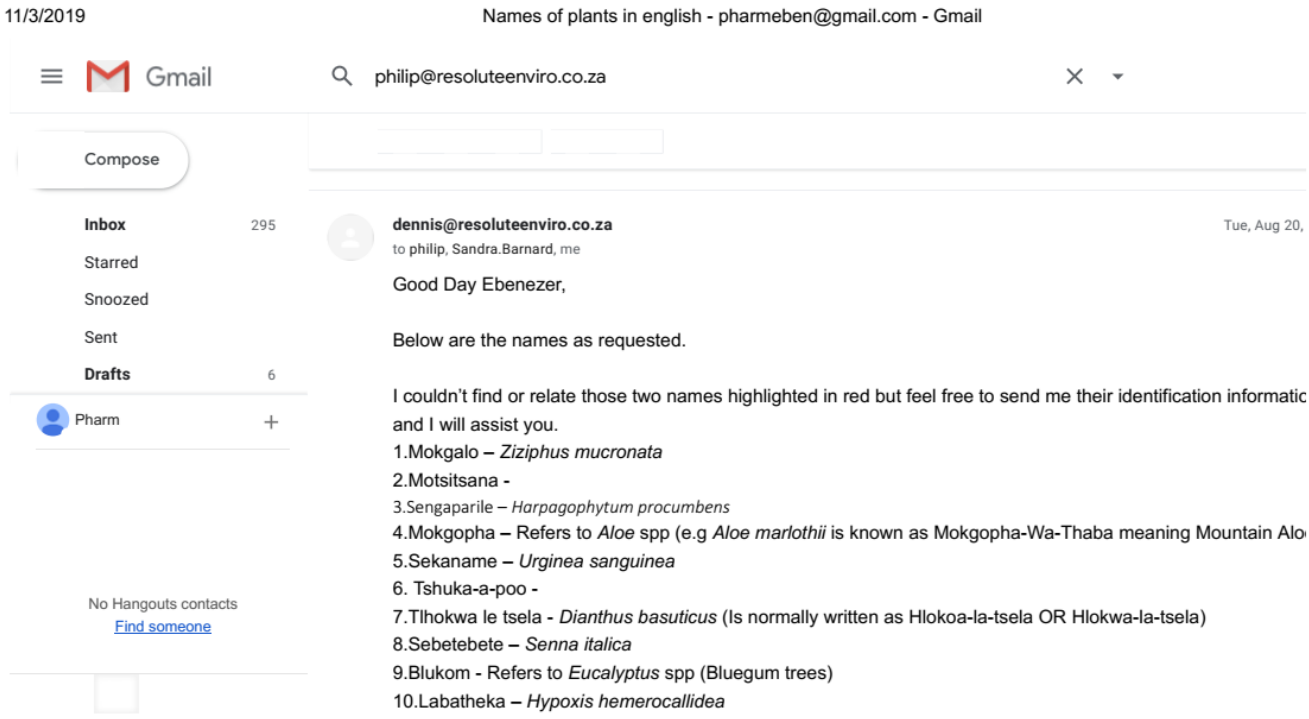
4000
KwaZulu-Natal, AFRIKA BOROA
Mohala: 27 31 2604769 - Fekse: 27 31 2604609

APPENDIX XVII: Email from plant scientist in KZN province



APPENDIX XVIII: Email from plant scientist in North West province



APPENDIX XIX: Ayurveda treatment guidelines for the management of diabetes

Guidelines for prevention and management of Diabetes

Central Council For research in Ayurvedic Sciences

MINISTRY OF AYUSH, GOVRNMENT OF INDIA

NO. 61-65, institute Area, Opp. D-Block Janakpuri, New Delhi 110058

General Guidelines for the users

- The prescriptions in this document should be judiciously used after proper consultation with Ayurvedic Physicians for diagnosis of the condition and understanding of the treatment.
- This document provides a selective list of medicines which are developed by research.

  However, the physician may use the medicines which are easily available or well-known even though not mentioned in this book.

- The prescriptions are provided for the specific type/phase/symptoms of a particular disease in this document on the basis of classical reference, research outcome or the ingredients of the formulation. It is advised that the physician may choose single or combination of formulations or procedures as per the need.

- Dose and duration of the treatment though specified in the document, should be decided by the physician based on the clinical findings, tolerance and individual condition of the patient.

- The diet and lifestyle may be advised to the patients as per the need.
- The references of the publication are given for each prescription and anybody interested in detail results of the clinical trials may log on to http://ayushportal.ap.nic.in or refer to the respective journals.

- In general, too spicy, salty, chilly, sour, preserved items, fried food, heavy, indigestible, too cold & hot, stale food and the food that do not suit the individual should be avoided.

- Too much tea, coffee, etc. should be avoided. Tobacco, alcohol and drugs should not be taken.

- Mental stress should be tackled by recreation such as medication, prayer, sports, exercises, yoga & other activities of individual's choice.

Background

The history of diabetes (madhumeha) can be traced back in 1000 BC (Caraka Samhita). Descriptions concerning the disease and its management are available in Ayurvedic literature. Caraka Samhita (1000 BC) and Susruta Samhita (1000-600 BC) defined madhumeha as the disease in which the patient passes frequent urine characterized as astringent and sweet The high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). The word diabetes comes from Latin “diabetes”, which in turn comes from Ancient Greek word which literally means “a passer through” and the word mellitus comes from the classical Latin word mellitus, meaning "mellite" (i.e. sweetened with honey; honey-sweet). Indian physicians identified the disease and classified it as madhumeha or "honey urine".

Ayurveda attributes multi-factorial etiology to the causation of diabetes. It has been described as one among the eight major diseases (asthamahagada) in Ayurveda, which are difficult to cure and refractory in nature.

Diabetes mellitus (madhumeha) is a group of metabolic diseases marked by high level of blood glucose resulting from defects in insulin production, insulin action or both. Diabetes may lead to serious complications in multiple organ systems. Diabetes is of two types- type I or Insulin Dependent Diabetes Mellitus (IDDM) & type II or Non Insulin Dependent Diabetes Mellitus (NIDDM). Complete or near total insulin deficiency is found in type I while type II diabetes mellitus is characterized by variable degree of insulin resistance, impaired insulin secretion and increased glucose production. Types II diabetes mellitus is increasing more rapidly due to obesity caused by sedentary life habits and changed life style. Insulin is the only treatment for type I diabetes and conventional modern medicine provides a number of drugs for controlling the blood sugar level in the patients of diabetes mellitus type II. However, with the prolonged treatment doses of the drugs often needs to be increased to control the blood sugar level and a time comes when patient has to be switched over to insulin. Such patients become cases of insulin dependent diabetes mellitus. To handle such a situation time tested treatment available in ayurveda may be adopted

Prevalence

Diabetes is undoubtedly one of the most challenging health problems in the 21st century .It is increasing globally with a rise from about 30 million cases in 1985 to 177 million cases in

2000 and worldwide estimates project that more than 360 million individuals will have diabetes by the year 2030 (Harrison's principle of Internal medicine, 2002). The prevalence of the disease increases with the age.

Introduction

Diabetes mellitus (DM) is one of the most common non-communicable diseases (NCDs) globally. It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many economically developing and newly industrialized countries.

It has been narrated in ayurveda that, the long periods of physical inactivity, laziness, sleeping for long hours, excess use of food which is heavy to digest like dairy products, aquatic and marshy animals, sugar/jaggery preparations, fresh grains etc. and similar foods that increase kapha are generalized causes of prameha.

Clinical Features

Common symptoms of diabetes include:

- Polyuria - increased urination
- Polyphagia - excessive appetite
- Polydyspia - excessive thirst
- Unusual weight loss or weight gain
- Fatigue
- Nausea, perhaps vomiting
- Blurred vision
- In women, frequent vaginal infections
- In men and women, yeast infections
- Dry mouth
- Slow-healing of sores or cuts in the skin / mucosa

- Itching of the skin, especially in the region of groin or genitals

Complications

Complication occurring due to diabetes may be broadly categorized as:

A. Acute complications

- Diabetic ketoacidosis (DKA)
- Hyperglycemia hyperosmolar state
- Hypoglycemia
- Diabetic coma
- Respiratory infections

B. Periodontal disease **Chronic complications**

- Physical disabilities
- Cognitive decline
- Retinopathy

Macroangiopathy

- Neuropathy
- Nephropathy

Laboratory Investigations

- Measurements of the plasma glucose
  - Fasting blood sugar (FBS)
  - Post prandial blood sugar (PPBS)
  - Random blood sugar (RBS)
- Oral glucose tolerance test (OGTT)
- Glycosylated haemoglobin (HbA1c)

- Urine test - Urine glucose, albumin, ketones etc.
- C-Peptide – c-peptide is a simple, cost-effective and non-invasive method in the assessment of beta-cell capacity
- Insulin test
- Blood Urea
- E.C.G.
- Lipid profile
- Serum electrolytes etc.

Diagnosis

As defined by WHO (recommendations 2006):

1. Fasting plasma glucose ≥ 7.0mmol/l (126mg/dl).or >=110mg/dl blood glucose (Ref: Diabestes India.com)
2. 2–h plasma glucose ≥ 11.1mmol/l (200mg/dl).or >180mg/dl(Ref: Diabestes India.com)

Premonitory signs and symptoms

- Sweet taste in the mouth
- whitish urine with sweetish odor
- Attraction of insects and ants to the urine / person
- Dryness in mouth, palate and throat
- Thirst/drowsiness
- Excessive sweating and foul smelling of the body
- Lethargy
- Unhygeinic body
- Excessive deposition of waste products in palate, tongue and teeth etc.
- Matting of the hair
- Abnormal appearance of the urine
- Numbness and burning sensation in hands and feet etc

Treatment Modalities

Management Approaches

Prevention

Ayurveda emphasized that the first and foremost principle of prevention as well as the treatment of any disease is avoidance of causative factors. This is called the principle of nidana Parivarjanam in Ayurveda.

- Restrict the excessive use of curds, flesh of domestic / aquatic animals and of marshy places, use of milk and milk preparations, water of rivers and tanks during rains and floods, new grains, puddings made of jaggery /sugar and consumption of kapha Dosha exaggerating factors.
- Restrict heavy diets, fatty foods which increase body weight and lipids / cholesterol.
- Avoid sleep during daytime and laziness.
- Various preparations of rice which crops within 60 days yava (barley), Godhuma (wheat), *Kodrava* (grain variety –*Paspolum scrobiculatum*) Adhaki (red gram-*Cajamus cajan*), Kulattha *(*horse gram-*Dolichos biflorus*) and Mudga (green gram) with bitter and astringent leafy vegetables should be taken.
- Use the oils of Nikumba (Danti-*Baliospernum montanum*), Ingudi (*Balanitis egyptica),* Atasi (*Linum usitatisimum*), Sarsapa *(Mustard-Brassica campesteris)* is useful.
- *Use the* meats of animals, which are having anti diuretic properties (badha mutrat¡), forest animals, forest birds are recommended.
- Navapatala (*Tricosanthus dioica*), raw banana, Tanduleyaka (*Amaranthus spinosus*), Vastukam (Bathuva-*Chenopodium album*), Matsyakshi *(Alternanthera sessilis*), bitter vegetables like Methika (*Trigonella foenum-graecum*), Karavellaka (*Momordica charantia*); Bimbi (*Coccinia Indica*), Marica (*Piper nigrum*), Saindava lavana (rock salt) should be used.
- Practice regular exercise/yoga, increase calorie consuming activities (brisk walking, swimming, cycling, etc.)
- Avoid fruits with high simple sugars like banana, cheeku *(*sapodilla*),* grapes, and mango etc.
- Use fruits like orange, watermelon, apple, guava, Jambu (*Syzigium cumini*), Kapitha (*Feronia limonia*), Amlaki (*Phyllanthus emblica*) etc.

Line of Treatment

- **Nidan parivarjana (avoidance of etiological factors)**

- Sodhana cikitsa **(bio-cleansing therapies)**

  Cleansing of the body by using bio-purification measures is advocated in case of obese diabetics. The selection of the bio-cleansing strategy / measure depends upon doshapredominance (kapha predominant patients are advised emesis, whereas Pitta predominant patients are advised purgation).

- **Palliative therapy**

  The following drugs /formulations have been found to be useful in type II diabetes mellitus. It is hypothesized that most of these drugs work by improving the insulin production and / or increasing the insulin sensitivity. These drugs may be used as an adjuvant to conventional insulin therapy in case of type-I diabetics also with an objective to improve the glycemic control and overall quality of life and to prevent long term complications.

Diet recommended in diabetes

Type of Diet	Name
Cereals	Purana shali (old rice), Shastic Shali (rice which crops within 60 days), *Yava* (Barley) (Hordeum vulgare), Godhum (wheat), Kodrava (grain variety – Paspolum scrobiculatum)
Pulses	Adhaki (red gram-*Cajamus cajan*), Kulattha (horse gram) and Mudga (green gram) should be taken with bitter and astringent leafy vegetables.
Vegetables	Navapatola (young Tricosanthus dioica), young vegetables variety of banana, Tanduleyaka (*Amaranthus spinosus*), Vastukam (Bathuva), Matsyakhshi (*Alternanthera sessilis*) all bitter vegetables (tiktasakam) like Methica (Fenugreek leaves), Karavellaka (Bitter gourd)
Fruits	Orange, watermelon, apple and guava, Jamb£ (*Syzigium cumini*) Kapitha (*Feronia limonia*), Amalki (*Phyllanthus embilica*) etc fruits.
Flesh	Harina (deer), birds like Kapota (pigeon), Titira (Grey Francolin)
Oils	Nikumba (Danti-*Baliospernum montanum*), Ingudi (*Balanitis egyptica*), Atasi (*Linum usitatisimum*), Sarsapa (mustard).

DRUG THERAPY

Single Drugs

Drugs	Dosage (per dose)	MOA/Vehicle	Duration
Amlaki *(Phyllanthus emblica) -Fruit*	3-6 gm	Warm Water	90 days
Haridra *(Curcuma longa)-Rhizome*	1-3 gm	Luke Warm Water	90 days
Jambu *(Syzigium cumini)-seed*	3-6 gm	Water	90 days
Mesharangi *(Gymnema sylvestre)-Leaf*	3-6 gm	Water	90 days
seed	3-6 gm	Water	90 days
Kumari *(Aloe vera)* swarasa-leaf Pulp	10-15 ml	--------	90 days
and stem bark	3-6 gm	Water	90 days
Vijayasara *(Pterocarpus marsupium)-stem*	3-6 gm	Water	90 days
Karavellaka *(*Bitter gourd-*Momordica charantia)-seeds*	3-6 gm	Water	90 days
Methika *(Trigonella foenum)-leaves and*			
Neem *(Azadirachtha indica)-seeds, Leaf*			

Compound Formulations

Drugs	Dosage (per dose)	MOA/Vehicle	Duration
Triphala Churna	3-6 gm	Warm Water	90 days
Amalki swarasa	10-15 ml	--------	90 days
Phalatrik¡di kv¡th	25-50 ml	--------	90 days
Gokhuradi guggulu	3-6 gm	Water	90 days
Vyoshadi guggulu	3-6 gm	Water	90 days
Chandraprabha Vati	250-500 mg	Water	90 days
Lodhrasava	10-20 ml	Water	90 days
Deodarvarishta	10-20 ml	Water	90 days
Dhanvantara ghrita	20-40 gm	Warm water	10 days
Kshira Baba taila	3-6 gm (orally) also used for abhva´ga	Warm water	10 days
Saptamrita lauha	250-375 mg	Milk/ghrita	10 days

Some research based drugs

The safety and efficacy of Ayurvedic interventions have been demonstrated through several experimental and clinical studies and extract of few studies are as follows:

Experimental studies

Aegle marmelos

- Biochemical studies in streptozotocin-induced diabetic rats confirmed the potent hypoglycaemic activity of an aqueous extract **Aegle marmelos** Diabetes Mellitus and Ayurvedic Management: An appraisal Research on Bilba leaves and suggested it to be an oral substitute for insulin.(Bhavapriya, 2000)

- Albino rats were treated with ethanol extract of two varieties (sweet and bitter) of (Bilva)leaves and their blood glucose lowering effect was studied using glucose oxidase assay method. Both the varieties exhibited hypoglycaemic activity in a dose dependent manner. Sweet variety (250 and 500 mg/kg) produced maximum blood glucose reduction at 6 hour, while the bitter variety at the same dose levels showed maximum reduction at 8 hour and this continued upto 24hour (Rao, Babu, Rao, Nimmi, 2002).

- Oral administration of aqueous extract of *Aegle marmelos* (Bilva) seeds (250 mg/kg) was found to decrease blood glucose level by 35.1% in normal healthy rats 6h after administration, by 41.2% in subnormal and by 33.2% in mild diabetic rats in glucose tolerance test after 2h. Treatment of severely diabetic rats for 14 days with a dose of 250 mg/kg reduced the fasting blood glucose level by 60.84%. It also brought about a fall in the level of total cholesterol with an increase in HDL-Cholesterol and a decrease in LDLCholesterol and triglycerides.

- Aqueous extract of *Aegle marmelos* (Bilva) seeds was thus proved to possess anti-diabetic and hypolipidaemic effects in diabetic rats (Kesari, Gupta, Singh, Diwakar, Watal, 2006). •

***Cinnamomum tamala* (Tejapata)**

- Oral Administration of an ethanol (50%) extract of ***Cinnamomum tamala* (Tejapata)** leaves significantly lowered the plasma glucose levels in normoglycaemic and streptozotocin-induced hyperglycaemic rats. The extract also showed anti-hypercholesterolaemic and antihypertriglyceridaemic activity in streptozotocin-induced diabetic rats (Sharma, Dwivedi, Swarup, 1996).

***Cinnamomum zeylanicum* (Tvak)**

- Water extract of ***Cinnamomum zeylanicum* (Tvak)** bark significantly reduced blood glucose value at 1h during glucose tolerance test. When diabetic animals with fasting blood glucose were treated with cinnamon extract (200mg/kg, b.w.) once daily for 2 weeks, the fasting blood glucose level came down (Prachi, Murali, Murthy, Tandon, Chandra, 2004).

***Coccinia indica* (Bimba)**

- The juice and decoction of leaves and stems of ***Coccinia indica* (Bimba)** (20ml/kg) showed significant hypoglycemic response in fasting rabbits. The decoction of the fruits of the plant also showed similar activity (Pillai, Ghosh, Uma, Kumar, 1980).

- The blood sugar lowering effects of ethanol extracts of whole plant and root of Coccinia indica (Bimba) were tested in different experimental models. While the plant-extract

reduced the blood sugar levels of fasted, glucoseloaded and streptozotocin-induced diabetic albino mice to different degrees, root extract reduced the blood sugar only of glucose-loaded animals (Mukherjee, Chandrasekar, Mukherjee, 1988).

***Gymnema Sylvestre* (Meshasringi)**

- Administration of Gymnema Sylvestre (Meshasringi) extract decreased serum glucose concentration in dexamethasone induced hyperglycaemic animals. The effects were comparable to the standard corticosteroidinhibiting drug, ketoconazole (Gholap, Kar, 2003).

***Momordica charantia* (Karavellaka).**

- Experimental and clinical studies revealed anti-diabetic and adaptogenic properties of the aqueous extract of Momordica charantia (Karavellaka). The aqueous extract of the fruit was more effective in diabetes than the powder of the dried fruit (Srivastava, Venkatakrishna-Bhatt, Verma, Venkaiah, 1993).

- The effect of varying doses of alcoholic and aqueous extracts of Momordica charantia (Karavellaka) on body weight, serum glucose, insulin and triglycoside was investigated in fructose fed rats. Serum glucose and insulin levels were significantly increased following feeding of fructose for 15 days.

- Administration of an aqueous extract of Momordica charantia (400mg/d) markedly prevented high fructose diet-induced hyperglycaemia and hyperinsulinaemia (Vikrant, Grover, Tandon, Rathi, Gupta, 2001).

- Administration of ethyl acetate-soluble fraction of ethanol extract of P.marsupium wood to alloxan-induced diabetic rates for 5 days significantly reduced the blood sugar levels along with an increase in insulin levels (Ahmad et al., 1991).

- The effect of the anti-diabetic plant, Pterocarpus marsupium (Vijayasar), on the development of cataract was assessed in rats. An aqueous extract of Pterocarpus marsupium (Vijayasar (1g/kg/day) was given to alloxan (120 mg/kg)-induced diabetic rats until the development of cataract.

- Administration of the plant extract exerted a favorable effect on body weight, blood glucose and anti-cataract effect as evident from decreased opacity index (Vats, Yadav, Biswas, Grover, 2004)

***Tinospora cordifolia*(Guduchi)**

- Oral administration of the root extract of Tinospora cordifolia(Guduchi) for 6 weeks resulted in significant reduction of blood and urine glucose and of lipids in serum and tissues in alloxan-induced diabetic rats (Prince, Menon, 2003).

***Trigonella foenum graecum* (Methi)**

- Extracts of Trigonella foenum graecum (Methi), tested for their hypoglycaemic effect in rabbits, the alkaloid-rich fraction showed maximum effect within two hours of its administration (Jain, Lohiya, Kapoor, 1987).

- Supplementation of the diet with Trigonella foenum graecum (Methi) leaves showed a significant effect on hyperglycaemia, hypoinsulinaemia and glycosylated haemoglobin in streptozotocin- induced diabetic rats.

- Methi leaves improved the body weight and liver glycogen and also showed a significant effect on key carbohydrate metabolic enzymes in diabetic rats.

- The effect of fenugreek leaves was found to be similar to that of glibenclamide (Devi, Kamalakkannan, Prince, 2003).

Clinical Studies:

- Oral administration of an alcoholic extract of Trigonella foenumgraecum(Methi) seeds significantly reduced the blood sugar levels of normal as well as of alloxan-induced diabetic rats (Vats, Grover, Rathi, 2002)

- **Vijayasara (*Pterocarpus marsupium)* in NIDDM:** A flexible dose open trial was conducted in four centres in India to evaluate the efficacy of *Vijayasara* in the treatment of newly diagnosed or untreated NIDDM. By the 12 weeks, control of blood glucose had been attained in 69% patients studied. The mean Hb Ac was decreased significantly (P<0.001) to 9.4% at 12 week from the initial mean of 9.8%. Other laboratory parameters remained stable and no side effects were reported (Flexible dose open trial of *Vijayasara* in cases of newly diagnosed non-insulin dependent Diabetes mellitus–ICMR collaborating centers, Central Biostatistical Monitoring Unit, Chennai and Central technical Coordinating unit, ICMR, New Delhi)

- **Ayush-82 and Shuddha Shilajit :** In a clinical trial (n=80) of NIDDM, an Ayurvedic formulation named Ayush-82, 5gm thrice daily and *Shuddha Shilajit*, 500mg twice daily was given for 24 weeks. Fasting and postprandial blood sugar levels were estimated at 6 th weekly intervals. There was statistically significant reduction in both fasting and postprandial blood sugar (Pandey *et al.*, 1995)

- ***Coccinia indica* :**In a controlled clinical trial (n= 30)of NIDDM, tablets made from aqueous extract of *Coccinia indica* twice daily were given before meal for 3 months. The drug was found to be significantly attenuated the lipid fraction almost to normal range with the control of hyperglycemia (Kamble *et al.*, 1996)

- **Ayurvedic Therapy in Diabetes Retinopathy:** A Combination of therapy viz.*tarpana* with *Patoladi ghrita* and internal administration of *Dhanvantara Kwatha* 20ml, *Punarnavasava* 25ml, *Candraprabhavati* 250mg and *Nisamalaki* 5 gm twice a day in the subjects of Diabetes retinopathy showed remarkable improvement in visual acuity. There was no further visual loss, no further focal haemorrhages and no neovascularisation was observed (Srikanth, 2005).

- **Ayush-82 –An Ayurvedic Hypoglycemic formulation :** Consisting of *Amra bija* (seeds of *Mangifera indica*), *Karavellaka bija* (seeds of *Momordica charantia*), *Jambu beeja* (seeds of *Syzygium cumini*), *Gudmara* (leaves of *Gymnema sylvestre*) was tried on a fairly large sample size (n=350) in a control clinical study revealed statistically significant reduction in fasting and postprandial blood sugar in Non insulin Dependent Diabetes Mellitus (CCRAS Research–An Overview, 2002).

- **Nishamalaki :** In a open clinical trial 100 patients of NIDDM (n=100) in the age range of

  31-70 years with normally blood sugar elevated cases i.e. 100mg or more in FBS were put on the drug Nishamalaki 1 gm twice daily with water for 6 weeks between. The results showed that the drug has got moderately good hypoglycemic effect (Nanda, Chopra, Sahu, and Padhi, 1998).

- **Amrita-Pippali-Nimba Yoga :**A series of 50 patients of diabetes mellitus divided into three groups Group A (n=15): *Amrita-Pippali-Nimba Yoga*; Group B(n=14): Add on treatment with *Amrita Pippali, Nimba Yoga* and Group C(n=8): Placebo were studied .The *Amrta-Pippali-Nimba Yoga* has showed significant improvement in both fasting and postprandial blood sugar levels in group A and B when compared to placebo (Mehra, Singh, 2001).

- ***Coccinia cordifolia* extract on Newly Detected Diabetic Patients:** In a double-blind, placebo-controlled, randomized trial Sixty newly detected type 2 diabetic patients (n=60) were randomly assigned into the placebo and experimental group (1 g alcoholic extract of

Coccinia cordifolia administered for 90 days). The significant decrease (at day 90) in fasting blood glucose and postprandial blood glucose was observed with a mean change of 15.6% and18.5% respectively in the experimental group (Rebecca, Ramaswamy, Ganapathi, Anura, 2008).

Counseling – Advise the patient to:

- Do physical exercise according to body condition, at least 30 – 60 minutes daily.
- Restrict intake of sweets containing refined / white sugars.
- Increase the use of barley, wheat, green gram and roasted bengal gram in diet.
- Limit the use of potato, rice, milk products and oily foods.
- Take utmost care of personal hygiene especially of feet and hand.
- Avoid injuries and immediately consult in case it happens.
- Avoid alcohol and tobacco consumption in any form.
- Regular medical checkup and monitoring of blood glucose level

a) Glycosylated haemoglobin (HbA1c) test at least twice in a year
b) Eye examination annually, especially fundus examination
c) Foot examination at least twice in year
d) Renal function screening at least yearly
e) Blood pressure assessment at least monthly
f) Lipid profile at least annually
g) Cardiac checkup at least annually

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Vyanabala vaishamya (Hypertension)

Introduction

Hypertension is a condition in which the blood pressure is chronically elevated. It is considered to be present when a person's systolic blood pressure is consistently 140 mm Hg or higher, and/or their diastolic blood pressure is consistently 90 mm Hg or higher. Various epidemiologic studies had consistently demonstrated that increasing levels of systolic BP correlate directly with the risk of developing cardiovascular events and stroke leading to mortality. In old age systolic blood pressure becomes a stronger predictor of risk than diastolic blood pressure or other standard risk factors besides age. Based on WHO definition the incidence of hypertension in urban population is around 40% and rural around 18%. High blood pressure is dangerous because it makes the heart work harder to pump blood to the body and it contributes to hardening of the arteries or atherosclerosis.

However, there is no doubt that this disease must have been existed in the past as well, though may not in the same form, incidence and severity due to different kind of life style in those days. The change in social and economic conditions, life style, dietary habits and an increasing stress and strain in earning the livelihood have increased the prevalence of this disease. Though

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a suitable term for the disease condition hypertension is not directly mentioned in the Ayurvedic classics, its symptomatology can be found in the chapters of vata vyadhi, prameha and hridroga. A disease condition vyanabala vaishamya, which can be correlated with hypertension, seems to be resulted from the vaishamya / vikriti of vyana vayu. Thish condition of vaishamya(Disharmony/Disproportion) can be of two types either vriddhi(Increase) or kshaya(Decrease). Hypertension comes under vriddhi type of vaishamya.

Types of Hypertension

Primary or essential hypertension - The hypertension of unknown origin.

Secondary hypertension - Hypertension with an identifiable cause secondary to another disease such as renal disease or tumor.

Isolated systolic hypertension - Most common in old age due to reduced vascular compliance, systolic B.P > 160 mm of Hg with Diastolic pressure < 90 mm of Hg.

Neurogenic hypertension - It can be caused by strong stimulation of sympathetic nervous system. (e.g. when a person becomes excited for any reason or state of anxiety).

Classification of Hypertension

	Systolic B.P.	Diastolic B.P.
Optimal B.P	< 120	< 80
Normal B.P.	< 130	< 85
High normal	130-139	85-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	160-179	100-109
Stage 3 Hypertension	180	> 110

Aetiology

1. Hereditary
2. Excess salt intake
3. Sleep apnea
4. Secondary to disease (e.g. polycystic kidney disease or chronic glomerulonephritis,adrenal disease, cushing's syndrome and coarctation of aorta etc.)
5. Certain medication (e.g. NSAIDS, steroids, throat lozenges and peptic ulcer medicines)

Pathogenesis

It is incorrect that hypertension is a simple physiological feature of ageing. Blood pressure tends to be normal or even low in the aged population. Development of Hypertension more depends on environmental factors, rather than simple ageing. Pathophysiological mechanism includes an increase in peripheral vascular resistance, secondary to arteriolar smooth muscle vasoconstriction with the lower plasma renin activity and low aldosterone levels.

Risk factors

1. Child of Hypertensive parents
2. Obese person
3. Age > 45 years
4. Gender (men and postmenopausal women)
5. Diabetes mellitus, dyslipidaemia
6. Physical inactivity
7. Smoking, alcoholism

Clinical features

Hypertension is usually found incidentally by healthcare professionals during a routine checkup, usually produces no symptoms although there may be

1. Headache
2. Fatigue
3. Dizziness
4. Transient insomnia
5. Difficulty in sleeping due to feeling of hot or flushed
6. Tinnitus

Complications

While elevated blood pressure alone is not an illness, it often requires treatment due to the following short and long term effects like:

1. Cerebrovascular accidents (CVA) or strokes
2. Myocardial infarction
3. Hypertensive cardiomyopathy (heart failure)
4. Hypertensive retinopathy, nephropathy and encephalopathy
5. Congestion in the lungs
6. Left ventricular hypertrophy

7. Epistaxis
8. Blurring of vision owing to retinal changes
9. Impotence
10. Angina pectoris

Investigations

1. 24 hour ambulatory blood pressure monitoring
2. Urine for protein, blood and glucose
3. Serum electrolytes
4. Serum creatnine
5. Renal function test
6. Blood sugar fasting
7. Lipid profile
8. Electro cardiogram (ECG)
9. Chest X Ray (PA view)

Management approaches

a. Prevention

1. Consume plenty of fruits and vegetables such as apple, banana, blackberrie, broccoli,cabbage, carrot, garlic, grape fruit, green leafy vegetable, onion, pea, tomato etc.
2. Consume preferably vegetarian, low fat, low calory diet rich in whole grain, high fibre and nuts
3. Use of garlic and onion in regular diet
4. Practice physical exercises such as brisk walking daily for 30 - 45 minutes
5. Weight reduction (in obese)
6. Limit use of salt (<5 gm/ day), fats and sweets

7. Avoid day sleep, anger, anxiety, hyper activity, over exertion

8. Avoid use of caffeine, alcohol and tobacco

b. Medical management

Line of treatment (Charaka Chikitsa.28/92)

1. Nidana parivarjana (avoidance of aetiological factors) -According to Ayurveda, avoidance of the causative factor is the first line of treatment for all diseases. Excess intakes of salt and fatty substance should be avoided and certain medicines such asNSAIDS, steroids, cough syrups etc. are also to be taken carefully.

2. Samshodhana chikikitsa (Bio-cleansing therapies) followed by Samana chikitsa (Palliative therapy) should be advocated.

i. Lekhana Vasti 350-500 ml for 8 days.

ii. Virechana karma (Purgation) with Eranda taila 15 - 30 ml with half glass of milk at night

iii.Shirodhara with medicated liquids (milk/ water/ oils (Narayana taila) daily 45-90 minutes for 21 days

iv. Takra dhara daily 45 minutes for 14 days

Note.Decision for Dhara and its medicies are required to be taken by the physician only dependinding upon its benefit3. Drug Therapy

Common medicinal pants

Plant name	Dosage(perdose)	Vehicle	Duration
Sarpagandha (Rauwolfia serpentiana Benth ex. Kurz.)Powder	1 -3 gm	water	15 days
Ashvagandha (Withania somnifera Dunal) Powder	3-6 gm	Milk	15 days
Jatamansi (Nardostachys jatamamasi DC.)Powder	1-3 gm	Water	15 days
Arjuna (Terminalia arjuna W.and A.) Bark Powder	3-6 gm	Water	15 days

Arjuna (Terminalia arjuna W.and A.)Bark ksheerapaka	10 -30ml		15 days
Rasona (Allium stivum Linn.) ksheerapaka	10-30 ml		15 days

Ksheerapaka is an easy preparation in which the milk is processed with the desired plant part.

Method of preparation of Ksheerapaka:

Prescribed amount of the Dravya (medicament) is taken.

Milk is taken in a quantity of 4 times that of the medicine.

Water is taken 4 times that of milk.

All are mixed together and heated on mild fire until all the water evaporates and only the milk remains and milk is now filtered which is taken lukewarm.

Every time the preparation shall be prepared fresh. It should neither be preserved nor refrigerated nor reused after a long time.

FORMULATIONS

Drug	Dosage (per dose	Vehicle	Duration
Mamsyadi kvatha	10-20 ml	Water	15 days
Sarpagandha ghana vati	125-250 mg	Water	15 days
Brahmi vati	125-250 mg	Water	15 days
Prabhakara vati	125-250 mg	Water/Milk	15 days
Arjunarishta	10-15 ml	Water	15 days
Abhayarisha	10-15 ml	Water	15 days
Pravala pishti	250-500 mg	Water	15 days
shveta parpati	125-250 mg	Water	15 days
Nagarjun!bhra rasa	125-250 mg	Water/Honey	15 days

Hridayarnava rasa	125-250 mg	Honey/ Triphal! kv!tha	15 days

Thease above mentioned medicines are prescribed Initially 2 times in a day after meal for 15 days followed by condition of patient and physician's direction.

NOTE: Formulations mentioned above any one of them or in combination may be prescribed by the physician.The duration of the treatment may vary from patient to patient. Physician should decide the dosage (per dose) and duration of the therapy based on the clinical findings and response to therapy.

Lekhana Vasti (medicated enema), containing Arjuna heart wood decoction. and . Arjunavachadi yoga have shown improvement in the hypertensive patients.

Yoga Therapy- The following yogic practices are beneficial in hypertension; however, these should be performed only under the guidance of qualified Yoga therapist. Duration of every yogic practices should be decided by the Yoga therapist.1. Breathing exercises -hand strech breathing, hand in and out breathing.

2.Asana- Shavasana, Vajr!sana, Bhujangasana, Vakrasana, Gomukhasana, Pavanmuktasana,Katichakrasana, Ardhakati chakr!sana, Tadasana.

3. Pranayama -Chandra anulomaviloma,Nadisodhana, Ujjayi, Bhramari.

Counselling - Advice for,

1. Regular blood pressure monitoring
2. Maintenance of weight in ratio of height
3. Practice of regular aerobic exercises (e.g. brisk walk, jogging, weight lifting etc.)
4. Increase intake of potassium, calcium and magnesium in diet
5. Relax mind and body by yoga, meditation and other methods
6. Consumption of fruits and vegetables such as apple, banana, broccoli, cabbage, carrot, garlic, grape, green leafy vegetables, onion, pea, tomato etc in plenty.
7. Wise Use of anti-inflammatory medicines.
8. Avoidance of cheese, animal fat, aged / stored meat, chocolate, cream, wine , yogurt and artificial sweeteners.
9. Avoid the use of antihistaminic drugs unless knowingly prescribed by qualified a physician.
10. Restricted use of sugar and salt in diet
11. Discontinuation of tobacco and alcohol in any form.

Indications for referral

Ppatients may be reffered in following conditions

1. Refractory hypertension - suboptimal control of blood pressure in spite of appropriate therapy
2. Target organ damage

3. Secondary hypertension not responding to medication

Reference

AYURVEDIC MANAGEMENT OF SELECT GERIATRIC DISEASE CONDITIONS,CENTRAL COUNCIL FOR RESEARCH IN AYURVEDA AND SIDDHA,Department of AYUSH, Ministry of Health & Family Welfare,Government of India, New Delhi - 110 058

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