PATIENT EDUCATION: THE EFFECT ON PATIENT BEHAVIOUR

A Thesis Submitted to Rhodes University in Fulfillment of the Requirements for the Degree of

Master of Science (Pharmacy)

by

CLARRIS SHIRI

August 2006

Faculty of Pharmacy
Rhodes University
Grahamstown

ABSTRACT

Evidence suggests that the prevalence of certain non-communicable diseases, such as hypertension, is increasing rapidly, and that patients with these diseases are making significant demands on the health services of the nations in sub-Saharan Africa. However, these countries also face other health-related challenges such as communicable diseases and underdevelopment-related diseases. Developing countries like South Africa have limited resources, in terms of man power and financial capital, to address the challenges that they are facing. Non-communicable diseases cannot be ignored and since health care providers cannot meet the challenges, it is worthwhile to empower patients to be involved in the management of their conditions. Patient education is a tool that can be used to enable patients to manage their chronic conditions and thereby reduce the morbidity and mortality rates of these conditions.

The aim of this study was to investigate the effect of a patient education intervention on participants' levels of knowledge about hypertension and its therapy, beliefs about medicines and adherence to anti-hypertensive therapy. The intervention consisted of talks and discussions with all the participants as one group and as individuals. There was also written information given to the participants. Their levels of knowledge about hypertension and its therapy were measured using one-on-one interviews and self-administered questionnaires. Beliefs about medicines were measured using the Beliefs about Medicines Questionnaire (BMQ) whilst adherence levels were measured using pill counts, self-reports and prescription refill records. The participants' blood pressure readings and body mass indices were also recorded throughout the study. The parameters before and after the educational intervention were compared using statistical analyses.

The participants' levels of knowledge about hypertension and its therapy significantly increased whilst their beliefs about medicines were positively modified after the educational intervention. There were also increases, though not statistically significant, in the participants' levels of adherence to anti-hypertensive therapy. Unexpectedly, the blood pressure readings and body mass indices increased significantly. The participants gave positive feedback regarding the educational intervention and indicated a desire for similar programmes to be run continuously.

They also suggested that such programmes be implemented for other common chronic conditions such as asthma and diabetes.

This study proved that patient education programmes can be implemented to modify patients' levels of knowledge about their conditions and the therapy, beliefs about medicines and adherence to therapy. However, such programmes need to be conducted over a long period of time since changes involving behaviour take a long time.

This work is dedicated to my beloved parents, Simon and Yenesi Shiri.

ACKNOWLEDGEMENTS

I would like to thank Rhodes University for financial support in the form of the JRC Fund and the Senior, as well as Graduate Assistant, Bursaries.

I am sincerely grateful to the following people:

My supervisor, Prof Sunitha C Srinivas for her guidance, encouragement, support, insight and long-lasting patience throughout the study.

The support staff members who took part in this study for their participation and patience. Their supervisors and heads of department for their support.

The Rhodes University Ethical Standards Committee for granting me permission to carry out this study.

Dr David Woods for launching the educational intervention.

Prof Sarah Radloff for her encouragement and help with the statistics.

Cecilia Blight for her prompt and efficient proofreading of this thesis, as well as valuable feedback.

The interpreters who assisted during the interviews and translated the written materials.

The Health Care Providers at Settler's Hospital, Settler's Day Hospital, Rhodes University Sanatorium and the Health District Office for their helpful ideas and support.

Prof Isadore Kanfer for his invaluable assistance in obtaining funding for this study as well as his support throughout the study.

Prof William Futter, Carmen Oltmann, Wendy Wrench and Sally Morley in the Department of Pharmacy Administration and Practice at Rhodes University for their support and direction.

My parents, siblings, aunts, uncles and cousins for their unending love, support, encouragement and prayers.

My fiancé, Amon Taurai Magadza, for his continuous encouragement, love and support throughout the study.

The Rhodes Adventists Students for their numerous prayers.

Colleagues, all the staff members and students of the Faculty of Pharmacy at Rhodes University for their encouragement and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER THREE

CHAPTER FIVE

LIST OF ACRONYMS

AIDS:	Acquired Immunodeficiency Syndrome
ANOVA:	Analysis Of Variance
ACE:	Angiotensin Converting Enzyme
BMQ:	Beliefs about Medicines Questionnaire
BP:	Blood Pressure
BMI:	Body Mass Index
CCM:	Chronic Care Model
CHW:	Community Health Worker
EML:	Essential Medicines List
FGD:	Focus Group Discussion
HBM:	Health Belief Model
HCP:	Health Care Provider
HIV:	Human Immunodeficiency Virus
MLSA:	Makana Local Services Area
MEMS:	Medication Event Monitoring System
MIC:	Medicines Information Centre
NDP:	National Drug Policy
NCD:	Necessity-Concerns Differential
PIL:	Patient Information Leaflet
PHC:	Primary Health care Centre
THIL:	Take Home Information Leaflet
WHO:	World Health Organisation

LIST OF APPENDICES

CHAPTER ONE
INTRODUCTION

1.1 Background to Research

Health care sectors in developing countries such as South Africa face the dual challenges of communicable diseases and non-communicable diseases. On the other hand, the main challenge faced by developed countries is non-communicable diseases, mostly due to lifestyle and behaviour [1]. Non-communicable diseases are a worldwide problem as shown by their 27% contribution to the global burden of diseases in 1990. This figure is expected to increase to 43% by the year 2020 [2].

The two major health challenges mentioned above, together with poverty-related diseases and the high injury rates in South Africa compete for the limited resources available. This leads to poor recognition of the magnitude of non-communicable diseases even though they have a substantial impact on the health of the country. For example, in 1996, 41% of reported deaths in South Africa were due to non-communicable diseases [1] and they were also the number one cause of death in the year 2000 [3]. Non-communicable diseases also have economic consequences for the nation because patients and their families spend money on medical care, the government pays for those attending public health care delivery centres and other organisations such as Medical Aid companies also contribute towards the payment of medical costs. Another financial impact is that employers can lose skilled employees due to disability and morbidity related to non-communicable diseases [2].

An example of a non-communicable disease prominent throughout the world is hypertension, the control of which is far from optimal [1,4-6]. Effective management of hypertension requires both medicinal and non-medicinal therapy [5,7]. Whilst patients have no control over the choice of medicinal therapy they receive from their Health Care Providers (HCPs), hypertensive patients can limit the progression of the disease through lifestyle changes [8-11]. These individuals therefore need to be educated on how their lifestyles can be altered to reduce the incidence of, for example, stroke, cardiovascular complications and renal system failure which occur due to poorly controlled hypertension [11].

The various information sources that patients consult about health-related issues include HCPs, Medicines Information Centres (MICs), the media, colleagues and friends. HCPs and MICs are sources of reliable, up-to-date and unbiased information. However, these two sources are not readily accessible to the majority of South Africans. There is a shortage of HCPs in the country, and those available do not always have enough time to attend to patients' health-related problems and educate them effectively due to the heavy patient load [12-15]. There are only 3 MICs in South Africa and these mostly cater for HCPs and not patients [16,17]. Intervention strategies that have been developed and utilised in Western countries, for the management of chronic non-communicable diseases, are not suitable for South Africa due to lack of resources and the different lifestyles, habits and practices of South African inhabitants compared to those of the Western world. A number of culturally-appropriate approaches are therefore needed in South Africa to educate patients about conditions and diseases and hopefully improve health-related outcomes [1,11].

Patient education programmes are effective in increasing patients' knowledge about a condition, modifying beliefs about medicines, as well as their medication-taking behaviour, and improving health related outcomes [18-21]. These programmes can take various forms including Focus Group Discussions (FGDs), distribution of written information, Internet-based learning and oral presentations addressing patients as individuals, in groups or the community as a whole.

1.2 Field of Research

This study involved a patient education programme for hypertensive individuals through talks involving all the participants as one group and as individuals and provision of written information. The aim of this educational intervention was to increase participants' knowledge about hypertension, address their beliefs about medicines and their adherence to anti-hypertensive therapy.

1.3 Overview of Chapters

The following chapter is a brief review of related literature on hypertension, its characteristics and management. Patient education itself is looked at in terms of its role in health care, the role of HCPs in patient education and the effect of patient education on different health-related

behaviours. The chapter deals with patients' adherence to anti-hypertensive treatment, factors affecting adherence and the implications of poor adherence to therapy. This is followed by a brief description of patients' beliefs about illnesses in general and their general, as well as specific, beliefs about medicines. This chapter also highlights the role of patient self-management in chronic conditions.

Chapter 3 describes the setting in which this study was conducted, the problems that this study sought to address, assumptions made and the hypotheses that were tested. Chapter 4 describes the methodologies used to achieve the aims and objectives of the study, including the statistical analyses performed on the hypotheses listed in Chapter 3.

Chapter 5 presents the results obtained which are discussed in Chapter 6, together with the limitations of the study. Chapter 7 summarises the study and also suggests recommendations for current and future work in the field of patient education. The conclusions of the study, based on the results obtained, are presented in Chapter 8. Throughout this report the terms hypertension and high blood pressure (BP) are used interchangeably. The person who conducted this study is referred to as the investigator. The terms participants and individuals are used, interchangeably, when referring to the people who took part in this study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Hypertension

2.1.1 Introduction

Hypertension is one of the prominent global health problems [4,5,7,22-24] and South Africa is no exception. Hypertension is typically asymptomatic and therefore patients do not observe the effects of the condition or the benefits of their therapy [5,7,24-28].

2.1.2 The characteristics of Hypertension

BP is the force exerted by blood on the walls of the arteries [5,29]. Hypertension is defined as "abnormally high BP in the arteries" which occurs when the heart has to pump blood with more force because of resistance to blood flow [5]. Resistance to blood flow can be due to increased blood viscosity or arteries that have become narrowed and hardened through the deposition of cholesterol on the walls [30]. Arteries can also become narrowed as a result of a rise in intracellular calcium levels or sympathetic nervous stimulation leading to the release of renin and subsequently Angiotensin II, a potent vasoconstrictor [31].

Hypertension is diagnosed after three BP readings, measured on separate, but consecutive occasions are 140/90 mm Hg or higher [4,5,7,23,24,29]. Essential hypertension means "The hypertension is of unknown origin." [32]. When the cause of hypertension can be identified, it is termed secondary hypertension. About 90 % of hypertensive patients have essential hypertension [5,32,33].

Although hypertension is typically asymptomatic [5,7,24-27], some symptoms may be present in hypertensive patients including headaches, dizziness, blurred vision, shortness of breath and nausea [5,30]. Most people are usually unaware that they are hypertensive until their BP is measured [5,25,30]. However, hypertension can lead to serious consequences such as stroke, cardiovascular complications, kidney damage and even death [4,5,7,23,34-39], hence it is also known as "the silent killer" [5,25,29].

2.1.3 Pre-disposing Factors and Prognosis of Hypertension

Research has shown that there are a number of factors associated with the incidence of essential hypertension, for example genetics [40-46], prolonged psychological stress [5,47-49], improper diet consisting of, for example, too many fats and sodium [8,50], too much smoking [51,52], excessive alcohol consumption [53] and obesity [5,7,23-25,54]. Causes of secondary hypertension include kidney disease, hormonal disorders, some medicines and illegal drugs, pregnancy and other occurrences such as lead poisoning [5,23,32].

Uncontrolled BP can lead to damaged blood vessels which can result in malfunctions of all body organs manifesting as stroke, renal failure, cardiac disease, mental disease, even blindness and death [5,7,23,24,34,36,37,39]. The severity of complications varies depending on the individual and the extent to which the BP was elevated before anti-hypertensive treatment was initiated [7] Controlling BP, using both pharmacological and non-pharmacological therapy, is one of the ways of preventing strokes and heart attacks [5,55].

2.1.4 Management of Hypertension

There is no cure for primary hypertension, but secondary hypertension is managed by treating the underlying cause [5,7,25]. As mentioned earlier (Section 2.1.2), hypertension is diagnosed after BP readings, measured on three separate, but consecutive occasions are 140/90 mm Hg or higher [4,5,7,23,24,29]. The goal of management of patients with primary hypertension is therefore to keep their BP readings below 140/90 mm Hg. HCPs give patients medicinal therapy and encourage them to alter their lifestyles accordingly (Section 2.1.4.2) in order for the goal BP to be achieved. Hypertensive patients have to visit HCPs regularly to have their BP measured. In cases where the BP is more than 140/90 mm Hg, the HCPs will review the patients' medicinal therapy as well adherence to the medicine and lifestyle measures. The guidelines list the different antihypertensive medicines to be used and the order in which they will be introduced to the patients. For example, when patients are not controlled on one medicine then a second one is added on. All patients are continuously encouraged to adhere to their medication and lifestyle measures [5,7,9,25,56].

2.1.4.1 Medicinal Therapy

There are different therapeutic categories of anti-hypertensive agents, all with different modes of action [5,7,16,24]. The following are categories available on the South African Essential Medicines[1] [57] List (EML) for the Eastern Cape Province where this study was conducted [56].

- Diuretics lower BP by decreasing the blood volume and amount of sodium in the body. Examples include hydrochlorothiazide and furosemide.
- Agents that alter the sympathetic nervous system functions include reserpine which blocks the ability of aminergic transmitter vesicles to take up sympathetic amines such as noradrenaline. Methyldopa stimulates central α-adrenoceptors and leads to a reduction in peripheral vascular resistance.
- Direct vasodilators act on the blood vessels, relaxing the muscles in the vessels and resulting in dilation of the vessels. Examples of vasodilators are hydralazine and verapamil.
- Angiotensin Converting Enzyme (ACE) inhibitors hinder the formation of angiotensin and thereby prevent vasoconstriction. Perindopril and captopril are examples.

Medicines from the same and different therapeutic categories can be combined to increase their hypotensive effects. There are no formulations with such combinations on the South African Eastern Cape Province EML. At government health care centres, patients with hypertension do not receive combination formulations whereas at private sector health facilities, they may receive these formulations. An example is Adco-Retic®, which consists of hydrochlorothiazide and amiloride, both diuretics. Another is Ziak® which contains hydrochlorothiazide and bisoprolol, a diuretic and sympathetic receptor antagonist respectively [16].

2.1.4.2 Non-Medicinal Therapy

Modification of lifestyle can also help in keeping BP controlled [8-10,58] and eliminate the need for medicinal therapy or lead to a reduction in the number of medicines taken by hypertensive patients [25]. These modifications include, amongst other factors, the Dietary Approaches to Stop Hypertension (DASH) diet [24], weight loss, exercise, limited alcohol intake, as well as

[1] WHO defines essential medicines as those that satisfy the priority health care needs of the population. They are selected with due regard to disease prevalence, evidence of efficacy and safety and comparative cost-effectiveness.

quitting smoking [5,8-10,58]. The effect of all these factors on BP is not additive [9,10], but is still greater than the result obtained from implementing only one of these lifestyle modifications [8]. These measures are also useful for those with BP that is below 140/90 mm Hg, but are at high risk of developing hypertension (BP ranging from 120/80mm Hg to 139/89 mm Hg) [8-10].

2.2 Patient Education

2.2.1 Introduction

In 1994 the WHO assembly drew up a declaration that stated "Patients have the right to be given factual, supportable, understandable and appropriate information, to be provided in such a way as to allow them to decide whether they wish to receive therapy" [59] According to the South African Pharmacy Council, pharmacists are obliged to educate their patients in order to enable them to understand their conditions and the role of the prescribed therapy [60-62]. There has also been an increase in the demand for health-related information by patients [61,63,64].

"Patient education is planned, organised learning experiences designed to facilitate voluntary adoption of behaviours, skills, or beliefs conducive to health. These educational activities can be part of either clinical patient care or community education." [65] The need for patient education cannot be disputed [66], it is an integral component of good medical practice and pharmaceutical care [67-70]. Outcomes of educating patients include an increase in their levels of knowledge about the condition, as well as its therapy [20,71], adaptation of lifestyles [1,65,72], altering of beliefs about the conditions and prescribed therapies [18,19,65,73,74] and improved adherence to therapy, as well as health-related outcomes [20,75-79].

2.2.2 The Role of Patient Education in Health Care

2.2.2.1 The Role of Patient Education in the Management of Hypertension

The challenges involved in the use of medicinal anti-hypertensive therapy include finding the ideal medication for every patient, side effects of the medicines and non-adherence by patients [5,7,22,80]. With regard to non-medicinal therapy, the greatest challenge is motivating the patients to adopt and maintain the recommended lifestyle changes [9,81]. Through education, patients can receive information on how best to alter their lifestyles. Other information that

HCPs can furnish patients with, includes, the nature of hypertension, the medication and the importance of adhering to both medicinal and non-medicinal anti-hypertensive therapy [18,63,66,82].

2.2.2.2 The Role of Patient Education in Adherence to Therapy

Patients need to be equipped to make informed decisions about their health since lack of pertinent health-related information can lead to poor adherence to therapy [20,59,61,75-77]. It is also important for patients to appreciate the reasons for adhering to medicinal therapy as well as non-medicinal therapy [20,59]. Patient education programmes can be used to raise patients' awareness of the role played by both medicinal and non-medicinal therapy to maintain their health [18,73,74,83,84].

2.2.2.3 The Role of Patient Education in Modifying Patients' Beliefs about Medicines

Beliefs about illnesses and medicines are shaped by factors such as demographics, knowledge and socio-economics [85,86]. HCPs can modify patients' beliefs by changing these factors though not all of them can be adjusted. For example, demographic factors remain unaltered and socio-economic factors are difficult to modify. This, however, is not the case with knowledge; patients' levels of knowledge about their condition and its therapy can be increased to promote a more positive attitude towards prescribed therapy [18,19,73,74,87]. Some beliefs, for example, concerns about medicinal therapy, are a result of patients being misinformed [73,88,89]. Such misconceptions can be cleared through patient education [83,84].

When patients' beliefs and perceptions are known, interventions can be planned to influence these positively and thereby improve adherence to therapy, so that adequate health outcomes can be achieved [83,90-93]. However, it is not always possible to ascertain patients' beliefs as some are reluctant to express their views and opinions during HCP-patient consultations. If HCPs do not correct perceptions that patients have about their illness and treatment, the latter will assume that these perceptions are correct [19]. Perceptions influence patients' decisions and since their families and other members of the community are usually involved in the decision-making process, HCPs can also influence these groups of people through education [46].

2.2.2.4 The Role of Patient Education in Patients' Self-Management of Chronic Conditions

Living with chronic diseases can be overwhelming for patients [94,95] and the burden can be lessened through educational interventions which equip patients with the necessary capabilities to live with and manage their conditions. Examples of these capabilities include identification of signs and symptoms indicating the worsening of conditions and regular self-measurements of certain parameters such as blood glucose levels [15,64,96,97].

2.2.3 The Structure of Patient Education

Information to be provided to patients includes that on their condition, the medication and the effect of lifestyle factors. With regard to conditions, useful aspects to be addressed include the cause and prognosis [18,63,82,98]. For example, in one study it was revealed that patients who were less aware of the complications of diabetes were more likely to develop complications of the condition [98]. In another study, patients who were less knowledgeable about their condition and believed themselves to be less susceptible to the complications were less adherent to their therapy [99].

Information required by patients on medicinal therapy includes the name, purpose of medication, directions for use, storage instructions, possible side effects, adverse effects that warrant medical attention, length of therapy and contraindicated foods as well as medicines [61,100]. Lack of adequate knowledge in these areas can lead to inappropriate use of medications [101,102], or even adverse reactions, as highlighted by a publication of the WHO entitled 'The safety of medicines' in September 2005. This stated that "A large proportion of negative reactions to medicines are due to irrational use or human error and are therefore preventable." Examples of such irrational uses listed included self-medication, poor adherence to the prescribed therapy and patients taking many medicines simultaneously that can interact and cause complications [103]. These negative reactions can be avoided through education of patients [20,77,101-105]. Patients also benefit when provided with information on how they can adapt their lifestyles to prevent their conditions from worsening. For example patients can be encouraged to quit tobacco use, unhealthy diets, excessive alcohol use and lack of physical activity [1,65,72].

There are various ways of implementing patient education programmes including oral presentations and discussions involving patients as individuals, in groups or the community as a whole [106]. This and other verbal information that patients receive during consultations with HCPs can be augmented with written information which is an adjunct, but not a substitute for verbal advice. Written information will enable the patients to retain more information [70,107-109]. Other methods that can be used to educate patients include the use of audio and audio-visual equipment [106,110,111].

Patient education is not a once-off procedure, patients need to keep receiving information when they visit HCPs for follow up purposes and to collect their prescription refills [77,100]. This will help to reinforce the advice they received during previous visits to the HCPs. The timing of information provision is also crucial [69,100]. For example, the anxiety that patients experience at the diagnosis stage can hinder them from retaining all the information that the physician provides. Pharmacists can repeat the information given by other HCPs during clinic visits and add more details about the prescribed therapy [61].

2.2.4 The Role of Health Care Providers in Patient Education

HCPs need to provide patients with pertinent information about their condition, its therapy and the necessary lifestyle changes [100]. If patients do not receive information from their HCPs, they will seek it from other sources, such as in the media and from friends, as well as colleagues. However, information from these other sources can be biased and misleading. It is therefore crucial for all HCPs including pharmacists, physicians, nurses, dieticians and physiotherapists to educate their patients so they can receive appropriate information [15,112-114].

The roles that pharmacists are expected to perform include being a care giver, decision-maker, communicator, leader, manager, lifelong learner and teacher [113]. Pharmacists are best suited for the role of educating patients since they are the last HCP that patients encounter before going home to start their therapy [61]. Pharmacists are sources of vital medicines information and they can provide patients, as well as other HCPs with such information and thereby fulfil their role as teachers [112].

2.2.5 Barriers to Patient Education

There are obstacles which can make it difficult for HCPs to educate their patients and the community. These include lack of resources such as time, finances and manpower [12-15]. The available HCPs are not always able and/or willing to educate patients. For example, HCPs may have reservations about providing patients with information about potential side effects because they believe it might lead to poor adherence [61]. At times the task of educating patients is carried out by people who have little or no experience in evaluating the procedure or the content of such programmes [115]. This occurs due to lack of resources to train HCPs on how to implement patient education programmes. Another barrier associated with manpower is lack of team-work. HCPs from different disciplines may have different opinions about the importance of patient education in health care [15]. Another barrier to patient education, which is common in South Africa, is language differences between HCPs and patients [116,117]. This is a common problem in South Africa where there are 11 different official languages [118].

2.3 Adherence

2.3.1 Introduction

World Health Organisation (WHO) defines adherence as "The extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes corresponds with agreed recommendations from a health care provider."[22] Reports have shown that adherence to chronic therapy averages about 50% in developed countries and is even lower in developing countries [22,80]. This has implications for the health outcomes achieved and the economy (Section 2.3.5).

2.3.2 Adherence and Compliance

The use of the word adherence is being advocated to describe appropriate patient medication-taking behaviour [69,119]. In the health care setting, the word adherence implies that patients are in partnership with their HCPs when it comes to making decisions concerning the patients' health [120-122]. The term adherence does not have the negative connotations unlike the word compliance which suggests that patients are the passive recipients of instructions from HCPs, and are not consulted on the suitability and acceptability of therapy and dosing schedules

[73,119,120,123]. The words compliance and adherence have been used synonymously in some publications [83,119,121,124].

Another new term, concordance, is also emerging [125]. This term implies an equal partnership between HCPs and patients when addressing medication-taking behaviour [69,80]. The patients share their opinions, beliefs and concerns with the HCPs during consultation sessions with the goal of promoting better understanding between the two [80]. The essential factor is therefore that patients participate in the decision-making process with their HCPs.

The terms adherence and concordance are not always accurate when describing appropriate medication-taking behaviour. Patients do not always participate actively during consultations with their HCPs [126,127] and maybe content to let the HCPs do all the talking [126]. In some cases, the patients will only speak when answering questions raised by the HCPs. In such instances, the word compliance is more suitable because the patients passively receive medication and instructions from their HCPs, whether or not the medication regimens are suitable.

2.3.3 Factors Affecting Adherence

The factors which influence adherence to therapy can be categorized as follows: medication regimen and disease factors, patient-related factors and healthcare system factors [22,74,80,128].

2.3.3.1 Health Care System Factors

The factors in the health care system that influence adherence include the HCP-patient relationship [22,74,80,83,128,129], the attitude of the HCPs [128,129] and the capacity of the health care system to create an environment conducive to positive health-related behaviour. Unfriendly, judgmental HCPs have been associated with poor adherence to therapy. The health-care system must be an environment that supports adherence through educating patients and promoting self-management and follow-up programmes [80,128,129]. Consultation times should also be long enough for patients to have all their concerns about their health addressed and for the HCPs to ensure that the patients understand the nature of their condition, its prescribed therapy and the importance of adherence to the therapy [22,61,63,98,100,128]. This can be

achieved by presenting the link between therapy and desired health outcomes because patients need to understand first that the benefits of therapy outweigh the risks [73,88,90,130,131]. The risks include potential side effects and, in the case of chronic therapy, disruption of day-to-day living [119]. HCPs can provide guidelines on how patients can incorporate the medication regimen into their everyday lives.

HCPs should establish favourable relationships with patients, based on trust and competence [68,74,80,128,129]. In order for this to happen, the patients must be convinced that the HCPs are competent. The effectiveness of the HCPs' advice will either reinforce the patients' confidence in HCPs or lead to loss of faith in HCPs and even the health care system as a whole [22]. It is vital that HCPs provide feedback to patients about the progress of conditions. This is especially important in the case of asymptomatic conditions where patients cannot observe the effects of therapy and in the case of therapies with a delayed onset of action [119].

2.3.3.2 Patient-Related Factors

Adherence to therapy is influenced by patients' beliefs and perceptions [73,80,90], levels of knowledge [18,74,80] and their expectations of the therapy [80,129]. The Health Belief Model (HBM) [85] shows that patients' beliefs about illnesses and medicines have a bearing on health-related behaviour. The beliefs are in turn influenced by factors such as cultural norms and levels of knowledge and understanding regarding conditions and their therapies [85,86].

Whilst patients need to understand the reason for adhering to therapy and the consequences of doing otherwise, they are not always equipped with enough information to promote adherent behaviour [18,73,132]. Poor communication between HCPs and patients has been reported to be a source of non-adherence [74,132,133]. Verbal advice alone is not enough for educating patients on how to use their medication correctly because they can forget information [131]. Written information is therefore also necessary to reinforce and serve as a reminder for the verbal advice [63,132,133].

According to some studies [128,129,134-136], demographic factors such as level of education, gender, marital status, socio-economic status, ethnicity and even age itself do not affect patients'

adherence [135,137]. It is other factors associated with age which affect adherence, for example, elderly patients usually have more than one chronic condition and therefore more medication to take, some of which may have complex regimens. The older patients are also more likely to have a poor memory and decreased visual acuity. These factors can hinder patients from adhering to their therapy [132,137]. With regard to children and adolescents, factors such as poor parental monitoring and peer pressure can also lead to decreased adherence to therapy. This issue can be addressed, for example, by parents or guardians alerting the school authorities about learners' medication, especially in cases where some doses are to be taken during school hours [137].

2.3.3.3 Disease and Medication Regimen Factors

Complexity of therapy, duration of therapy, its benefits, side effects, cost and the symptoms, as well as the prognosis of the disease, influence adherence [22,73,119,138]. In asymptomatic conditions like hypertension, adherence can decrease if patients interpret the lack of symptoms as a sign that their condition has been cured [19]. Chronic conditions also pose a challenge to adherence in that if the symptoms of a condition stabilise and have little or no effect on the patients' day-to-day lives, they may decide to reduce or stop therapy. On the other hand, treatment regimens which affect day-to-day living may result in decreased adherence [22,73,80,128]. Other factors, such as inaccessibility of health care, taste of medicines, poor labelling of medication containers and perceptions of the treatment regimen may also affect level of adherence to therapy [73,80].

2.3.4 Measuring Adherence

For patients to be deemed as adhering sufficiently to anti-hypertensive medication they must take at least 80% of the prescribed amount [139,140]. This level of adherence has been reported to be sufficient to adequately keep patients' BP controlled [141-144]. Although there are a number of methods that can be employed to determine levels of adherence, it is not a simple task. Methods that can be employed include pill counts, patients' self-reports, electronic monitoring systems, prescription refill records and biochemical techniques.

2.3.4.1 Pill Counts

Patients' medicines are quantified in order to determine how much medication is present and therefore how much was used. This is either done in the patients' homes or they are requested to present all their medication to HCPs or researchers conducting the study. Adherence is calculated by comparing the amount of medication that the patients were supposed to use with the amount missing which the HCPs or researchers assume to have been taken by the patients [132].

This particular method depends on one main assumption: that all of the dispensed medication that is no longer in the container was ingested by the patients. This assumption has important implications. For example, patients might not present all their medication for counting. One of the reasons is that some patients keep their medication in more than one container, for their personal convenience. These patients may, deliberately or otherwise, leave some containers behind when they visit HCPs [132,134,145]. There are, however, some patients who purposely remove some medication from the containers to disguise the fact that they have not been adhering to their prescribed therapy [128,132,134,146-149].

Another problem with the underlying assumption of the pill count method is that, even if patients have actually taken all the medication which is absent from the container, this does not necessarily mean that they took it correctly. An example is a patient taking three tablets once a day instead of one tablet three times a day. The amount of "absent" medication might be correct, whether or not the individual has adhered to the regimen [134].

The main advantage of the pill count method for assessing adherence is that it does not require special skills or expensive apparatus [134,148]. This method can be used to assess the effect of adherence on health outcomes and to establish the magnitude of non-adherence [134]. However, due to its drawbacks, it is more useful when combined with other methods [128,150].

2.3.4.2 Medication Event Monitoring System (MEMS)

This method makes use of a computer micro-chip incorporated into the medication package [128,147,148] in order to record the date and time when the medication container is opened, with the assumption that a dose of medication is removed and ingested [128,132,139,147]. This

enables the calculation of adherence with the added advantage that dosing intervals can also be established, something which is not possible with the pill count method [132,134,148]. This seems to be the best method for measuring adherence so far [139,147,151]. It is difficult for patients to tamper with this device or its functioning as this requires an uncommon level of mechanical skill as well as an unlikely commitment to deception on the part of the patients, in order to appear adherent. [132,147].

The MEMS has also been shown to be inconvenient for some patients, particularly those with regimens that include a dose during the day when the patients might not be at home as they have to carry the medication in its container wherever they go. The device can make the medication container less portable. This is probably a problem for man more than for women since they usually carry a purse or bag [139,150]. As a result, patients may leave the medication container at home and pack their daytime dose in a more portable container leading to the recordings from the device not fully coinciding with patients' actual behaviour. Another limitation of this method is its expensiveness, especially considering the fact that the device may become faulty and need to be repaired or even replaced [22,137,139].

2.3.4.3 Self-Reports

Self-reported adherence can either be carried out orally, for example, during interviews with the patients or by written means such as questionnaires and diaries [139,151]. Adherence is calculated as the proportion of times when the patients reportedly took their medication. This method is simple and inexpensive, but it also has a number of limitations [128,137,139].

One of the documented disadvantages of the self-report method is overestimation, patients can write or say what they think the HCP wants to see or hear instead of reporting their actual medication-taking behaviour [128,137,139]. Another problem with self-reported adherence is miscommunication, for example, during interviews [134], the interviewer may misunderstand what the patient is saying or the patient may not fully understand what is being asked and therefore answer incorrectly. As this method sometimes relies on the recall of information from memory, it is possible for patients to forget some information [134,139,152].

2.3.4.4 Prescription Refill Records

This method involves checking HCPs' records to determine when patients collected their prescription refills [137,153]. Many pharmacies in the private health sector in South Africa now use computerized systems, therefore it is easier for information such as dates of refill collections to be accessed when required [153,154]. Data needed to calculate adherence levels can be collected on one occasion, which is not the case with, for example, pill counts. All that is required is for the patient to give consent for their records to be retrieved from the doctor or pharmacy.

This method is not without faults. Patients can collect their refills on time, but just store the medication without taking some of it. There is also no way of ascertaining whether dosing instructions were adhered to. Prescription refill records can be used together with pill counts and self-reports to improve the accuracy of adherence levels recorded during studies [150].

2.3.4.5 Biochemical Techniques

This involves measuring the level of medicines, or their metabolites, in body fluids such as urine or blood plasma. However, although this method shows that actual ingestion of medication did occur, it has its own limitations one of them being that there is no way of knowing if the correct dosing intervals were adhered to [147]. Another major drawback of this method is that pharmacokinetic factors vary between individuals and there can even be intra-individual variations due to, for example, change in diet or the presence of other illnesses or conditions [134,155]. Patients can also take their medication correctly just before they visit the clinic or doctor, a behavioural pattern known as "white-coat compliance" [134,137,156].

It is possible to detect poor adherence in white-coat compliers when they are using medicines with a delayed onset of action [147]. Another way of detecting this kind of behaviour is to incorporate an inert chemical marker into the formulation and use its levels in body fluids to measure adherence [134,147]. The chemical marker must have a relatively long plasma half-life so that patients who only take their medication just before a scheduled visit to the clinic or doctor will have lower levels of the chemical marker than those who would have been taking their medication for a longer period [132,147,148,157]. The biochemical technique is laborious,

involving the collection of body fluid samples and then analysis. Each process requires proper training, has potential for error and can be very expensive [139].

All methods of measuring adherence have their own limitations [134,137,139,151]. What is more important is convincing patients that the benefits of their therapy outweigh the risks involved in taking the medication [46,88]. This is assuming that the patients' goals, like those of the HCPs, are to have the diseases and conditions cured or controlled. However, this is not always the case [81,158].

2.3.5 Implications of Poor Adherence

Poor adherence has several implications for patients' health outcomes and the economy [73,80]. In terms of patients' health outcomes, poor adherence to therapy results in poor therapeutic efficacy and lack of realisation of treatment goals [159]. There can be worsening of the existing condition, emergence of a new one or development of resistance to the medication [73,80,128]. To give an example, poor adherence is one of the most important causes of poor blood pressure control [22,160-163]. As mentioned earlier (Section 2.1.3), uncontrolled BP can lead to stroke and cardiovascular diseases which in turn result in increased hospital admissions and morbidity, as well as mortality rates [5].

With regard to implications to the economy and the practice of pharmacy, poor adherence to therapy leads to wastage of medicines and other resources as patients do not utilise them appropriately. More resources are also used to treat the complications of the untreated diseases. Such overuse of resources can be avoided through adherence to anti-hypertensive therapy [22,159].

Adherence is the single most important modifiable factor that compromises treatment outcome [164]. Improving adherence therefore has far reaching health and economic implications for patients and the nation as a whole [161].

2.4 Beliefs about Illnesses and Therapies

2.4.1 Introduction

Studies have shown that beliefs and perceptions, about a condition and its therapy, can influence the level of adherence to therapy [19,83,84,88,90,92]. Patients' beliefs about therapy are one of the factors affecting adherence that can be modified in order to promote adherence to therapy [165]. Social support from family members and the community also has a role to play in modifying beliefs and perceptions [84,95].

2.4.2 Health Belief Model

"The Health Belief Model is a psychological model that attempts to explain and predict health behaviours." [85]. Beliefs and perceptions are shaped by factors such as demographics, personality, cultural norms, socio-economics and knowledge [85,86]. The HBM states that people will take health related action if they believe that doing so will help prevent the emergence of a negative condition or worsening of an existing one. Perceptions of their ability to carry out the preventative action will also influence people's behaviour [84,85,166].

Adherence to therapy depends on patients' perceptions of the benefits of therapy, the severity of a disease and their susceptibility to the disease when they follow or ignore HCPs' recommendations [85]. For example, patients might perceive themselves to be susceptible to complications of their disease whether or not they take their medication which will probably decrease their adherence to therapy [167]. The HBM has been widely used, for example, in the promotion of preventative behaviour and in the understanding and modification of medicine-taking behaviour [19,84,85].

2.4.3 The Theory of Reasoned Action

This theory states that "A person's behaviour is determined by their attitude towards the outcome of that behaviour and by the opinions of the person's social environment." It explains how and why attitudes and beliefs affect people's behaviour. Attitudes and subjective norms influence the intention of an individual to carry out a certain action and the intention in turn affects behaviour. Subjective norms are the perceptions that individuals believe significant people surrounding them have about their actions [46].

2.4.4 Beliefs about Illness

Patients have beliefs about their illnesses and the severity that are based on previous experiences, usually of acute illnesses [19,84,85,91,92]. Patients often expect the taking of medications to result in curing of their condition, which will be reflected by cessation of symptoms [19,92]. However, some conditions like hypertension are asymptomatic [7,25-27] and taking of medication might not result in any overtly evident change. Patients also have perceptions about the duration of their condition and its therapy. For example, patients newly diagnosed with hypertension may expect both the condition and therapy to have a short duration. This may lead them to discontinue their treatment when they believe they are cured. Patients who appreciate that their condition and its therapy are chronic are less likely to discontinue their therapy [19].

2.4.5 Beliefs about Medicines

2.4.5.1 Patient's Beliefs about Medicines

Patients' beliefs about medicines influence factors such as treatment preferences and adherence [85,90]. The beliefs relating to medication fall into two categories, namely general and specific beliefs. General beliefs are those that patients have about all medicines and these have an influence on patients' initial attitude towards medication. It is the specific beliefs that have a more powerful effect on patients' beliefs about adherence to therapy prescribed for chronic conditions [73].

Specific beliefs are those beliefs that patients hold about medicines that are specifically prescribed for them for a condition, for example, hypertension. These beliefs are further divided into two groups; firstly, perceptions about the necessity of the medication and, secondly, concerns about any untoward effects that the medication may cause [73]. Although patients may believe their therapy to be necessary for their health, they may also have concerns about the untoward effects of the therapy [88,90]. Patients consider the benefits, determined by the perceived necessity, as well as the risks (undesirable effects) of their prescribed medication, when deciding whether or not to follow HCPs' advice [73,83,88,90,168,169].

An interaction of the two factors (perceived necessity and level of concern) is termed the Necessity-Concerns Differential (NCD). It is a stronger predictor of patients' adherence to

therapy in comparison to factors such as type of illness and age [88,90]. High levels of the perceived necessity of a therapeutic regimen have been demonstrated to lead to improved adherence. On the other hand, high levels of concern about therapy can lead to poor adherence to therapy [88,90,168-171]. Concerns about therapy include side effects, value or appropriateness of medication, disruption of lifestyle, social stigma attached to the medication and developing dependency on the medication [90,169]. These concerns are not always unfounded, considering factors such as occurrence of adverse drug reactions and therapeutic failure [162,169].

General beliefs are divided into two groups namely patients' beliefs about the prescribing habits of medical doctors (overuse) and their beliefs about the harmful nature of medicines (harmful). Whereas the specific beliefs are made up of two opposite facets, the two categories of general beliefs are similar. High levels of general beliefs means that patients think their doctors over-prescribe and that medicines are generally harmful substances that cause more harm than good. Both specific and general beliefs about medicines can be measured [130].

2.4.5.2 Measuring Beliefs about Medicines

Robert Horne and his colleagues in the United Kingdom developed a reliable and valid instrument for measuring beliefs about medicines. The Beliefs about Medicines Questionnaire (BMQ) [130] (Appendix B) is self-administered and consists of two main sections, to measure both specific and general beliefs about medicines. The specific section consists of two 5-item scales, one determining patients' levels of perception about the necessity of their medication. For example, one of the statements in this scale is "Without my medicines I would be very ill." Another statement is "My health at present depends on my medicines." The other scale in the specific section of the BMQ assesses the concerns patients have about the potential undesirable effects of their medication. An example of a statement in this scale is "I sometimes worry about becoming too dependent on my medicines." The NCD is a numerical indicator of patients' level of perceived necessity of therapy relative to their concerns about undesirable effects of the therapy.

One of the examples of the statements in the section addressing beliefs about prescribing habits is "Doctors use too many medicines", and another "If doctors had more time with the patients

they would prescribe fewer medicines". An example of the statements in the harmful section is "All medicines are poisons" and yet another is "Medicines do more harm than good". This section also has the following statement "Natural remedies are safer than medicines", which enables the respondents to share their opinions about complementary therapy compared to medicines [130].

The specific and general sections of the BMQ consist of 10 and 8 statements respectively. The task of respondents is to indicate to what extent they agree or disagree with the statements that are listed. The responses are scored according to a Likert 5 point scale. The possible responses and their corresponding scores are as follows: strongly agree (5), agree (4), uncertain (3), disagree (2), strongly disagree (1). The scores for each section are calculated by adding up the scores for the items within that section. The NCD is calculated by subtracting the concerns score from the necessity score. A high positive NCD value shows that patients believe the need for their medication to maintain their health overrides the concerns about the discomfort that they may experience from the medication. An NCD value of 0 indicates that the level of concern and the perception of medication necessity bear the same weight for the patients [130].

2.4.5.3 Comparing Health Care Providers' and Patients' General Beliefs about Medicines

Patients' relationships with their HCPs influence their attitudes towards prescribed treatment [74,83,129,172], for example, if patients have a positive perception of HCPs then they are more likely to listen to the advice given and use their medication as prescribed. However, if patients have negative opinions of the HCP, for example, if they believe that too many medicines are being prescribed, then this could increase the likelihood of poor adherence [172]. The BMQ (Appendix B) can be used to compare the beliefs about medicines of patients and HCPs. In this way, misconceptions can be addressed and this can promote better relations between HCPs and patients [172-174].

Some medical doctors prescribe more medication than is expected by patients [173,175]. This could be because they fail to understand the reasons for patients' visits and in an attempt to maintain a healthy relationship with the patients, prescribe medicines because they perceive this to be the patients' expectations [18,175,176]. Doctors are more likely to prescribe medication for

their patients if they believe that they are responding to the patients' expectations [173]. However, they do not always predict patients' expectations correctly [176].

A study conducted in Australia showed that HCPs from different fields of practice have little confidence in each other's abilities and performance of duties. Other HCPs, besides doctors, may share the same opinions as patients about the prescribing habits of doctors. This is probably due to insufficient information exchange, between HCPs from different disciplines, regarding planned approaches for patients' treatments [15,18].

2.5 Patients' Self-Management of Chronic Conditions

2.5.1 Introduction

The current health care system is mostly conducive to serving acutely ill patients and does not adequately cater for chronic patients or involve their family and friends in treatment plans [165,177]. This leads to sub-optimal management of chronic conditions [64,94,177]. Living with a chronic condition means that patients have to take medication daily, alter their lifestyles, and monitor the progress of their conditions mostly based on the symptoms they experience [64,94]. HCPs need to ensure that patients are in a position to actively participate in the management of their conditions through the use of medicinal therapy and lifestyle changes [97,177]. Decision-making is the most important skill required by patients in order for them to manage their conditions effectively [64].

2.5.2 The Chronic Care Model (CCM)

This model was designed to develop practice and system changes that can result in better care of chronic patients. It places great importance on the involvement of the community, as well as family members, particularly the opinion leaders in a community, for example, church elders [177]. This is hardly surprising since patients' beliefs are influenced by what they believe those around them think of their decisions and actions [46]. According to the CCM, HCPs need to be adequately trained on how to educate patients to equip them for self-management. The HCPs must ensure that patients and their families have received pertinent information and that they have developed confidence to participate in the management of their chronic conditions [177].

Treatment of chronic conditions is not only affected by physiological factors, but by all aspects of the patients' lives, including social and psychological factors [177,178].

2.5.3 The Concept of Self-Management

Self-management has been defined as "The decisions and actions taken by someone who is facing a health problem in order to cope with it and improve his or her health" [179]. Management of chronic conditions is mainly the patients' responsibility [95,177], although their families and other members of the household also have a role to play [64,177,179]. Self-management involves monitoring and managing symptoms, adhering to treatment, maintaining a healthy lifestyle and managing the impact of the illness on daily living, emotions, as well as on social relationships [94,96,165,177,179]. Just as HCPs usually prioritise when treating a patient with more than one condition or disease, patients also have priorities when managing their condition(s). With both parties, these priorities are often based on the amount of emotional investment placed on each task, a phenomenon known as the "Dual Task Theory" [165,180].

2.5.4 Benefits of Self-Management

There is evidence to support the view that adherence can improve if patients are actively involved in their treatment programmes. Therapy has greater efficacy if combined with follow-up programmes by HCPs and correct use of medication by patients [22,80,128]. Another benefit of patients' self-management of their conditions is improved health outcomes [94,181], for example, decreased utilisation of health care services [59]. This results in efficient utilisation of resources such as manpower, medicines and money; hence patient self-management is also cost-effective [64].

The next chapter describes the setting in which this study was conducted, together with the hypotheses that were tested based on the different factors which can be improved by patient education that have been mentioned in this chapter.

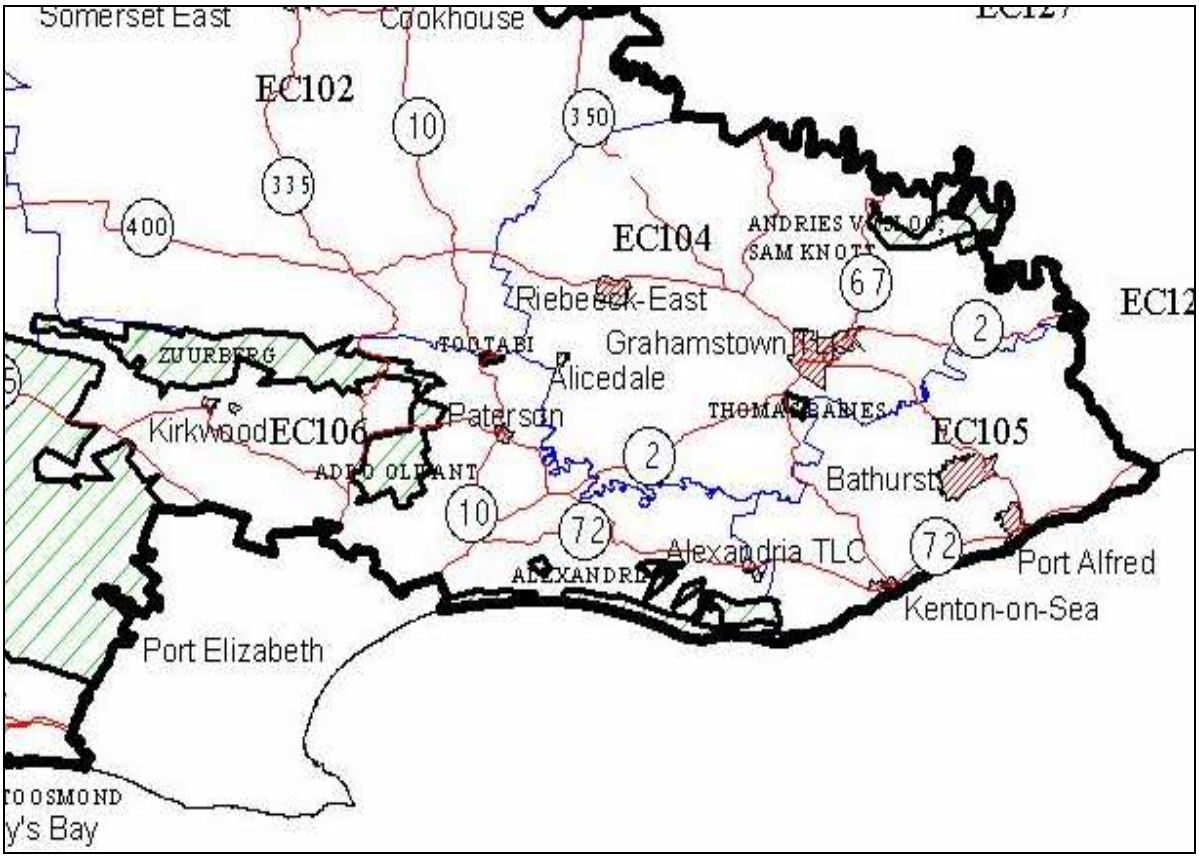
CHAPTER THREE
THE SETTING IN WHICH THE STUDY TOOK PLACE

3.1 Introduction

This study was conducted in Grahamstown, which is under the Makana Local Services Area (MLSA) sub-district in the Cacadu district situated in the Eastern Cape Province of South Africa. Figure 3.1 is a map showing South Africa and its nine provinces whilst Figure 3.2 is a map showing the MLSA. The MLSA public health system consists of one Primary Health Care Centre (PHC), 19 clinics and six mobile clinics. Like all the other provinces in South Africa, the Eastern Cape has an Essential Medicines Formulary and patients visiting public health care facilities almost always receive only medicines on this formulary [56].

Figure 3.1: Map of South Africa Showing the Nine Provinces

Figure 3.2: Map of Makana Local Services Area



3.2 Health Care Services in South Africa

3.2.1 Health Care Services at National Level

During the apartheid era, medicines were not available to all South Africans due to segregation. The health system in the country was divided into two sectors, the private one comprising 20% of the population and the public sector comprising the remaining 80%. In 1992/93, the private sector utilised 3.22% of the country's Gross National Product, whilst the public sector utilised 3.44%. This means that the total intended health expenditure for the whole country was divided almost equally between the two sectors, even though their population sizes were far from equal [62].

The National Drug Policy (NDP) was passed in January 1996 to rectify such inequalities, its objectives being to ensure that the whole population had access to adequate health care services including essential medicines, and that HCPs and patients used the medicines in a rational

manner. To ensure this, all parties involved including prescribers, dispensers and consumers of the medication needed to receive information on the safe and cost-effective use of medicinal and non-medicinal products. The information was to be presented in a language familiar to those receiving it. This information included that on "disease prevention, limited self-diagnosis, appropriate, as well as inappropriate, self-medication and suitable alternative non-medicinal treatment" [62].

3.2.2 Health Care Services Provided in Makana Local Services Area

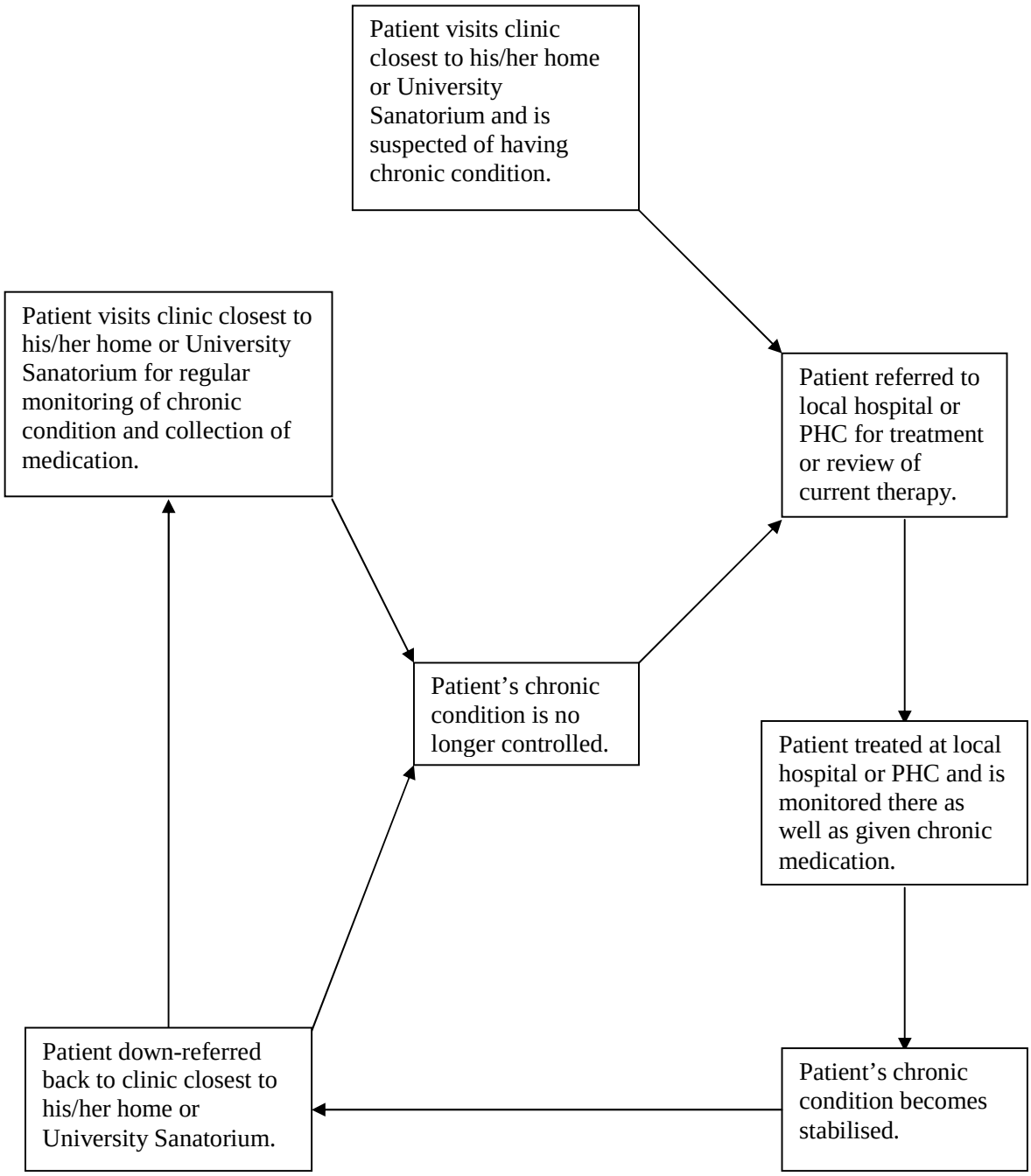
The information specified in this particular section was gathered during an informal interview with the district pharmacist of MLSA, as well as during District Pharmacy and Therapeutics Committee (PTC) meetings that the investigator attended. The PTC is comprised of different HCPs, who meet regularly to discuss issues pertaining to the delivery of health care to patients.

Ideally, when patients are first diagnosed with a chronic condition, they are referred to the only PHC available in this sub-district, for therapy and monitoring. Once stabilised, the patients are then down-referred to the clinics closest to their homes, where they receive their medication on a monthly basis. If a patient uses medication that is not available at the clinic closest to his or her home, then his or her health passport[2] is sent to the PHC where the medication is packed and sent to the clinic together with the patient's health passport. The individual then collects the medication from this clinic which will be closest to his or her home. If for some reason a patient's chronic condition is no longer controlled, he or she is referred to medical doctors who are only available at the PHC and local hospital. Such patients will continue to collect their chronic medication personally from the PHC or hospital until their condition is stabilised and they are down-referred back to the clinic closest to their home. This system, which is depicted in Figure 3.3, was envisaged to ensure even distribution of patients amongst the health care centres in MLSA thereby allowing for a lower HCP to patient ratio.

[2] Health Passport: a book where all details about the patient's visits to public health care centres are recorded. The patient keeps this book. This is a system used in the public health sector in South Africa.

However, at the time this study was conducted, five of the clinics were reluctant to adopt this system and did not order and stock medicines for chronic conditions, from the district pharmaceutical depot.

Figure 3.3: Referral System for the Public Health System in MLSA



From the time when the system was first implemented, the number of patients receiving medication for chronic conditions from these five clinics did not increase. If anything, it decreased because some patients were referred back to the hospital or the PHC when their conditions became uncontrolled. This meant that a large number of chronic patients living close to these five clinics received their medication from the PHC or local hospital. The patients either went directly to the PHC or hospital themselves or their medication was packed and sent from either of these two health care centres to the clinics closest to the patients' homes.

Since a large number of patients receive their medication, directly or indirectly, from either the hospital or PHC, the resources at these two facilities are overstretched. This is especially the case at the PHC. These resources include manpower and pharmaceutical products. For example, for the period from April 2005 to March 2006 the PHC's dispensary was allocated a budget of 640 000 Rands (R640 000) for medication expenditure. However by November 2005, the dispensary had already ordered medication worth R1.8 million from the depot. In terms of manpower at the PHC, in the period from April to November 2005, each nursing sister attended to an average of 59.5 patients per day. A total of 34 416 patients visited the PHC during this time period and of these, 650 of every 1000 were hypertensive.

Due to the high HCP to patient ratio, there is limited time available for HCP-patient consultations. This situation was further aggravated in the year 2005 when some HIV-positive patients on antiretroviral therapy were down-referred from the hospital to the PHC for collection of medicines. The medicines are packed at the local hospital, but a doctor and pharmacist at the PHC monitor and educate the patients. The out-patients from the local psychiatric hospital are also now being down-referred to the PHC for collection of chronic medicines and monitoring. Their chronic medication is dispensed at this facility. These two tasks (dispensing medicines for the psychiatric patients and attending to patients on antiretroviral therapy) added to the PHC's staff workload but the number of HCPs did not increase accordingly. Pharmacists therefore do not have sufficient time to educate most of the patients when they collect their medication. Most of the time, the medication is given to the patients by pharmacy assistants and not pharmacists.

There are Community Health Workers (CHWs) at the facility, but they are volunteers without any professional training and can only assist with, for example, measuring of patients' BP, blood glucose levels and interpreting for HCPs and patients who do not understand the local language, isiXhosa. The nursing sisters still have to attend to all the individuals who visit the PHC, except for those who merely go to collect prescription refills. Likewise, the staff members at the dispensary have to dispense all the medicines that are needed by the patients. Time is a limiting factor when it came to educating patients.

Occasionally the CHWs attend workshops where they are trained, by HCPs, on how to educate patients with particular conditions. After these workshops, they can then use the skills they have acquired to assist the HCPs in educating patients. At times the CHWs give talks to patients whilst they are waiting to see the HCPs. The CHWs present topics that they are knowledgeable about, but there is no evaluation of the information delivered during these presentations.

3.2.3 Health Care Services at Rhodes University

Rhodes University, where this study took place, has a sanatorium where students and staff members without medical insurance are treated for common ailments and their chronic conditions monitored. Like the public health care sector patients in MLSA, these staff members have health passports in which their chronic conditions and the medications prescribed are listed. The patients' health-related parameters such as BP, are measured at the university sanatorium and the health passports sent to the PHC. There the chronic medication is packed and then returned to the university sanatorium where the patients collect it together with their health passports. The patients receive enough medication for 28 days. In this way, the refill date is maintained on the same day of the week namely Thursday. The date when the patients' medication is dispensed and the due date for the next refill are recorded in the health passport.

It is the responsibility of the university messengers to deliver the health passports to the PHC on Thursdays and collect them, as well as the patients' medication, on Fridays. The staff members therefore have to visit the university sanatorium for a check-up before Thursday during the week when they are due for prescription refills. When necessary, for example if BP is too high, the individuals are referred to the medical doctor at the sanatorium or the PHC. A medical doctor

visits the university sanatorium three mornings a week and stays there for as long as it takes to attend to the staff members needing his attention. The length of time he spends at the sanatorium therefore depends on the number of patients that need his attention. If a staff member visiting the sanatorium needs a medical doctor's attention on a day when he does not visit then he or she is referred to the PHC where a medical doctor is available every day.

The sanatorium is not included in the group of clinics that were supposed to adopt the referral system mentioned earlier (Section 3.2.2). There are no medicines for chronic conditions stocked at the sanatorium. The individuals with chronic conditions at the university who do not have medical insurance are encouraged to make use of the sanatorium instead of going to the PHC. This is because the PHC is usually busy and there are long queues. An individual can spend the whole morning waiting in the queue before they are seen by a HCP and given their medication. This can result in individuals spending hours away from work.

3.3 Problems that the Study Sought to Investigate

3.3.1 Patients' Levels of Knowledge about Hypertension and its Therapy

The main aim of this study was to determine patients' levels of knowledge and understanding about hypertension and its therapy. Not all hypertensive individuals are aware that it is an asymptomatic condition which cannot be cured, but controlled. During her undergraduate studies, the investigator had an opportunity to visit a number of chronic patients that were served at the PHC. This was part of the university's Community Experience Programme for final year Bachelor of Pharmacy students. During these visits, the investigator learnt that most patients did not know much about their chronic conditions. Some were not even aware that they had to be on anti-hypertensive therapy for an indefinite time period. The reason for this lack of knowledge was due to deficiencies in the public health care system, as well as patients' poor access to medicines information from the public health system and other sources.

3.3.1.1 Deficiencies in the Public Health Care System in Makana Local Services Area

During a FGD held with three of the nursing sisters at the PHC (Section 4.6.2 and Appendix F), it was revealed that there is no structured system for patient education at the facility. Talks are given sporadically and monitoring or evaluation of the information delivered to patients during

the talks is not carried out. Furthermore, these talks only benefit those patients that are present at the PHC on that particular day and at that particular time when the talks are given. With regard to written information, at the time the FGD was conducted, there were no posters or leaflets at the local PHC addressing some of the prevalent conditions, such as hypertension, or their therapy. The nursing sisters informed the investigator that they do not spend a lot of time with the patients other than those on antiretroviral therapy.

At the university sanatorium there are a few posters addressing the issue of hypertension, but these have limited information. Although the sanatorium has a lower HCP-patient ratio than the PHC, patients' time there is limited by the need to resume their duties at work. Hence the HCPs at the sanatorium also have insufficient time to educate patients.

3.3.1.2 Patients' Poor Access to Medicines Information

Most of the individuals in the study's target population do not have access to Medicines Information (MI) sources such as MICs, the Internet, journals, magazines and other literature. Most of them cannot use a computer therefore, even if they have access to the Internet, they cannot search for medicines information. With regard to written information on the university campus, very little, if any, information is available in the local language. The information in English is from secondary and tertiary sources of information such as journals and textbooks written using scientific terms, which a lay person would probably not understand. Access to the university libraries is therefore of no use to the majority of the participants or, for that matter, anyone without scientific training. Since most of the participants do not receive their medication from the PHC, they do not get to attend the talks that are presented there.

3.3.1.2.1 Medicines Information Centres

In South Africa there are three MICs [16] and these cater mostly to HCPs although one of them does, on occasion, address queries from the public for a limited number of conditions such as migraines, overactive bladder and hair loss queries. In some instances, pharmacists give out the telephone contact details of this MIC to patients so they can call the centre directly. However, the staff members at this facility usually refer them back to the pharmacist since their primary goal is "To enhance the professionalism of all health professionals" [17]. Communication with the MIC

personnel is mostly through electronic mail and since the majority of the individuals in this study's target population do not have access to, or the capacity to utilise computers and electronic mail facilities, this MIC is not readily accessible to them.

The South African Pharmacy Council mandates that pharmacists should ensure that patients receive enough information about their therapy [60]. This section has shown this requirement is not being met. The patients serviced by the public health system in MLSA are not exposed to an adequate patient education system.

3.3.2 Poor Control of Hypertension

According to the Medical Research Council Director's report for the Chronic Diseases of Lifestyle Unit for 2002 to 2006, 56% of the South African population had at least one of the following risk factors: hypertension, diabetes, smoking and hyperlipidaemia. This report also stated that non-communicable diseases, such as hypertension, were characterised by poor diagnosis and management, due to inadequate resources [1]. A survey carried out in South Africa in 1998 showed that 13% of the male and 16% of the female populations were hypertensive [182]. The ABC Analyses[3] [183] for the PHC's dispensary showed that the highest medicinal expenditures at this facility were anti-hypertensive medicines. For example, from 1 April 2004 to 31 March 2005, R402, 629.20 was spent on perindopril, one of the anti-hypertensive agents. This was the highest figure on the budget.

With the advent of HIV and the resultant AIDS, other conditions have taken a back seat in terms of the focus given by HCPs and patients [184,185]. Even the HCPs at the clinics that were reluctant to adopt the referral system for chronic patients (Section 3.2.2) were willing to take part in the antiretroviral roll-out programme. At the PHC, there was a lot of written information about HIV and AIDS available for patients. However, patients also need to be knowledgeable about conditions such as hypertension since they can have life-threatening complications if not managed effectively [5,7,8,23,24,29,39].

[3] ABC Analysis: assembles data from recent or projected procurements to determine where money is actually being spent, allowing managers to focus first on high-cost items when considering ways to reduce procurement costs.

3.3.3 Poor Adherence to Therapy

During informal interviews held with the local HCPs by the investigator it was reported that poor adherence to chronic therapy was a problem in Grahamstown. Poor adherence to anti-hypertensive therapy limits the effectiveness of the therapy in controlling BP and can result in cardio- and cerebro-vascular as well as renal complications [22,73,80,128,160,186,187]. However, although everyone has a right to decide whether or not to adhere to therapy, HCPs should ensure that patients are equipped to make informed decisions about their health [61,63,73].

Having discussed the setting in which this study took place, as well the problems identified within this setting, this chapter now lists the assumptions made and describes the hypotheses that were proposed, based on the identified problems and the reviewed literature (Chapter 2).

3.4 Assumptions

The following are the assumptions made during this study:

- The study sample was representative of the hypertensive support staff members at Rhodes University, in the various departments involved (Section 4.2), on chronic medication.
- Participants had not been involved in any intervention programmes specifically designed for hypertensive individuals in the 6 months prior to the study.
- Participants did not take part in any other intervention programmes designed for hypertensive individuals during this study.
- The six most recent BP readings, before the start of the study, were reflective of the participants' BP prior to the study.
- Sometimes, for different reasons, participants visited private medical doctors who kept patients' records on file and did not use the health passport system. If a patient had a health passport, the doctor would write down their diagnosis, as well as any medication prescribed or dispensed in the health passport, as well as in the file kept in the doctors' rooms. In this way, the next time the patient visited another health care centre, the HCPs there would have details of the patient's previous visit(s) to the doctor. During this study it was assumed, for all participants with health passports, that all the visits made to HCPs,

where anti-hypertensive medicines were issued, were recorded in the health passports. The dates of the visits, as well as the amount of medication dispensed, were used in the calculation of participants' adherence levels. For those using the private health sector, prescription refill dates were recorded electronically by their HCPs and these records could be obtained with the participants' permission.

- Sometimes the chronic medicines received by patients were pre-packed at the PHC's dispensary. Since adherence was also to be measured using the pill count method (Section 4.7.4.3.1), it had to be assumed that the correct amounts of medication had been dispensed.
- Medication not presented by the participants for pill counts was assumed to have been ingested, unless the individual indicated that they had medication stored elsewhere. In this case, they were asked to state the amount.

3.5 Hypotheses

The hypotheses proposed during this study are listed below under different headings. They were tested using the statistical analyses described in the following chapter (Section 4.9).

3.5.1 Demographic Factors

1. H_0: Demographic factors (age, gender and number of years of formal schooling) had no effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

   H_1: Demographic factors (age, gender and number of years of formal schooling) had an effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

3.5.2 Medical History

2. H_0: The length of time since diagnosis of hypertension had no effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

H_1: The length of time since diagnosis of hypertension had an effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

1. H_0: The number of anti-hypertensive medicines that participants were taking had no effect on participants' beliefs about medicines and their adherence levels.
   H_1: The number of anti-hypertensive medicines that participants were taking had an effect on participants' beliefs about medicines and their adherence levels.

2. H_0: Having medical insurance had no effect on participants' adherence levels.
   H_1: Having medical insurance had an effect on participants' adherence levels.

3.5.3 Comparing Pre- and Post-Intervention Data

5. H_0: There was no change in the participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.
   H_1: There were changes in participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

6. H_0: There was no change in participants' systolic and diastolic BP readings, as well as Body Mass Indices (BMIs) after the programme.
   H_1: There was a change in participants' systolic and diastolic BP readings, as well as BMIs after the programme.

3.5.4 Correlation Analysis

7. H_0: There was no correlation between the participants' specific beliefs about their anti-hypertensive medicines and their adherence to the therapy.
   H_1: There was a correlation between participants' specific beliefs about their anti-hypertensive medicines and their adherence to therapy.

   According to the HBM, beliefs and perceptions influence health-related behaviour, such as adherence to prescribed therapy [19,88]. If this theory held true for this study's population,

then a higher level of the perceived necessity of anti-hypertensive medicines would mean a higher level of adherence to therapy [88]. In the same way a high level of concern would result in low adherence levels [88,90,91,168]. Since there is an interaction of these two factors (perception of necessity and level of concern) when patients make decisions [73,83,88,90,130], the NCD would therefore be a better indicator for this assessment [88,90]. The higher and more positive the NCD value, the higher the level of adherence to therapy [88].

8. H_0: There was no correlation between the participants' level of knowledge about hypertension and its therapy and their level of adherence to therapy.
   H_1: There was a correlation between the participants' level of knowledge about hypertension, as well as its therapy, and their level of adherence to therapy.

   If knowledge influences beliefs and perceptions, which in turn influence behaviour [85,88], then an increase in the participants' levels of knowledge would have lead to an improvement in adherence.

9. H_0: There was no correlation between the participants' level of knowledge about hypertension and its therapy and their specific beliefs about anti-hypertensive medication.
   H_1: There was a correlation between the participants' level of knowledge about hypertension, as well as its therapy, and their specific beliefs about anti-hypertensive medication.

   The HBM also states that factors such as cultural norms and knowledge influence beliefs and perceptions [85]. This means that those individuals knowledgeable about their condition and its therapy should have higher NCD [88] values, as well as higher necessity and lower concerns scores, than their colleagues who are less informed.

10. H_0: There was no correlation between the participants' BP readings and their levels of adherence to therapy.
    H_1: There was a correlation between the participants' BP readings and their levels of adherence to therapy.

One of the main causes of poor BP control is non-adherence to therapy [22,160,187]. This meant that an increase in level of adherence would result in a decrease in both systolic and diastolic BPs.

11. H_0: There was no correlation between participants' BMIs and their BP readings.
    H_1: There was a correlation between participants' BMIs and their BP readings.

    Being overweight is one of the risk factors of hypertension [5,7,23,24,54]. Participants with higher BMIs would therefore have higher BP levels.

CHAPTER FOUR
METHODOLOGY

4.1 The Target Population

The university departments where participants were recruited from for this study included Housekeeping, Building and Maintenance, Catering, Grounds and Gardens and Engineering. Their responsibilities cleaning buildings on the university campus and preparing meals for university students as well as staff members. Individuals from the Building and Maintenance department are responsible for putting up and repairing building structures on the university campus. Those from the Grounds and Garden department attend to the university grounds, whilst those from the Engineering department repair electrical appliances and university vehicles. These departments had supervisors for the different sections within the departments.

The individuals in the target population mostly spoke isiXhosa which is one of the 11 official languages in South Africa [118]. They were in the low income bracket, for example, some catering staff members earned a gross salary R2500 per month. To put this amount into perspective: rent could range between R300 and R400 per month, groceries for a family of 5 for a month cost about R700 – R800. School fees, in the township schools, where most of their children studied, ranged from R100 to R300 per child, per term for primary education and secondary education respectively. There were also other expenses such as electricity, water and transport costs. These figures were obtained from a number of support staff members who were asked by the investigator. However, although most of these university staff members did not have medical insurance, health care services were offered free of charge at public health care facilities.

4.2 The Study Sample

4.2.1 Recruitment of Participants

This study was approved by the Rhodes University Ethical Standards Committee and invitation letters (Appendix A1) were sent out through the heads of the departments involved who issued copies of these letters to individuals in their departments whom they knew to be hypertensive. The letter was also posted on the notice boards in the departments for the benefit of those who

were hypertensive, but not known to be so by the heads of departments. The invitation letter explained what the programme entailed and what the participants would gain from taking part in this programme. It also invited the willing respondents to attend the launch of the programme on a mentioned date.

The programme was launched by the Vice Chancellor of the university who gave a motivational talk. The investigator thanked the participants for attending the event and for giving consent to take part in the study. She then explained the purpose of the study and outlined the sequence of events that were going to take place throughout the study. The benefits of the programme were also highlighted to the participants. On the same occasion, the participants who attended signed a consent form (Appendix A2) and completed the BMQ [130] (Appendix B).

4.2.2 Eligibility Criteria

Participants were accepted to the programme if they were hypertensive and on anti-hypertensive therapy. They also had to be working for the university as support staff members throughout the duration of the study. Individuals were excluded if they had previously been diagnosed as hypertensive, but had stopped therapy and were not willing to resume it. Those who had stopped therapy after being instructed to do so by their medical doctors' instructions were also excluded from the study. The characteristics of those individuals who responded to the invitation letters and met the eligibility criteria are shown in Section 5.2.1.

4.2.3 Communicating with Participants

The investigator did not speak the local language, isiXhosa, and a number of the participants were not proficient in the English language. During the monthly encounters with the participants that involved measuring of BP and adherence (Section 4.7.1), their colleagues or supervisors were requested to help with interpretation where necessary. The investigator used simple terminology as much as possible and explained technical terms. During the one-on-one interviews (Section 4.6.3), there were retired nurses who took up the role of interpreting. The interpreters understood the terms used by the investigator and were also familiar with how these terms could be translated in a way that could be easily understood by the participants.

During this study, written information was made available to all participants in both English and isiXhosa. The English versions were translated into isiXhosa and then to verify the translation, were back translated into English by a different set of people who had not been involved in the initial translation of the material from English to isiXhosa. Where there were discrepancies between the original English translation and the back translation, the whole procedure was repeated, but only for those statements or questions that had discrepancies. This was carried out by different individuals from those who were involved in the first translation. The translating was mostly done by local, current and retired HCPs and also by members of the support staff in the Faculty of Pharmacy at the University. These people were chosen because of a greater similarity to the participants, in terms of language and life experiences.

4.2.4 Terms Commonly Used by Patients in the Makana Local Services Area

In this target population, the word ‘medicine’ and its isiXhosa translation were associated with liquid formulations such as syrups and suspensions. It did not encompass all types of medication. Hence when asked if they were taking any medicine for their high BP, most of the participants would say “No”, since they were not taking liquid preparations. The word ‘tablet’ and its isiXhosa translation were used to refer to tablets and capsules. The term ‘drug’ was associated with illegal drugs such as cocaine and marijuana. For this reason, during the talks and discussions, as well as in the written information given to the participants, the word ‘tablet’ and its isiXhosa translation was used instead of drugs or medicines when referring to antihypertensive medication.

Most of the individuals in this community also referred to high BP as “high-high” and were more likely to recognise this word and instead of the literal isiXhosa translation of the term high BP. Therefore during talks, discussions and in the isiXhosa written information the word “high-high” was used when referring to high BP and the local translation put in brackets after it.

4.3 Delimitations of the Study

The PHC could have been a source of a large number of participants. However, it would not have been possible to meet regularly with all of them as they lived in different areas and some might not have been comfortable with the investigator visiting them in their homes. If the

participants were not at home, when the investigator went to visit them, it would not have been easy to locate them. The investigator could have arranged to meet with the participants when they collected their medication refills at the PHC. However, some of them might not have gone to the PHC on the expected dates and it would have been difficult to contact these individuals, since not all of them had access to telephones.

The university support staff members were therefore targeted because of their accessibility. They were at work at least 5 times a week so it was easy to make appointments to meet with them at the university. At the university, the participants were met with at their different workstations. If they were not present at their place of work, they were located through their supervisors and heads of departments.

4.4 The Aim and Objectives of the Study

The aim of this study was to measure, before, during and after an educational intervention, participants' levels of knowledge about hypertension, its therapy, the importance of adherence to anti-hypertensive therapy and the role of lifestyle factors. The investigator also set out to measure the participants' specific as well as general beliefs about medicines (Section 2.3.5.1) and their levels of adherence to therapy.

The objectives of the study were as follows:

Pre-intervention

- To conduct baseline interviews to determine participants' levels of knowledge about hypertension, its therapy and the role of lifestyle factors.
- To measure participants' beliefs about medicines.
- To measure the local HCPs' general beliefs about medicines.
- To determine, using one-on-one interviews, the participants' levels of self-reported adherence to medicinal therapy and lifestyle recommendations for hypertensive individuals.
- To measure participants' adherence levels using the pill count method and their punctuality in collecting prescription refills.
- To measure participants' BP.

- To measure participants' weight and height in order to calculate BMIs.
- To investigate the patient education structures at the local PHC where most of the participants receive their chronic medication.

Intervention

- To educate participants about hypertension through a series of talks and discussions involving all the participants as one group and as individuals.
- To provide participants with summary information leaflets (Appendix E) for the information presented during the group talks.
- To assess participants' understanding of the group talks and discussions.
- To meet with participants on a monthly basis for the purposes of measuring adherence levels, BP and weight.

Post-intervention

- To conduct post-intervention interviews to determine changes in the participants' levels of knowledge about hypertension, its therapy and the role of lifestyle factors.
- To establish the effect of the educational intervention on participants' beliefs about medicines.
- To determine whether there were changes in participants' levels of adherence and their punctuality in collecting prescription refills.
- To design, pilot test and distribute take home information leaflets with information on hypertension and its therapy (Appendix H3).
- To determine participants' opinions of the entire programme.

4.5 Choice of Study Method

The use of randomised controlled studies during research is advocated [188-190]. In order to make sound conclusions the results must show significant differences between the control and experimental groups, which can only be attributed to the differing factor, since all the other variables will have been similar. However, it is not always simple to observe significant differences due to various reasons, one being that, individuals in the experimental group might not fully utilise the intervention under investigation.

In one study where the intervention under investigation was the effect of home-based exercise on change in quality of life in colorectal cancer survivors, it was observed that the experimental group performed, on average, 76% of the required exercise. The control group, which was not meant to engage in any of the exercises, performed 52% of these exercises. This is a phenomena known as ‘contamination’ and is discussed fully in the subsequent paragraph. The main outcome measured was Quality Of Life (QOL), as assessed by the Functional Assessment of Cancer Therapy-Colorectal (FACT-C) scale. Exercise behaviour was measured using the Leisure Score Index (LSI) of the Godin Leisure-Time Exercise Questionnaire. This three question instrument assessed the participants’ average frequency of mild, moderate and strenuous exercise during free time in a normal week. This instrument was completed at baseline and on a weekly basis during the 16-week intervention period. Failure of the experimental group to fully participate in the exercise programme led to the observed differences between the two groups being statistically insignificant (p-value = 0.679) [189-192].

A limitation, which has been cited as a source of inconclusive results during controlled trials, is contamination. This is the extent to which the control group adopts the intervention meant only for the experimental group [189,191,193]. It is quite possible for the control group to make use of the intervention intended for the experimental group, especially in cases where the intervention is something that the individuals can do for themselves, for example, physical exercise. Therefore, as part of the control group adopts the intervention and some members of the experimental group do not do so fully, the post-intervention results of the two groups become more similar. This ‘narrows the gap’ between the two groups and makes it difficult to observe definitive results and thereby make statistically sound conclusions about the intervention under study [191].

When people agree to take part in a study it is because they want to be part of the intervention and not because they want to be in the control group. Even a promise to the control group that they will also get an opportunity to participate in the same programme does not guarantee that they will refrain from adopting the intervention at the same time as the experimental group [191]. It is not always a simple task to explain to lay people the implications of controlled studies or to convince them to give up the perceived benefits of being in the experimental group [194,195].

They would probably not believe the allocation to the two groups to have been a random process [191,193] and the control group might feel deprived of a programme that they volunteered to join at the same time as their "lucky" colleagues.

At first this study was meant to be a randomised controlled study, but this was found not to be feasible due to a number of reasons. Firstly, the volunteers who agreed to take part in this study live and work in close proximity to each other and it would have been easy for members of the control group to make use of the intervention. In order for this study, which involved an educational intervention, to be a controlled study the participants in the experimental group would have to have been asked to keep the information they received to themselves. This was not a feasible expectation since the information might be new to them and they might have been tempted to share it with their 'less fortunate' colleagues, who would have been 'excluded' from participating in the programme.

A most likely source of contamination would have been if a participant in the control group got access to one of the information leaflets given to the experimental group. Bearing in mind that asking questions during the baseline study can pique the interest of some interviewees, this could have prompted them to go and find the information that they did not know and maybe even alter their behaviour based on their findings [191]. In this particular study, this could then have led to participants, including some in the control group, modifying their health behaviour before they had even been advised to do so. The possibility of contamination could therefore not be excluded in this study.

A non-randomised controlled study was considered, that is, dividing the participants according to their location around the university campus. However, the support staff members at the university were sometimes reshuffled within their departments to different locations on the university campus. Since this study was meant to cause the minimum amount of disturbance to the normal running of the university departments involved, it would not have been appropriate for the investigator to request for the participants involved not to be reshuffled. Besides being work colleagues, some of the participants were also friends and neighbours and travelled to work

together. It would therefore have been virtually impossible to keep the two groups apart for the duration of the study to avoid contamination.

After invitation letters were sent out, 84 people volunteered to take part in the programme and of these, 74 met the eligibility criteria (Fig 5.1). Five volunteers were assigned to the pilot testing of the interview questionnaire leaving 69 participants for the main study. Dividing them would have meant about 35 and 34 participants in either the control or experimental groups. With the inevitable problem of drop-outs, for example, due to retirement or the end of work contracts with the university, the number of participants in this study would have decreased further possibly leading to inconclusive results. A randomised controlled study needs a large sample in order to reduce the bias that can be caused by participants' characteristics [195]. Therefore, this was a self-controlled study. The impact of the educational intervention was investigated by comparing all the participants' variables before and after the intervention [194].

4.6 Data Collection

4.6.1 Time Period for the Study

The duration of the study was divided into three time periods: pre-intervention (October to mid December 2004), intervention (March to July 2005) and post-intervention (August to October 2005). The pre-intervention data recorded also included participants' BP readings and prescription refill patterns from 6 months prior to the start of the study. During the period from mid December 2004 to mid-February 2005 the investigator did not meet with the participants because the university was closed for the end of year break. From the middle to the end of February 2005, participants were not contacted to give them time to become accustomed to their work places since some of them had been reshuffled.

The intervention period started with the participants having discussions with the investigator. The investigator met the participants on a one-on-one basis and during these meetings their adherence levels and blood pressure were also measured. During this intervention period talks were organised for the participants (Section 4.7.2). The intervention period ended in July 2005 after summary leaflets (Appendix E) had been handed to the participants. The post-intervention period lasted from August till October 2005, when post-intervention interviews were conducted.

Participants were asked to share their opinions about the programme, through anonymous self-administered questionnaires, in March 2006. During this period they were also given the take home information leaflets (Appendix H3).

4.6.2 Focus Group Discussion with Local Health Care Providers

A FGD was held with three of the nursing sisters from the PHC, the purpose being to determine the provision of patient information regarding hypertension at the facility. The investigator asked the nurses about the system they had in place, if any, for educating patients diagnosed with hypertension. The questions raised during this discussion and the responses given by the nurses are shown in Appendix F. The HCPs were also asked to share their opinions on the role of written information in promoting adherence to therapy. After the FGD, the investigator observed the facility to investigate the availability and accessibility of written information such as posters or leaflets which addressed the topics of hypertension, adherence to anti-hypertensive therapy, as well as other pertinent issues, such as drug interactions.

4.6.3 One-on-One interviews

4.6.3.1 Design of Interview Questionnaire

An interview questionnaire (Appendix C) was used to measure participants' levels of knowledge about hypertension, its therapy, self-reported adherence and the effect of lifestyle factors on hypertension. The questionnaire was administered before and after the educational intervention so that the participants' levels of knowledge before and after the intervention could be compared in order to establish the effect of the intervention.

Different issues pertaining to hypertension were addressed in this questionnaire (Section 4.6.3.3). These aspects include hypertension itself, that is, the definition, BP readings, diagnosis, consequences of uncontrolled high BP, signs and symptoms, as well as its effect on their life at home and at work. Another aspect which was dealt with was treatment, particularly the names of their medication and dosages. Factors such as the possibility of drug-drug and drug-disease interactions, recommended lifestyle and adherence were also addressed. Other characteristics documented included demographics, health history, satisfaction with current health services in

Grahamstown and use of alternative medicines. The questions were adapted after being retrieved from different sources [5,19,196-200].

4.6.3.2 Pilot-Testing of Interview Questionnaire

The pilot testing was carried out with five volunteers and an interpreter as all five individuals were not proficient in the English language. The participants were asked the questions in the questionnaire and where they did not understand, the investigator asked the question in a different way. Both the interpreter and the volunteers were encouraged to give suggestions on how the questions could be asked in a clearer and understandable manner. Changes were made to the questionnaire based on suggestions from the volunteers as well as the interpreter, local HCPs who were consulted and also based on the investigator's observations during the pilot testing. One major change made to the questions was changing of terms such as 'high blood pressure' and 'medicine' to terms that the participants were familiar with, that is, 'high-high' and 'tablets' respectively (Section 4.2.4).

Another example of a change made to the questions is illustrated as follows. During the pilot study there were three questions included as ice-breakers for the investigator to establish rapport with the participants. One of these three questions was removed from the questionnaire. This question inquired about the participants' choice of beverages. However, the investigator realised that this question created expectations of being provided with such a beverage at some point during the study. Since it was not guaranteed that these expectations would be met, this question was excluded from the final questionnaire used for the interviews. This questionnaire had two ice-breakers which inquired whether or not the participants woke up and slept at the same time everyday. These questions were not included in the post-intervention interview because by then, the participants were familiar with the investigator.

The questionnaire which was pilot tested also included a question to ascertain how many sick-leave days each individual had taken in the year prior to the study. The purpose of this particular question had been to compare the number of sick-leave days taken by the participants before and after the intervention in order to establish if there would be changes due to the educational intervention. Since some participants might not have been able to accurately recall this

information, the only source of reliable data would have been staff records, which the investigator could not access due to confidentiality issues. This question was therefore left out.

The categorisation of questions was also changed and the wording of some questions. For example, there was a question “How do you describe your hypertension?” which sought to determine the participants’ perceived severity of their hypertension. The volunteers during the pilot testing of the questionnaire were not fully aware of how to answer this question therefore it was changed to “Do you think your blood pressure is under control?” Another question was “How does high blood pressure or the treatment affect your life, for example, can you walk long distances?” was broken down into two questions “Does your high-high affect your life in any way?” and “Do your tablets affect your life in any way?” The sequence of questions also changed as did the layout of the questionnaire which was in a landscape format during the pilot study and portrait in the final questionnaire (Appendix C).

4.6.3.3 Categorization of the Final Interview Questions

The questionnaire used for the main study was divided into nine sections (Appendix C). Most of the questions were close-ended and the possible responses were listed on the questionnaire. Each response was assigned a numerical code that was recorded when a participant gave that particular response. This was done to ensure that the interview session was not unnecessarily long and tedious for the participants. After the interviews, all the different responses gathered from the open-ended questions were summarised, categorised and also assigned numerical codes.

Section 1: Demographics

This was included in order to establish the diversity of the participants in terms of age, gender and number of years of formal schooling. The data in this section was also used during statistical analyses to determine the effect of demographic factors on the outcomes of the study. These outcomes were participants’ levels of knowledge about hypertension, as well as its therapy, beliefs about medicines and levels of adherence. Other demographic factors recorded were race, home language, language proficiency and work department.

Section 2: Medical history

The following health-related aspects of the participants' lives were documented: co-existing chronic conditions, length of time since diagnosis of hypertension, other family members with high BP, whether or not the participants had been hospitalized at some point in their lives prior to the study and frequency of visits to health care facilities due to actual illness. Headaches and dizziness are commonly associated with hypertension [5,19,30]; the participants were asked how often they experienced these two symptoms. Hypertension is also associated with congestive heart failure (CHF), hence the participants were also asked if they ever experienced breathing difficulties, when this usually occurred and if it happened whilst they were lying down flat as this is one of the symptoms of CHF [5].

Section 3: Knowledge about hypertension

In this section, participants were asked questions to establish how much they knew about the nature of hypertension. This included the meaning of the term hypertension or high BP, its asymptomatic nature and whether medication alone was enough to control hypertension without the participants having to alter lifestyle or whether they could merely reduce table salt intake and not take their medication. The individuals were also asked if they thought their BP was controlled and what could happen if this was not the case. The participants were asked questions to determine their awareness that anyone can develop hypertension and that it must be treated regardless of their age. There were also questions in this section to determine awareness of predisposing factors of hypertension such as body weight and psychological stress.

Section 4: Knowledge about treatment

Participants were asked to name their anti-hypertensive medication and report the dosage instructions. Those who did not know the names of their medication were asked to describe it or to point it out if they had brought it to the interview. The dosages described by the participants were cross-checked with the instructions on the packaging, as well as with the health passports either on that same day, if they had brought their health passports, or at a later date when they met with the investigator again. Other questions in this section included those that served to determine the perceived role and duration of the anti-hypertensive medication by the participants. They were also asked if they were on other medication and if they were aware of the

potential for drug-drug and drug-disease interactions. Storage of their medication was also queried.

Section 5: Adherence

This section covered self-reported adherence by asking questions such as whether or not participants took their medication at all times, even when they were feeling well. Missed or extra doses and measures which served as reminders for the participants to take their medication daily were also discussed. The participants were asked to state other reasons, besides forgetting, why they might not take their medication as directed.

Section 6: Lifestyle with hypertension

Questions in this section sought to enquire whether participants had adapted to the lifestyle recommended for people with high BP. For example increased physical activity, low salt intake, reduced smoking and alcohol consumption [5,9,10,25,50].

Section 7: Effect of hypertension on life

These questions were included in order to establish the effect, if any, of hypertension and its therapy on the participants' day-to-day living. One of the common side effects of ACE inhibitors is a dry, persistent cough [16]. In this section, those participants taking these agents were asked if they experienced this symptom and whether or not they sought medication for the cough. There was also a question about their ease in sleeping at night to determine if hypertension affected the participants' sleeping patterns.

Section 8: Satisfaction with health care services in Grahamstown

The health care system contributes significantly to HCRs' adherence to therapy [22,74]. Even though the participants mostly visited the university sanatorium for medical attention, some occasionally visited the PHC or local hospital. Therefore, this section addressed participants' opinions about the health care services delivered at these three facilities. The participants were also asked to suggest changes that could improve aspects of the health care delivery that they thought were lacking at the university sanatorium, PHC or local hospital.

Section 9: Use of alternative therapy

With the prevalence of the use of alternative/complementary medicines such as household as well as traditional remedies and commercial herbal products increasing [196,201,202], it was worth investigating whether this particular group made use of this kind of therapy, especially for their hypertension.

4.6.3.4 The Interview Procedure

With the aid of the interpreter where necessary, the investigator introduced herself and the interpreter and then thanked the participant for coming to the interview. The participants were reminded of the purposes of the study, their agreement to participate in the study and were thanked for continuing to do so. The investigator then explained the purpose of the interview session, which was to ask the participants questions about their "high-high" (high BP). The investigator used the information obtained during these interviews to establish how much the participants understood about "high-high" at baseline level as well as the way they were living with the condition. The participants were encouraged to answer all the questions freely and honestly.

After the interview, the investigator answered the questions that the participants had. Those who had been absent at the launch of the programme by the university's Vice-Chancellor and had not completed the BMQ (Section 4.2.1), were given an opportunity to do so after the interviews. The participants were thanked again for agreeing to be part of the programme and told that they would be informed, in advance, of the next stage. The same interview questionnaire (Appendix C) was used again during the post-intervention interviews to determine the effect of the educational intervention on the participants' understanding of high BP and its therapy.

4.6.4 Measurements

The outcomes measured during this study included participants' levels of knowledge about hypertension as well as its therapy, beliefs about medicines, levels of adherence to anti-hypertensive therapy, participants' BP and their height, as well as weight, for the purposes of calculating BMIs. The various methods used for carrying out these measurements were one-on-

one interviews, self-administered questionnaires, pill counts, health-related reports like the health passports.

4.6.4.1 Measurement of Levels of Knowledge about Hypertension and its Therapy

Participants' levels of knowledge about hypertension and its therapy were measured using one-on-one interviews and self-administered questionnaires. Correct responses were documented using the numerical figure 1 and incorrect responses the figure 0.

The scores were calculated as follows:

[Number of questions answered correctly, during the interview or from the self-administered questionnaires ÷ Total number of questions raised] × 100

Pre- and post-intervention scores were compared in order to assess the impact of the educational intervention on the participants' levels of knowledge about hypertension and its therapy. The interview questions are listed below (bold font) together with the responses that the investigator considered as correct.

4.6.4.1.1 Questions from the Interview Measuring Knowledge about Hypertension

The questions are numbered as they appear in the interview questionnaire (Appendix C).

3.1 What do you think high blood pressure (high-high) means?

The participants' responses were considered correct if they reflected that the participants understood the concept of blood not flowing well in the blood vessels and the heart having to work harder to pump blood to all parts of the body. The possible reasons for poor blood flow were blocked and/or narrowed blood vessels, as well as poor heart function.

3.2 Do you know what the suitable blood pressure is?

The participants' responses were considered correct if they stated a systolic BP between 100 and 120 mm Hg and a diastolic BP between 60 and 80 mm Hg.

3.4 Do you know what will happen if your blood pressure is not controlled?

Any of the following responses were considered as correct: stroke, heart attack, other heart disease, dementia or mental illness, kidney failure, any other body organ failure and death.

3.5 Do you think that if you feel fine then your blood pressure is also fine?

The participants' responses were considered as correct if they indicated knowledge of the asymptomatic nature of hypertension.

3.6 Do you think that high blood pressure only develops in people who are stressed all the time?

The participants' responses were considered correct if they demonstrated awareness that psychological stress is not the only predisposing factor of hypertension.

3.7 Do you think children can get high blood pressure?

The responses were considered correct if they demonstrated participants' awareness that people can develop hypertension at any age.

3.8 Do you think your tablets alone are enough to control your blood pressure, without you altering your lifestyle, for example what you eat?

The responses were considered correct if they indicated that participants' were aware of the need to supplement their medicinal therapy with lifestyle changes in order to maintain BP control.

3.9 Do you think that high blood pressure is just a normal part of aging that people do not need to take tablets for?

The participants' responses were considered correct if they stated that individuals with hypertension had to continue with their medicinal anti-hypertensive therapy, even at an older age.

3.10 Do you think that as long as you cut down on salt, without taking your tablets for high blood pressure, you will be fine?

The participants' responses were considered correct if they indicated an understanding of the fact that, although salt reduction plays a huge role in lowering BP, hypertensive individuals also need to take their therapy and adopt other lifestyle measures such as engaging in physical exercise.

3.11 Do you believe that your weight can affect your blood pressure?

The participants' responses were considered correct if they demonstrated awareness that bodyweight can affect BP.

3.12 Do you know that there are some foods you should not eat or can only eat in small amounts because of your high blood pressure?

Can you give me examples?

Their responses were accepted as correct if the participants mentioned any of the following: low fat and salt diet, reduced red meat and alcohol intake.

4.6.4.1.2 Questions from the Interview Measuring Knowledge about Anti-Hypertensive Medication

4.1 Are you taking any tablets for your high blood pressure?

This question was included to determine whether the participants were aware that the medication they had been given was for their high BP.

4.2 What are their (tablets) names?

If the interviewee stated names, these were checked against the medication listed in the health passport. Both generic and brand names were acceptable.

4.5 Do you think there is a cure for high blood pressure?

The accepted response for this question was that hypertension has no cure.

4.6 How long are you going to be taking your tablets for high BP?

The participants' responses were considered correct if they showed awareness of the fact that anti-hypertensive therapy was life long.

4.8 When you get or buy medicines or tablets, for example, for flu or a cough, do you tell the pharmacist/nurse that you have hypertension and are taking tablets for it?

The participants' responses were considered correct if they stated that they informed HCPs that they were hypertensive when they were seeking treatment for other illnesses.

4.9 Do you know there are some medicines and tablets that you are not supposed to take because of your hypertension and the tablets you are taking?

The participants' responses were considered correct if they indicated awareness of drug-drug and drug-disease interactions.

4.6.4.1.3 Measurement of Knowledge about Hypertension and its Therapy Using Self-Administered Questionnaires.

The self-administered questionnaires (Appendix D) were given to participants during and after the intervention period. These addressed the same topics as the interview questions, on knowledge about hypertension and its therapy, but in slightly greater detail. Questionnaires on each topic were completed before the educational talk (Section 4.7.2) addressing that particular topic (pre-intervention questionnaires). The same questionnaires were then completed again at the next talk which occurred after a period of about two to three weeks (post-intervention questionnaires) and for the third time (post-post intervention questionnaires) after the summary information leaflets (Appendix E) had been given. The leaflet was available in both English and isiXhosa and will be discussed further in Section 4.8.3. The questions for the self administered questionnaires were obtained from different sources [130,196-198,200].

These self-administered questionnaires were pilot-tested at the PHC. During the pilot study, some of the respondents skipped some questions because they thought they were part of the previous question. This could have been solved by increasing the space between the questions, but this would have meant more pages of paper being used for the questionnaires. Some HCPs at

the PHC had suggested using as few pages as possible when designing questionnaires for this population because patients would be reluctant to respond to long questionnaires. This was demonstrated by the study participants' responses to questionnaires that were more than one page long. Therefore, in order to distinguish between the different questions and simultaneously limit the number of pages used for each questionnaire, the numbers of the questions were in bold font.

4.6.4.2 Measurement of Beliefs about Medicines

4.6.4.2.1 Participants' Beliefs about Medicines

All the participants received copies of the BMQ in both English and isiXhosa so that they could choose which language to respond in. The BMQ was administered before and after the educational intervention. In cases where individuals selected both languages, the responses given in the language where the participant scored higher NCD [130] values were recorded. In this way the participants were given the benefit of the doubt.

Mean and standard deviation values were calculated for the participants' perceptions of the necessity of their medication (n), as well as for their concerns about their anti-hypertensive medicines (c). The average and standard deviation for the NCD were also determined. The mean and standard deviation values were also calculated for the participants' beliefs about the prescribing habits of doctors (o) and the harmful nature of medicines (h) [130]. The pre- and post-intervention mean values for these variables (n, c, NCD, o, h) were compared, using statistical analysis (Section 4.9), to assess the impact of the programme on the participants' beliefs about medicines.

Cronbach's alpha (CA) was used to test the internal consistency of the BMQ [203,204]. CA is a quantity defined in multivariate statistics and has an important use as a measure of the reliability of a psychometric instrument, since it assesses the extent to which a set of test items can be treated as measuring a single latent variable. Data collected using a psychometric instrument, such as the BMQ, can be considered reliable if a CA value of 0.70 or higher is obtained [204].

4.6.4.2.2 Local Health Care Providers' Beliefs about Medicines

HCPs in Grahamstown completed the section of the BMQ measuring general beliefs about medicines. This exercise was carried out in order to compare the HCPs' and participants' general beliefs about medicines. The HCPs included nursing sisters, pharmacists, medical doctors and pharmacy assistants from the PHC, local hospital and the university sanatorium. A letter was sent out to the HCPs requesting them to complete the general section of the BMQ. The letter also explained the aim of the entire study, as well as the objective of this particular exercise.

4.6.4.3 Measurement of Adherence to Anti-Hypertensive Therapy

Medication-taking behaviour was assessed using three different methods namely pill counts, punctuality when collecting prescription refills and participants' self-reports. These measures were chosen because of their inexpensive nature, as well as their simplicity. There were insufficient resources available for the use of the MEMS or biochemical techniques [128,140,147].

4.6.4.3.1 Pill Counts

Each participant was asked to bring all their anti-hypertensive medication to the monthly meetings with the investigator (Section 4.7.1) where the investigator quantified it. The investigator inquired whether the participants had other medication elsewhere and the amount stated was added to that presented for counting. This usually occurred when the participant had collected a refill, but was still using medication from the previous collection. Sometimes the participants could not remember the actual amount left at home, if it was a new and unused supply the investigator could calculate the exact amount (Section 3.2.3). If the medication was from a packet that had been used the participant was encouraged to give an estimate of the number of days that the medication they had not presented would last.

Percentage adherence was calculated using the formula below:

% adherence score = [(Amount of medication actually taken during a specified time period – Amount of medication that should have been taken during that time period) × 100] ÷ (Amount of medication that should have been taken during the specified period)

The amount of medication that should have been taken was calculated from the number of days since the last pill count and the dosing instructions given by the HCPs. The amount actually taken was calculated by subtracting the present amount from the total amounts of medication that should have been received during the specified period. Those who had taken less than the prescribed amount of medication scored a negative percentage, whilst those who took extra scored a positive percentage. The ideal score was 0%. Therefore the closer to 0% the adherence level was, the more adherent the participant.

Adherence was calculated for each of the participant's medications and then an average percentage adherence score was calculated. Whilst calculating the average percentage scores for each individual, the values were added together with their numerical signs (positive or negative). However, in the analysis of the overall data no signs were assigned to the percentage adherence values. There was no distinction made between those who took more medication than prescribed and those who took less. The investigator was measuring the presence, and not the nature, of adherence.

4.6.4.3.2 Punctuality when Collecting Prescription Refills

The details of clinic visits when prescription refills were collected were recorded in the health passport together with the date when the participants were due for their next refill. For the participants who did not have health passports, a letter was written to the HCPs, from whom they received their anti-hypertensive medication, requesting the dates of refill collections for the duration of the study, as well as the amount of medication dispensed with each refill. This was done at the end of the study so that the HCPs only had to provide the information required on one occasion instead of monthly.

Percentage adherence was calculated as follows:

[Number of times when refills were collected on time during a specified period ÷ total number of times when refills should have been collected during that period] × 100

Participants were considered to have sufficiently adhered to their anti-hypertensive medication regimens when they had taken at least 80% of the prescribed amount of medication [139,140].

Therefore, they were considered to have collected their refills on time if they had done so before, on or up to five days after the refill collection date. If a participant took 80% of their medication during a 28 day cycle, then they would have 5.6 days worth of medication on the refill date, hence they had up to five days after the refill date before their medication ran out.

4.6.4.3.3 Self-Reported Adherence

This was in the form of medication diaries filled in by the participants, as well as self-reported medication-taking behaviour during the one-on-one interviews.

- **Medication Diaries**

For this study, the investigator made adaptations to the medication diary designed for patients on anti-retroviral therapy (Appendix G1) at the local hospital and PHC. At the top, the diary had the participant's name, the month and instructions, in English and isiXhosa, on how to use the diary. A copy of the diary used during this study is shown as Appendix G2. The investigator showed participants the correct use of the diary which involved ticking in an appropriate column each time they took their medication. The participants were also asked to record any health-related problems they faced during that month or questions they wanted to ask the investigator at the next meeting. This served as a reminder for the participants since it was possible for them to forget some of their queries on the day they met with the investigator. The diaries were collected during the monthly meetings with the participants.

Percentage adherence was calculated by slightly altering the formula used for pill counts as follows:

% adherence score = [(Amount of medication taken, as indicated by diary – Amount of medication that should have been taken during a specified time period) × 100] ÷ (Amount of medication that should have been taken during the specified period).

- **Participants' Self-Reports during Interviews**

The questions (bold font) associated with the theme of adherence are listed below, together with the responses that the investigator considered as correct. As with questions testing participants' levels of knowledge about hypertension, correct responses were documented using the numerical

figure 1 and incorrect responses using 0. The mean scores before and after the intervention were compared, using statistical analysis (Section 4.9), in order to assess the impact of the educational intervention on participants' self-reported adherence levels.

Questions from the Interview Used to Measure Participants' Adherence to Anti-Hypertensive Medication

4.2a How do you take them (anti-hypertensive medicines)?

Self-reported adherence was documented if participants' responses matched the dosage written in their health passports or on their medication packages.

5.2 Do you ever forget to take your tablets?

Self-reported adherence was recorded if the participants stated that they never forgot to take their medication.

5.4 If you forget to take your tablets today, do you take double the dose tomorrow?

The participants' responses were considered correct if they stated that they did not take double doses to compensate for missed doses.

5.5 If you mistakenly take double the dose of your tablets today, do you skip taking tomorrow's dose?

The participants' responses were considered correct if they stated that they did not skip a dose if they had taken more than one dose the previous day. Another acceptable response was that participants consulted HCPs if they took more than the required dose of their medication.

5.6 Do you always take your tablets even when you are feeling well?

The responses were considered correct if participants stated that they took their medication all the time even when they felt well physically.

Questions from the Interview Used to Measure Participants' Adherence to Lifestyle Recommendations for Hypertensive Individuals

6.2 How many cigarettes do you smoke per day?

Smoking even 1 to 4 cigarettes a day increases the risk of cardiovascular complications [205]. Therefore the correct response was 'None'.

6.3 How is your meat usually prepared?

The participant was considered to be adherent if their response was either 'Boiling' or 'Grilling'.

6.4 How often do you eat 'take-aways' (fast foods)?

The response 'very few times or not at all' was considered as correct.

6.6 How often do you engage in physical exercise?

The participants' responses were considered correct if they reflected that the individuals engaged in regular physical exercises.

6.7 Do you eat the same amount of salt as other family members without high blood pressure or less?

6.8 Do you add salt to your cooked food at the table when you are eating?

These questions sought to determine the participants' salt (sodium) intake patterns. A score was only allocated for Question 6.8. This was because the response to Question 6.7 was relative. For example, one family could have been consuming less than 5g of sodium per person per day. This is the recommended salt intake. If the hypertensive individual in that family consumed the same amount of salt as the rest of the family they would still have been adhering to the recommended salt intake [58].

On the other hand, members of another family could have been consuming 12g of sodium per person per day and the participant 10g per day. Although this value is less than what the rest of the family was consuming, it is greater than the recommended values of sodium intake. It was not possible to ask participants how much salt they consumed because it was likely that they would not have been able to state a specific amount even in terms of spoonfuls. The participants'

responses to question 6.8 were considered as correct if they stated that they did not add salt to food after it had been cooked.

The self-administered questionnaires completed during the intervention period also included questions on adherence to prescribed anti-hypertensive medication and the recommended lifestyle changes. However, the questions were designed to ask what the participants should do and this was not necessarily what they actually did. Hence the questions in these self-administered questionnaires were considered as questions testing participants' levels of knowledge about adherence rather than measuring actual adherence.

Percentage self-reported adherence, based on the interview questions, was calculated as follows:
[Number of responses to questions, during the interview that reflected the ideal behaviour ÷ 14 (Total number of questions, during the interview addressing the issue of adherence)] × 100

4.6.4.4 Measurement of Blood Pressure

This was measured with the participant sitting relaxed and silent in an upright position. The left hand was used and jewellery on that hand was removed. Three BP readings were taken for each patient with intervals of at least two minutes between the measurements. All three readings were recorded and the average value was calculated.

4.6.4.5 Measurement of Weight

The participants were asked to remove their shoes, aprons, overalls, if they were wearing clothing underneath the overalls, as well as jerseys and sweaters. They were also asked to empty their pockets. They were then instructed to stand silently and upright on the scale. The reading on the scale was recorded.

4.6.4.6 Instruments Used for Measurements

The weight was measured using a Soehnle digital bathroom scale that was calibrated against a manual scale in the following manner: the investigator weighed herself, on the manual scale and

then immediately afterwards on the digital scale. The two weight readings were noted to see if there were any differences. There were no differences noted.

BP was measured using a Rossmax Semi-automatic Upper Arm Blood Pressure Monitor with an adult or obese-sized cuff. This was calibrated against a mercury sphygmomanometer using the method for calibrating an Omron Digital Automatic Blood Pressure Monitor Model HEM-907XL [206], which was similar to the Rossmax Blood Pressure Monitor used during this study. The mercury sphygmomanometer and its rubber ball were each connected to 2 separate ends of a T-shaped tube whilst the arm cuff was wrapped around a large metal cylindrical object. The air release valve of the rubber ball was closed. The instrument being calibrated was connected to the other end of the tube and the ON/OFF button was pushed. The rubber ball of the mercury sphygmomanometer was inflated to 4 different pressure values. The reading on the Rossmax Blood Pressure Monitor was noted at each of these pressure values. The instrument would be considered accurate if the difference between its readings and those of the mercury sphygmomanometer ranged between -3 and +3 mm Hg. The readings obtained from the 2 instruments during calibration were within 3 mm Hg of each other. Therefore, the Rossmax Blood Pressure Monitor was considered to be accurate.

4.7 The Educational Intervention

This educational intervention consisted of monthly meetings involving the investigator and the participants as individuals. There were also four group talks held with all the participants, who could attend, where the principal issues concerning hypertension were discussed. The investigator repeated the talks to those individuals who had not attended. This was done during the monthly meetings with the participants (Section 4.7.1). As part of the educational intervention the participants also received summary information leaflets (Appendix E) that highlighted the main points of the four talks presented.

4.7.1 Monthly Meetings

After the baseline one-on-one interviews and administration of the BMQ, the investigator met with the participants individually every month. The participants' work colleagues or supervisors served as interpreters where necessary. The purpose of these meetings was to educate

participants as individuals and to address their queries concerning their health. Their BP, weight, as well adherence levels were measured. Measurements were performed from November 2004 to October 2005, with a 3 month break from December 2004 to February 2005.

Education of participants as individuals was initiated during the third monthly meeting (March 2005). The first two meetings were reserved to establish a rapport with the participants. The investigator also wanted to ensure that the participants were using the medication diaries correctly. Throughout the study, the participants were encouraged to express their concerns and other problems they experienced with their hypertension, as well as the therapy. The investigator addressed the participants' queries and suggested ways of solving these or advised the participants to report to their HCPs. The participants were also reminded of their prescription refill dates and encouraged to take their medication as prescribed. In addition, the participants were given advice on the recommended lifestyle for hypertensive individuals. For example, they were encouraged to engage in physical exercises and employ other methods of losing weight since most of them were overweight or even obese (Section 5.7).

4.7.2 Group Talks

Four topics were addressed during the talks, that is, hypertension, anti-hypertensive medication, adherence and the recommended diet, as well as the ideal lifestyle for hypertensive individuals. The objectives of each meeting will be discussed in the next section under separate headings. The talks were between three and four weeks apart and were held from April to July 2005, with each talk lasting between 30 and 45 minutes, including the time when the participants asked questions. The participants also completed self-administered questionnaires (Appendix D) at these talks.

The talks were presented by two local HCPs, one of the university lecturers and the investigator herself. Where the talks were given by the local HCPs and the university lecturer, the objectives of the talk were discussed beforehand with the investigator. The individual(s) addressing the participants were also given a copy of the self-administered questionnaire for the topic they were presenting. This way the presenters were aware of the expected outcomes of the talks.

4.7.2.1 Objectives of the Group Talks

4.7.2.1.1 Hypertension

The objective of this talk, which was given by two local HCPs, was for participants to understand the following:

- The meaning of BP.
- The causes or predisposing factors of high BP.
- Management (cure versus control) of high BP.
- Prognosis and complications of high BP if not controlled effectively.
- The desirable BP reading.

4.7.2.1.2 Anti-Hypertensive Medication

The objective of this talk, which was given by the investigator, was for the participants to understand the following:

- There is no cure for high BP.
- Anti-hypertensive medicines alone will not be effective without lifestyle modifications.
- Possibility of drug-drug and drug-disease interactions.
- Potential interaction between home remedies and traditional medicines with hypertension or its therapy.

The questionnaire for this topic also raised questions on the participants' use of medicines supplied by traditional healers.

4.7.2.1.3 Adherence

The purpose of this talk, which was given by the investigator, was to emphasise the importance of adherence and for participants to know the following:

- The need to always take their medication as directed.
- What to do if they missed a dose or mistakenly took an extra one.
- The need to take medication everyday even when they felt physically well.
- The fact that anti-hypertensive therapy is life-long.
- Importance of collecting prescription refills before they run out of medication.
- What to do if they experience side effects.

The questionnaire also included three questions to determine whether the participants thought that they were receiving enough information about hypertension and its management from their HCPs. The responses to these particular questions in the post-intervention questionnaires for this topic would reflect if the talk made the participants realise that there was information about hypertension and its therapy that they had not been aware of.

4.7.2.1.4 Diet and Lifestyle

This talk was given by one of the university lecturers and the objective was to make the participants aware of the following:

- Appropriate food preparation for hypertensive individuals.
- Recommended diet, that is, a diet low in salt and fats and rich in fruits and vegetables.
- The importance of cutting down on alcohol and quitting smoking.
- The effect of body weight on BP.
- The effect of physical exercises on BP and weight.

After each presentation, the participants were given an opportunity to ask questions and these were addressed by the person who had given the talk or the investigator herself.

4.7.3 Summary Information Leaflets

After the four talks, a summary leaflet was distributed to the participants (Appendix E) which was available in English and isiXhosa and summarised the main points of the talks. These leaflets were handed out individually to each participant during the monthly meetings after the talks. The investigator asked the participants to go through the leaflet in her presence so that she could address any queries that the participants had about the leaflet before leaving the leaflet with the participants. An interpreter was available where necessary. It was not always possible for the investigator to go through the entire leaflet with the participants due to time constraints from the participants' side.

During the monthly meetings following the distribution of the summary leaflets the self-administered questionnaires (Appendix D) used to test participants' levels of knowledge about hypertension and its therapy were administered again (post-post intervention questionnaires).

This was in order to establish whether the summary leaflet helped participants to remember more information from the talks. When the participants were given the information leaflet, they were not informed that they would have to fill in questionnaires at a later stage. This was done in order to minimise the chances of them merely cramming the points raised in the leaflet.

Another leaflet, the take-home information leaflet (Appendix H3), was designed for the participants and this included information on hypertension and its therapy. It also presented information on the different anti-hypertensive medications that the participants were taking. This take-home leaflet was given to the participants at the end of the study.

4.8 Design of the Take-Home Information Leaflets (THILs)

4.8.1 Background

In 2003, the amended regulations to the Medicines and Related Substances Act 101 were published stating that pharmaceutical industries must provide Patient Information Leaflets (PILs) with all the medicines they manufacture [207]. Considering that patients' medicines information needs have been increasing [61,63], this amendment plays a role in improving relations between HCPs and patients which has the potential to increase patient adherence to medication [22,74,80,128,129].

The information to be incorporated in the PILs is listed in Appendix H1 and includes the name, dosage form, scheduling status, composition, intended use, contraindications, warnings, dosing instructions and side effects of the medicines accompanied by the statement: "Not all side-effects reported for this medicine are included in this leaflet. Should your general health worsen while taking this medicine, please consult your doctor, pharmacist or other health care professional for advice" [207]. This list of requirements meets the medicines information needs of most patients, as shown by previous studies [18,63,67,82]. The THILs served to emphasise the information that the participants received during the educational intervention and also enabled the individuals to have access to other important information that might not have been addressed during the talks and monthly meetings. The participants could also refer to this leaflet if they forgot the information they had received during the intervention.

4.8.2 Content of the THILs

The THILs included details of anti-hypertensive medication and also included the information presented in the summary leaflets (Appendix E). The THILs were personalised in that each participant received a leaflet containing information about the specific medicines that they were taking for their hypertension. The different anti-hypertensive medicines taken by the participants are listed in Table 4.1 together with the number of participants taking each particular medication. There was also a general section in the leaflet that addressed topics such as missed doses, tips on remembering to take medication and the use of other medications, to mention a few. There were a few pictures in the THILs including photographs of participants' medication packages, a sphygmanometer, tablets and a person exercising.

Table 4.1: Names of Anti-Hypertensive Medicines Used by Participants and the Number of Participants Taking Each Medication.

Generic name of medication	Number of participants who took it
Hydrochlorothiazide (HCTZ)	30
Perindopril	15
Atenolol	6
Nifedipine	5
Furosemide	4
Reserpine	4
Verapamil	4
Hydralazine	3
Indapamide	2
Amlodipine	1
Lisinopril	1
Combinations:	
Enalapril and HCTZ	2
Amiloride and HCTZ	1
Bisoprolol and HCTZ	1

The specific medicines information fell under the following headings: name of the active ingredient, mode of action, dosing instructions, side effects and other important points, such as contraindications. Due to the controversy regarding whether or not to give patients information on side effects [208-210], only a few were listed in the THILs. These side effects were described as having been reported by other people who had made use of the same medication. As prescribed in the Medicines Control Act 101 of 1965 there were also statements explaining that these were not the only side effects that could occur and that the participants would not

necessarily experience any of the mentioned side effects [207]. There was also an instruction to report any health-related problems to a HCP, even if the individual did not think these problems were caused by the medication that the individual was taking.

Overall the THILs consisted of the following:

- A cover page entitled ‘You Can Control Your High Blood Pressure’, in English and isiXhosa, with a picture of a sphygmanometer being used to measure BP. The sphygmanometer in the picture was the one that had been used during the study and participants were therefore familiar with it.
- A contents page.
- The information included in the summary information leaflets.
- An introduction to the section describing information about the specific anti-hypertensive medications that the participants were taking.
- Information about the specific anti-hypertensive medications that each participant was using.
- A general section with other relevant information about hypertension and its therapy.
- Tips on how participants could remember to take their medication.
- Health care facilities in Grahamstown where they could seek medical attention and health-related information.
- After the contact details mentioned above, a statement, in bold font, reminding participants that they could control their BP by taking the appropriate actions such as taking their medications correctly and adhering to lifestyle recommendations.
- The back cover included a list of references for the information included in the leaflet, the date when, and address where, the leaflets were designed.

The number of pages in each THIL ranged from 24 to 36, depending on the number of medications for which information was included in the document. An example of a THIL is included as Appendix H3.

4.8.3 Format and Languages Used in the THILs

The THILs were in the form of A-4 size booklets with each page, except the cover and back pages, divided into two columns one presenting the information in English and the other in isiXhosa. The headings were in the form of questions in bold font and Times New Roman font size 14 was used throughout. All the information in the leaflet, except the references, date and place of publication, was provided in English and isiXhosa.

4.8.4 Pilot Testing of the THILs

The THILs were pilot tested to assess the acceptability of its design and content, as well as understanding of the terms used. The pilot study was carried out with 31 hypertensive patients at the PHC. The investigator greeted the individuals, introduced herself and explained the purpose of the exercise. There was a retired nursing sister available as an interpreter, as well as a CHW from the PHC.

Verbal, informed consent was obtained from the volunteers who were then given the THILs, requested to read it and asked questions regarding the design and content of the leaflet. A copy of the pilot study questionnaire is shown in Appendix H2. Only a portion of the THILs was tested, which included the cover page, a page introducing the information about the different medications and details of one specific medication. The main reason for not testing the entire document was lack of adequate time for volunteers to read the entire document.

The volunteers were reluctant to take part during the time when they were waiting to see the nursing sister because they believed that they would lose their place in the queue. Reassurance that this would not be the case convinced a few individuals. The volunteers preferred to take part whilst they were waiting outside the dispensary for their medication. However, the time spent there was limited and once the individuals collected their medication they were anxious to leave the PHC because, by then, they had spent a long time at the facility. It was not feasible to allow the volunteers to take the leaflets home for the investigator to follow up on them. These individuals lived in different areas around Grahamstown and the investigator would not have been able to contact all the individuals to question them about the leaflet. More importantly,

there was no reassurance that all the individuals presented with leaflets would retain them or even read them.

Each of the pilot study volunteers was given a THIL with information about one of the anti-hypertensive medications they were taking. Some of the main study participants had medication brands different from those available at the PHC because they received theirs from private sector HCPs. The private sector also supplied formulations consisting of more than one anti-hypertensive medication. However, the active ingredients in these different brands or the combination formulations from the private sector HCPs were available at the PHC. Therefore the leaflets designed for individuals taking these formulations were considered to have been pilot tested.

Bisoprolol, lisinopril, enalapril, amlodipine, indapamide and amiloride were not available at the PHC. However, they belong to the same pharmacological classes as other medications that were dispensed at the facility. The information provided for the medication in each of these classes was mostly similar and therefore the leaflets with information regarding these medications were also considered to have been pilot tested.

4.8.5 Changes to the THILs after Pilot-Testing

The pilot study volunteers reported that they understood all the words in the THILs. The only exceptions were two individuals who stated that names of their medication were words that they did not understand. It was explained to them that these were merely names of their medication and had no particular meaning. The volunteers also reported not having suggestions on how the leaflet could be modified. The only changes made to the leaflet were corrections of grammatical errors that the investigator noted during the pilot study.

4.8.6 Distribution of the THILs

After all the necessary changes had been made, the THILs were given to the main study participants. They were asked to go through these leaflets to determine whether there was information that they did not understand. This was the last meeting with the participants and they were also asked to share their opinions of the entire programme. This was done through the use

of a self-administered questionnaire (Appendix I) and in order to maintain anonymity they were asked not to write their names on the questionnaires. The responses were summarised and are included in Section 5.11 and Appendix I

4.9 The Statistical Methods Employed to Test the Hypotheses Proposed in this Study

A one-way Analysis of Variance (ANOVA) statistical test was performed to investigate the effect of age, level of education, number of anti-hypertensive medicines and number of years since diagnosis of hypertension on the following variables:

- Levels of knowledge about hypertension and its therapy.
- Beliefs about medicines
- Levels of adherence

Scheffe's multiple comparisons test was used to test for pair-wise differences when the ANOVA results were significant.

The t-test for independent samples was used to ascertain the effect of gender and availability of medical insurance on:

- Levels of knowledge about hypertension and its therapy
- Beliefs about medicines
- Levels of adherence

Normality was examined using Kolmogorov-Smirnov test and homogeneity of variances determined using Levene's test.

Paired T-tests for dependent samples were performed to compare the following variables before, during and after the intervention:

- Levels of knowledge about hypertension and its therapy
- Beliefs about medicines
- Levels of adherence to anti-hypertensive therapy
- Systolic and diastolic BPs
- BMIs

Correlation analyses using the Pearson correlation coefficient were performed to test for correlations between the following variables:

- Specific beliefs about medicines and levels of adherence to anti-hypertensive therapy
- Level of knowledge about hypertension, as well as its therapy and levels of adherence to therapy
- Levels of knowledge about hypertension and specific beliefs about medicines
- Systolic as well as diastolic BP and level of adherence to therapy
- BMI and systolic, as well as diastolic, BP

Bonferroni adjustments to the level of significance were used, for multiple correlations, to ensure that the overall level of significance did not exceed 0.05.

The probability of committing a Type II error which is the probability of not detecting a difference due to intervention when in actuality there is a difference (denoted by β) and estimates of the effect size of the tests were determined. The estimate of the effect size of the test is the proportion of total variability attributable to the educational intervention [211]. This test was done on the participants' levels of knowledge about hypertension as well as its therapy, their beliefs about medicines and their adherence levels.

4.10 Summary of the Study's Procedures

Table 4.2 summarises the various activities that took place throughout the study, as well as the time frames.

Table 4.2: Summary of the Study's Procedures

Month	Activity
0-2	Approval from Ethics committee, presentation of research proposal to local HCPs, invitation letters sent out
2-3	Launch of the programme by Vice Chancellor, administration of pre-intervention BMQs for participants and HCPs
3-4	Pre-intervention interviews
4-5	Pre-intervention measurements (BP, BMI, adherence)
5-8	FGD, Christmas break
9-13	Monthly meetings, intervention period measures (BP, BMI, adherence), talks and discussions, intervention questionnaires (pre and post), summary leaflets distribution, design of THIL
14-17	Post-post intervention questionnaires, post-intervention measurements (BP, BMI, adherence), post-intervention BMQ, post-intervention interviews
18-24	Pilot testing and distribution of THIL, participants' evaluation of the intervention

CHAPTER FIVE
RESULTS

5.1 The Study Participants

5.1.1 Baseline Study Participants

There were 84 individuals who responded to the invitation letters (Appendix A1), 74 of which met the eligibility criteria (Section 4.2.2) whilst the other 10 did not. Of those eligible for the study, five were involved in the pilot testing of the interview questionnaire (Section 4.6.3.2) leaving 69 for the main study. Table 5.1 shows the characteristics of these 69 baseline participants whilst Figure 5.1 shows the flow of participants throughout the study. The reasons for participants dropping out of the study are listed together with the number of participants (n) who dropped out for each particular reason.

Figure 5.1: Flow of Participants throughout the Study (n = number of participants)

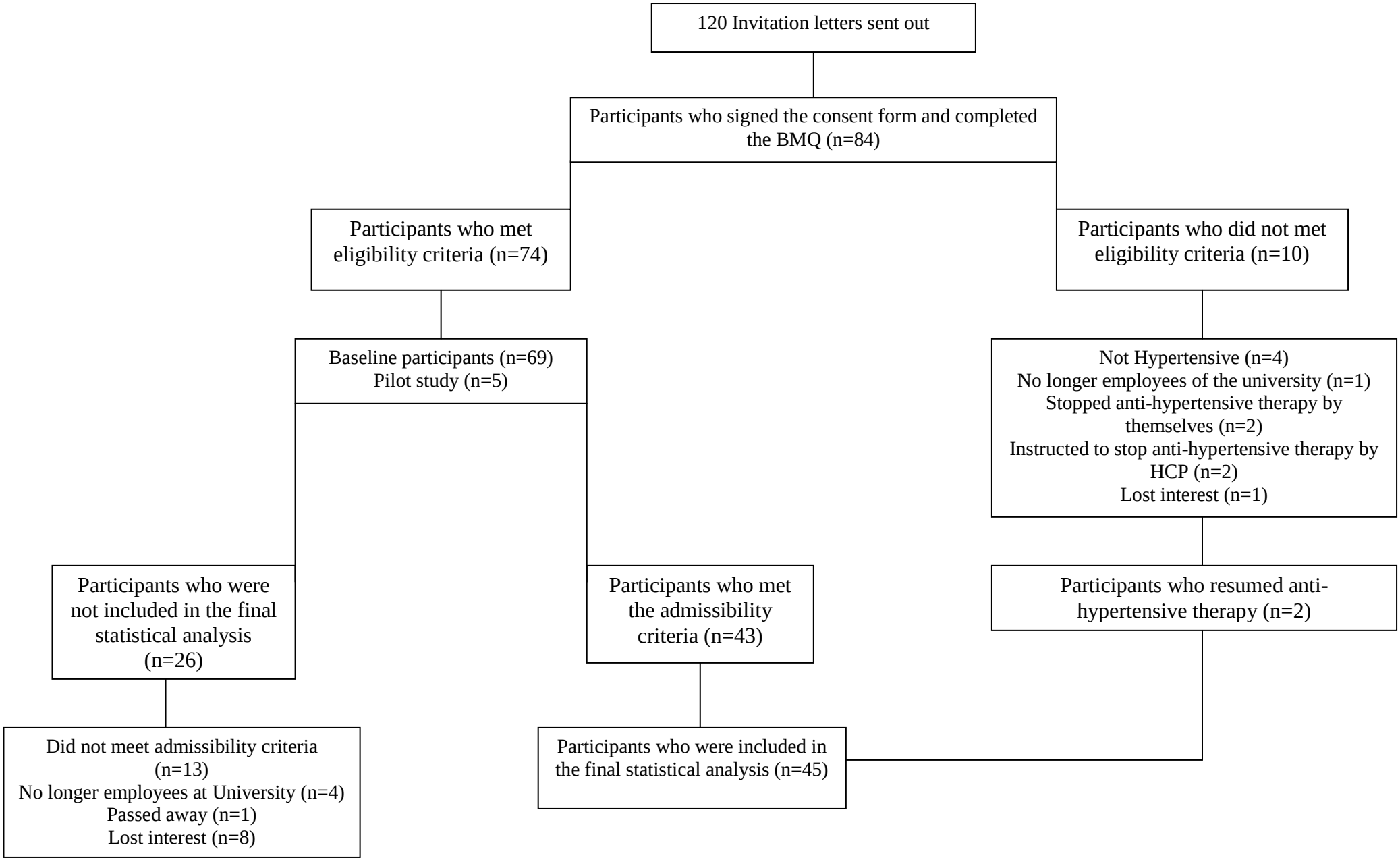


Table 5.1: Characteristics of Study Participants at Baseline Level (n = 69)

Characteristic	Number of participants	Percentage
Gender:		
Female	47	68.12
Male	22	31.88
Age (years):		
<40	7	10.14
41-60	60	86.96
>60	2	2.90
Race		
Black	60	86.96
White	1	1.45
Coloured	8	11.59
Home language:		
English	3	4.35
isiXhosa	59	85.51
Afrikaans	7	10.14
Highest qualification:		
Grade 1-4	4	5.80
Grade 5-7	16	23.19
Grade 8-12	48	69.57
>Grade 12	1	1.45
Co-existing chronic conditions (some participants had more than one):		
Diabetes	9	13.04
Asthma	4	5.80
Epilepsy	2	2.90
Arthritis	8	11.59
Gout	3	4.35
Gastric ulcers	5	7.25
Fibromyalgia	1	1.45
None	39	56.52

5.1.2 Admissibility Criteria

In order for participants' data to be included in the final statistical analyses of the study, they had to meet specific criteria listed below. The participants had to have data available for the 3 phases of the study, namely pre-intervention, intervention and post-intervention. Of greatest importance were the pre- and post-intervention periods as they were used to assess the overall impact of the educational intervention on the different parameters. The data collected included adherence levels, BP readings, BMIs, beliefs about medicines and levels of knowledge about hypertension as well as its therapy.

The admissibility criteria are listed as follows:

- Participants who met with the investigator at least twice during the pre-intervention period, once during the intervention period and twice in the post-intervention period. Such participants would have BP readings, as well as BMIs available.
- Participants who were interviewed, using the questionnaire (Appendix C), both before and after the intervention.
- Participants who completed the BMQ (Appendix B) both before and after the intervention.
- Participants who had adequate data obtained from at least one of the three methods used to measure levels of adherence, that is, pill counts, punctuality in collecting prescription refills and self-reports (Section 4.6.4.3). Adequate data was enough data to be able to calculate adherence for each time period using at least one of these three methods.
- Participants who completed all three self-administered questionnaires (pre-, post- and post-post intervention) used to determine levels of knowledge about hypertension, its therapy, adherence and the recommended diet as well as lifestyle for hypertensive individuals (Appendix D).
- Participants who attended, or met with investigator to discuss, the four topics, 'hypertension', 'anti-hypertensive medication', 'adherence', as well as 'diet and lifestyle'.

With regard to calculation of adherence, only 28 (62.2%) participants had data available from all the three methods. Adherence levels were therefore calculated and reported separately for each method, using the number of participants with enough admissible data for that particular method.

By the end of the study there were still 56 participants taking part and 45 of these, 11 (24.4%) males and 34 (75.6%) females, met the admissibility criteria listed above. The other 11 did not meet the admissibility criteria. The demographics and other characteristics of the 45 participants who met the admissibility criteria are described in Section 5.3.

5.2 Focus Group Discussion with Local Health Care Providers

The investigator held the FGD with three nursing sisters from the PHC. Appendix F is a table outlining the different questions that the investigator raised during the FGD and the responses given by the nursing sisters. The nurses reported that they counselled hypertensive patients at the time of diagnosis and afterwards if their BP did not seem to be controlled. The advice given included recommended lifestyle measures such as a low fat, as well as a low salt diet, with an emphasis on fruits and vegetables. They also advised patients to consume more white meat compared to red meat, engage in physical exercises and to lose weight. The nursing sisters also reported that they raised patients' awareness on the possibility of interactions between medicines for diseases other than hypertension, as well as complementary medicines, and their anti-hypertensive medications or the hypertension itself. Patients were advised to carry their health passports and anti-hypertensive medication packages with them when they visited any health care facilities, for example, private practitioners' rooms. This way the HCPs that the patients visited would have access to the patients' medical history.

The nursing sisters reported the absence of a checklist for the topics that were addressed when hypertensive patients were counselled. They depended on their own memory and it was possible for them to forget some important points whilst counselling a patient. One of the nurses stated that although there were some patients who did not adhere to their therapy due to lack of pertinent information, some were deliberately non-adherent in order for their BP levels to remain elevated so that they could receive Disability Grants[4] from the government. Some patients even tried to manipulate their BP readings, for example, by placing salt beneath their tongues before their BP was measured.

Talks were given sporadically at the PHC and these were not planned. These talks only benefited those individuals attending the PHC on the particular days and times when the talks were given. From the discussion with the nursing sisters, as well as the investigator's observations, it was gathered that written information materials such as posters and information leaflets addressing the topic of hypertension and its therapy were absent at the facility. There was a poster available

[4] Disability Grant is a monthly payment given by the South African government, either temporarily or permanently, to adults who are not able to work due to a mental or physical disability. To qualify for the grant, one's monthly income must be below a specified amount.

in one of the consultation rooms which described the stepwise treatment for an individual diagnosed with hypertension and was therefore for the benefit of HCPs only.

5.3 Final Study Participants

5.3.1 Demographics

The frequencies of the various demographic factors of the participants are presented in the form of diagrams such as bar graphs and pie-charts as follows.

Figure 5.2: Frequency of Participants' Age Groups

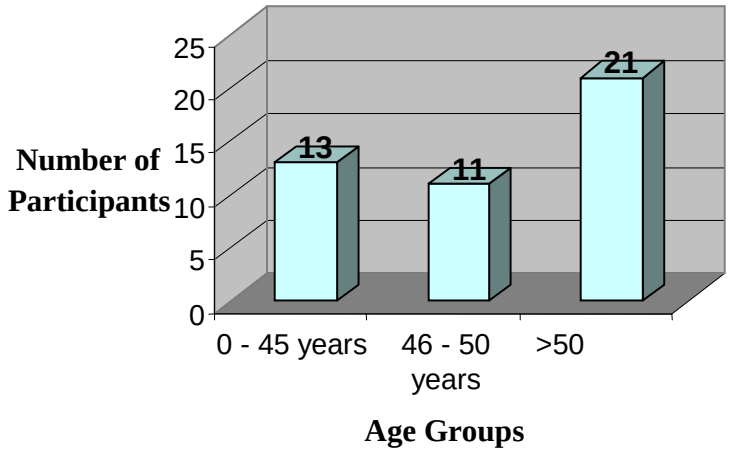


Figure 5.3: Frequency of Participants' Race Groups

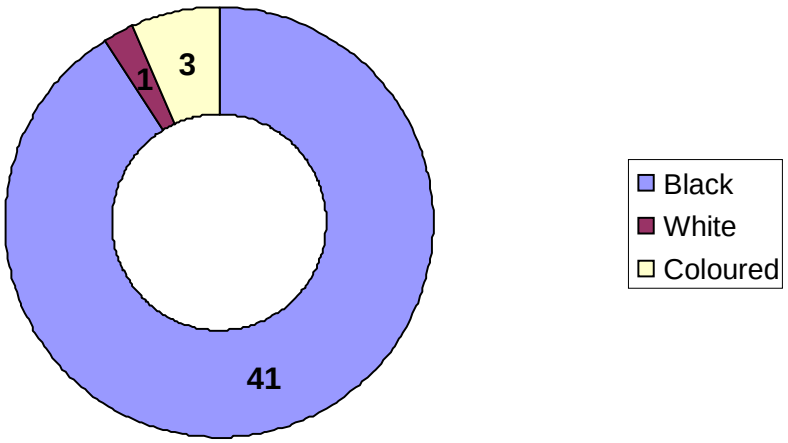


Figure 5.4: Frequency of Participants' Home Languages

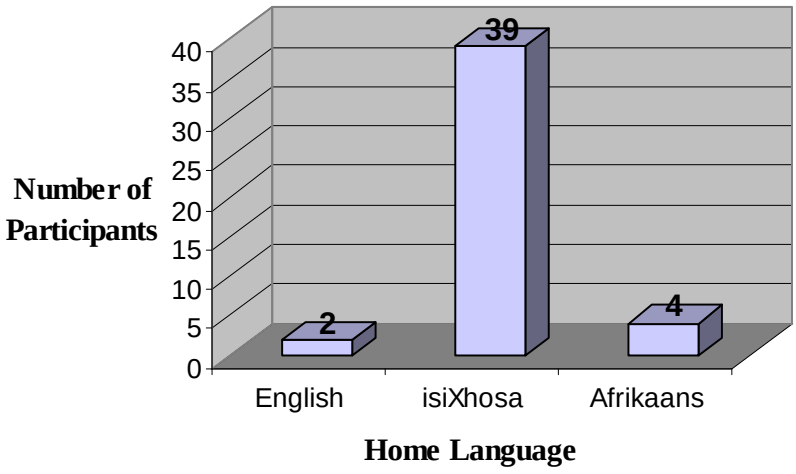


Figure 5.5: Participants' Language Proficiency

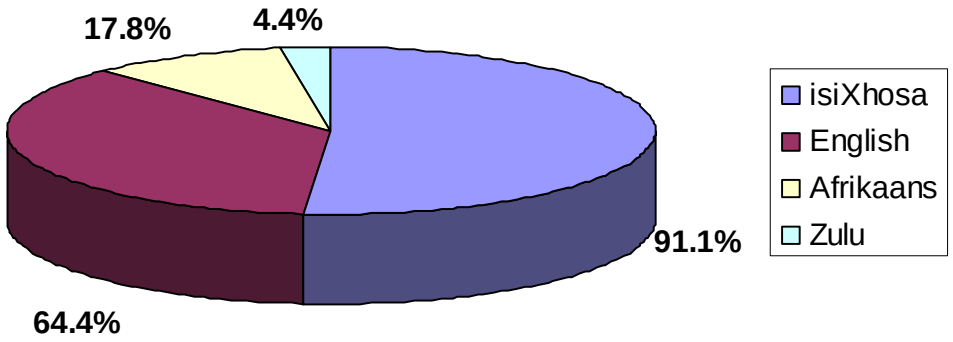
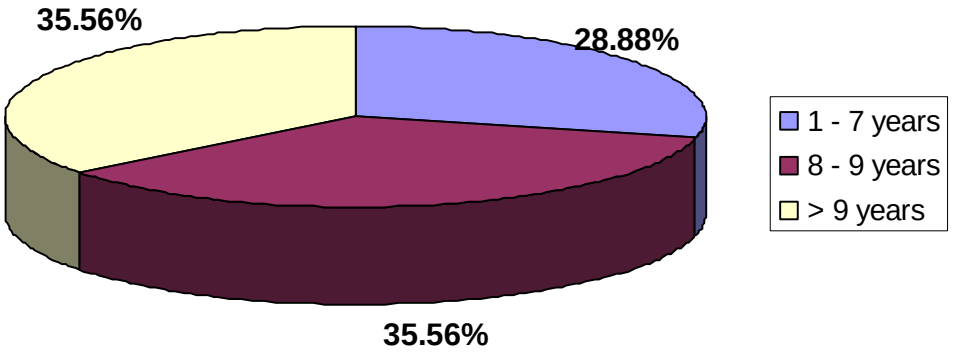


Figure 5.6: Frequency of Number of Years of Formal Education Received by the Participants



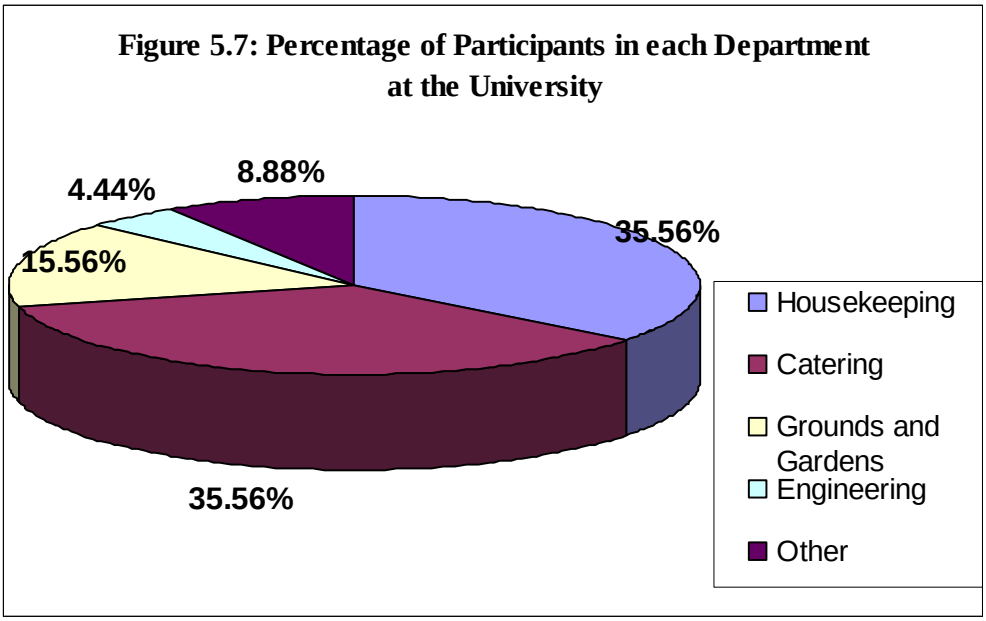


Figure 5.7: Percentage of Participants in each Department at the University

5.3.2 Medical History

Figure 5.8 presents the co-morbid chronic conditions that some (15) of the participants had. Some participants had more than one co-morbid condition.

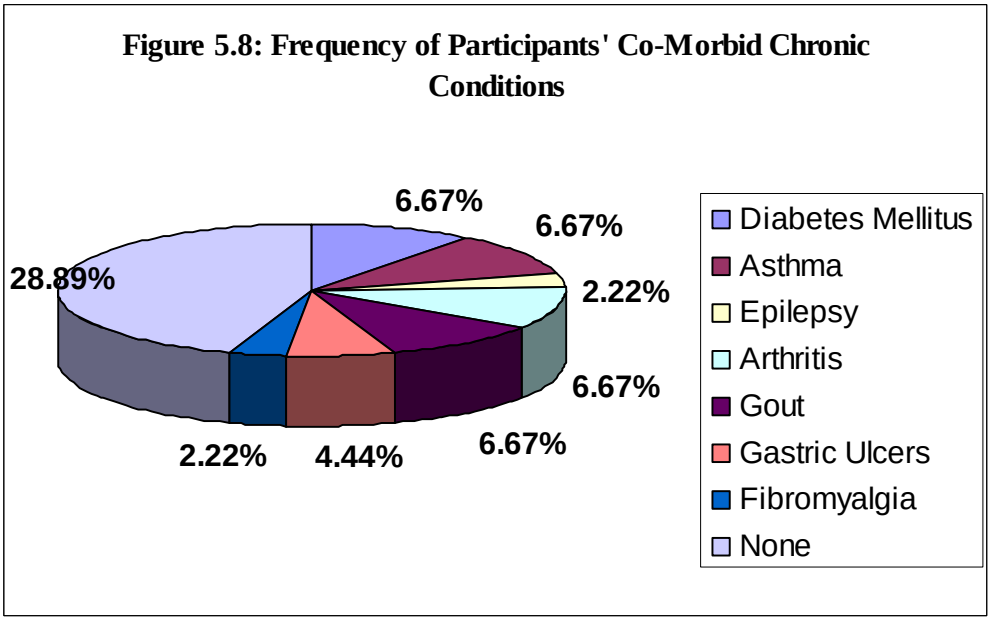


Figure 5.8: Frequency of Participants' Co-Morbid Chronic Conditions

Figure 5.9 shows the frequency of participants' visits to health care facilities for medical attention before and after the educational intervention. These did not include the visits that the participants made to collect their chronic prescription refills. After the intervention there were no participants who visited health care facilities on a monthly basis except to collect prescription refills. There was also a decrease in the number of participants who visited health care facilities once every two months. The numbers of participants seeking medical attention once and twice a year increased.

Figure 5.9: Frequency of Participants' Visits to Health Care Facilities

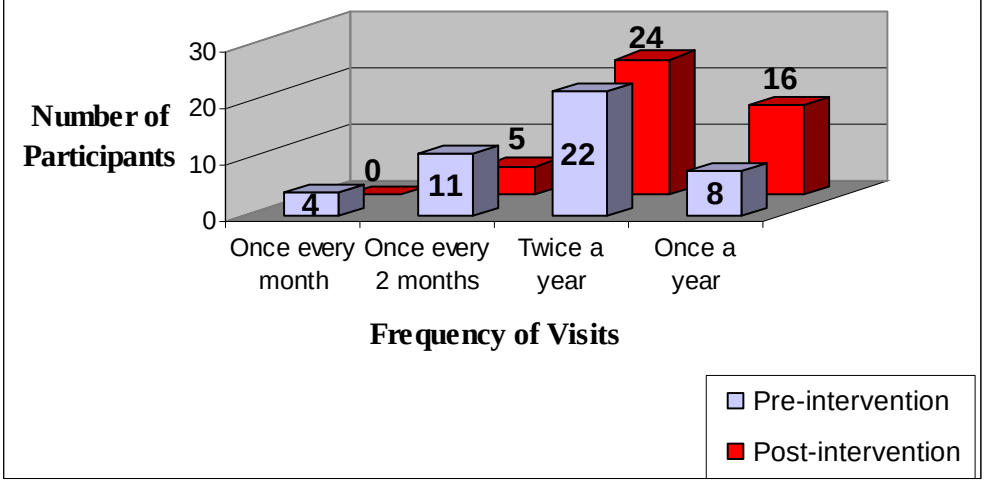


Figure 5.10: Length of Time since Diagnosis of Hypertension

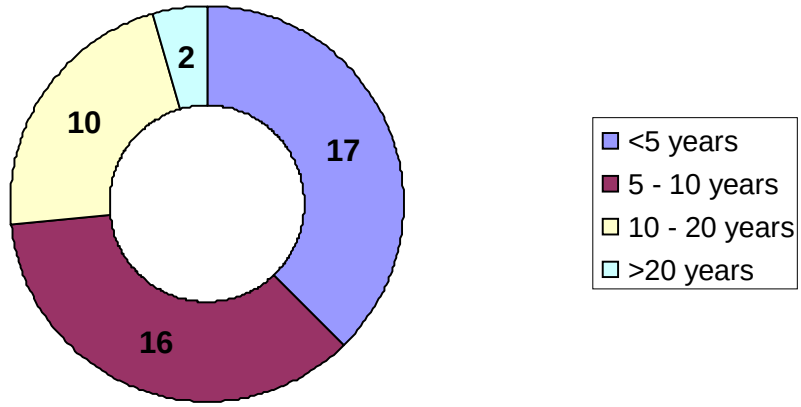


Figure 5.11: Hypertensive Family Members

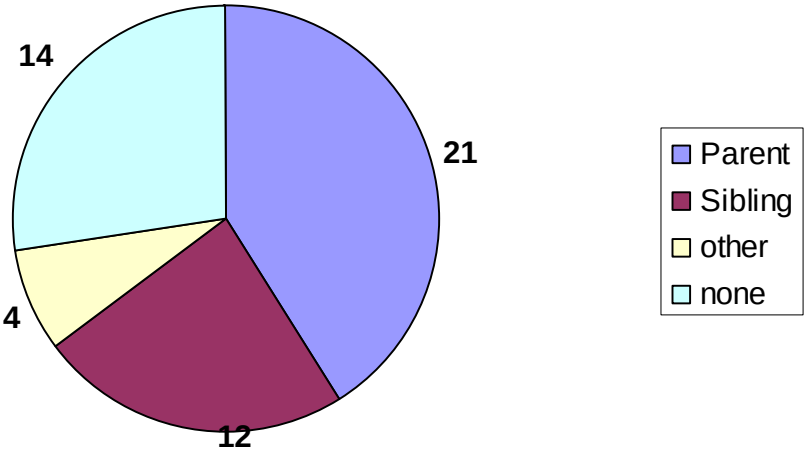


Table 5.2 presents the rest of the participants' medical history gathered during the one-on-one interviews.

Table 5.2: Study Participants' Medical History

Questions raised	Pre-intervention	Post-intervention
Hospitalised in the past	19	19
Do you ever feel tightness in the chest or pain or difficulty in breathing?	16	16
Trigger factors for chest tightness and breathing difficulties		
Asthmatic	1	4
Flu/cough	8	7
Changes in the weather	4	0
Walking long distances or running	5	2
Night time	2	1
Other	2	0
Not known	0	2
Does this (tightness of chest) ever happen when you are lying down flat?	5	5
How often do you get headaches?		
Very rarely	24	22
Some of the time	9	10
Most of the time	4	9
Almost always	8	4
Site of pain where headache is experienced		
Forehead	13	10
One-sided	7	7
Temporal area	2	2
Whole head	5	2
Back of head	10	5
Varies	3	4
Rarely gets headache	5	15

5.3.3 Knowledge about Hypertension

Table 5.3 shows the frequencies of responses to the questions participants were asked relating to knowledge about hypertension.

When asked if they thought their hypertension was controlled, before and after the intervention, 39 (86.7%) participants answered "Yes". When BP records were observed the following were noted: before the intervention 12 (26.7%) participants could be classified as having poorly controlled hypertension (average diastolic BP readings above 90 mm Hg, systolic BP readings

more than 140 mm Hg, or both). After the intervention the number of participants with poorly controlled hypertension increased to 15 (33.3%).

Table 5.3: Frequency of Responses to Interview Questions Relating to Knowledge about Hypertension

Question raised	Number of participants who gave correct responses during the interviews	
	Pre-intervention	Post-intervention
Defining hypertension	1	23
Desirable blood pressure	7	25
Consequences of uncontrolled blood pressure	27	44
The asymptomatic nature of hypertension	29	35
Only psychologically stressed people can develop hypertension	30	43
Children can develop hypertension	19	39
Anti-hypertensive agents alone being enough to control blood pressure	31	40
Hypertension being a normal part of aging which requires no therapy	45	45
Reducing salt (sodium chloride) intake alone being enough to control blood pressure	40	45
Body weight can affect blood pressure	42	43
Awareness of recommended diet for hypertensive individuals	36	45
Read literature on hypertension		
Magazines and information leaflets	11	11
Books	2	5
Internet	1	2
Posters	0	1
Summary leaflets distributed during the study	0	37
None	33	4

5.3.4 Medicinal Hypertension Treatment

5.3.4.1 Participants who were not on Anti-Hypertensive Medication

Four (8.9%) of the participants had reported not taking anti-hypertensive medication during the pre-intervention interviews. Of these, two had stopped because they were instructed to do so by their general practitioners, one decided to stop on his own after experiencing pain in the chest, which he believed was caused by his medication and the fourth participant lost his health passport, became anxious about being harassed by the nursing sisters if he reported at the university sanatorium or PHC, and thus decided to not to refill his prescription, especially since

he was not experiencing any pain or discomfort. Initially these four participants had been excluded from the study as they did not meet the eligibility criteria due to their not being on chronic anti-hypertensive therapy. However, before the educational intervention began, two of them (one who had been instructed to stop and one who had stopped because of pain in his chest) resumed their anti-hypertensive therapy and were therefore readmitted into the study.

There was one participant who joined the study because he had been told by the nursing sisters at the PHC that he was hypertensive. He had been given a month's supply of medication, but he reported that he had not been told to return for more the following month. The investigator advised this participant to visit the university sanatorium or the PHC to seek advice from the HCPs. He visited the local PHC and his anti-hypertensive therapy was resumed. However, during the study the participant did not always present his medication and health passport for the monthly meetings with the investigator. At times he did not arrive for the scheduled monthly meetings. As a result he did not meet the admissibility criteria and his data was therefore not included in the final statistical analysis of the study's findings.

5.3.4.2 Participants' Knowledge about Anti-Hypertensive Medicines

At the beginning of the study, two of the participants were not taking their medication according to the instructions written on their medication packages or in their health passports. After further questioning, the investigator realised that these two participants were imitating some of their friends who were on the same medication and advised them on the appropriate dosages. During the post-intervention interviews all the participants reported correct dosages for their medication. Before the intervention, 30 (66.7%) of the participants reported that they informed HCPs of their hypertension and chronic therapy when they were consulting the latter about another illness, for example, a cough. The number of participants reporting this behaviour increased to 39 (86.7%) after the intervention.

Table 5.4: Frequency of Responses to Interview Questions Relating to Knowledge about Medicinal Hypertension Treatment.

Question raised	Number of participants who gave correct responses during the interviews	
	Pre-intervention	Post-intervention
Names of anti-hypertensive medications	11	24
Purpose of medication		
Help individual	18	7
Lower/control blood pressure	21	38
Keep individual alive	2	0
Not helpful	2	0
Unknown	3	0
How it works	1	2
Hypertension can be cured	32	45
Duration of anti-hypertensive therapy	24	45
Awareness of drug-condition (hypertension) or drug-drug interactions	19	32
Awareness of side effects of anti-hypertensive medications		
Increased urination	4	4
Gastric Ulcers	1	0
Dizziness	1	2
Increased sweating	1	0
Increased thirst	1	0
Cough	6	4
Stomach muscle cramps	0	1
Heart problems	0	1
Constipation	0	1
Not aware of any side effects	38	34
Action taken after experiencing problems with medication	43	45
Storage of medications	45	45

5.3.5 Participants' Self-Reported Adherence

Table 5.5 shows the responses to questions that were raised during the one-on-one interviews to determine the participants' levels of self-reported adherence.

5.3.6 Lifestyle with Hypertension

Table 5.6 as well as Figures 5.12 a and b show the responses to questions that were raised during the interviews to determine participants' level of self-reported adherence to recommended lifestyle measures for hypertensive individuals. It was interesting to note that although 31

(68.9%) participants reported preferring the use of stairs to elevators, the reasons for doing so were not always for the sake of increasing physical activity. Fear of elevators was one of the main reasons given for preference of stairs to elevators when going from one floor to another. Another reason was that most of the buildings where the participants worked did not have elevators and therefore they had no option but to use the stairs.

Table 5.5: Responses to Questions Relating to Self-Reported Adherence

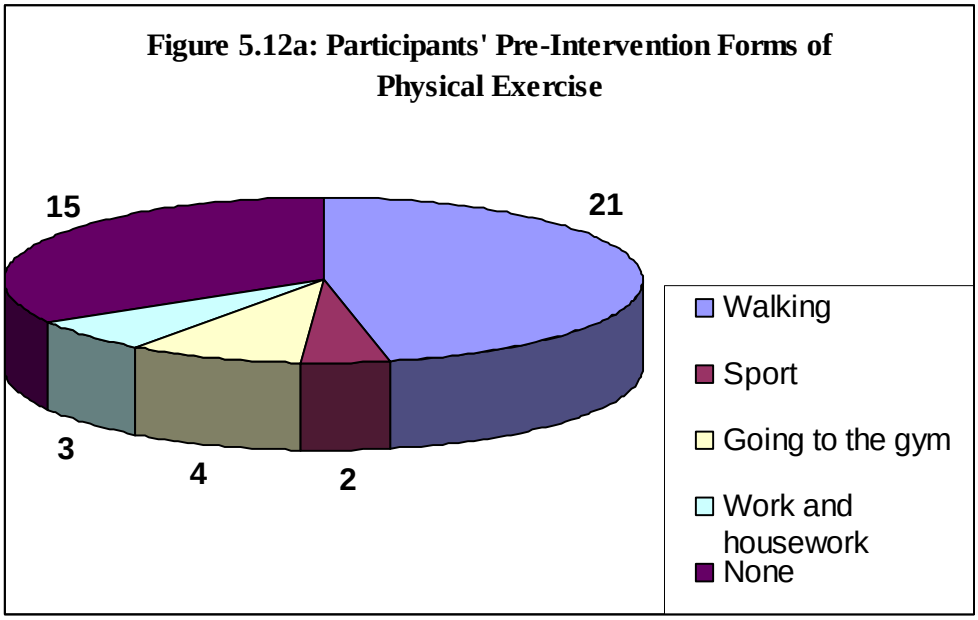
Questions raised	Response	
	Pre-intervention	Post-intervention
Always took medication as directed		
Yes	43	45
No	0	0
Not taking anti-hypertensive medication	2	0
Forgot to take medication		
Always	0	0
Sometimes	17	26
Never	26	19
Not taking anti-hypertensive medication	2	0
Reminders to take medication		
Family member	18	10
Colleague	3	3
Store medication in conspicuous place	4	3
Individual takes medication wherever he/she goes	2	4
Associate taking of medication with a daily activity	0	2
Medication diaries distributed during study	0	1
Other	1	1
None	18	21
If one dose is skipped double dose taken next time		
Yes	3	0
No	42	45
If mistakenly takes double dose, skips next dose		
Yes	4	7
No	41	38
Always take medication even when feeling well physically		
Yes	39	45
No	4	0
Not taking anti-hypertensive medication	2	0
Other reasons, besides forgetting, for not taking medication as directed		
Does not think the medication is necessary	3	0
None	42	45

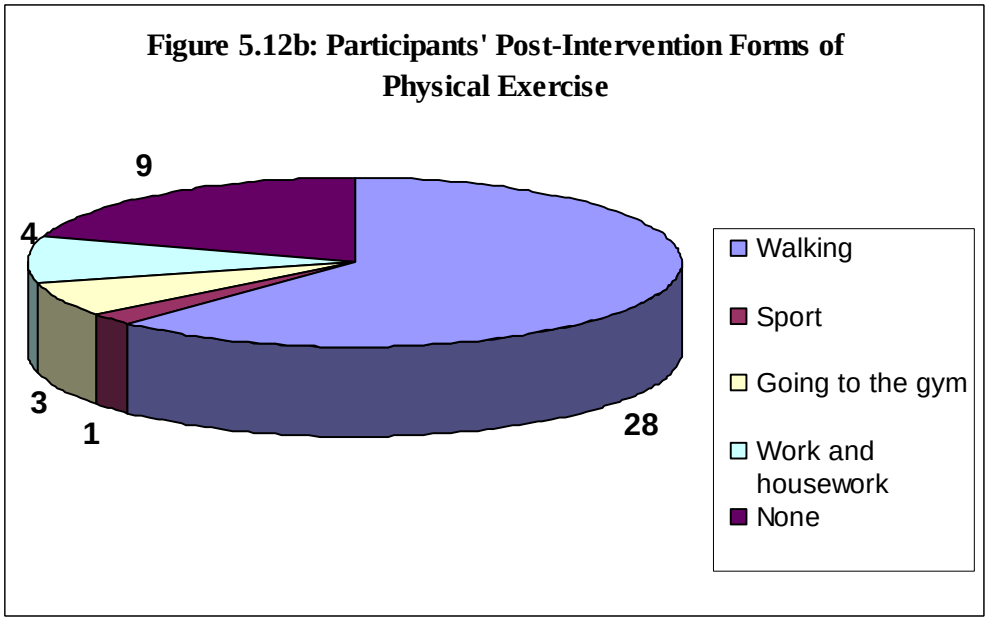
Walking was the most common form of exercise reported by participants (Figure 5.12 a and b and in some cases, the distance walked was as much as 5km. Before and after the intervention,

four and three participants, respectively, reported that their work at the university and housework at home was sufficient physical exercise for them. The jobs of most participants consisted of a substantial amount of manual work including gardening, cleaning buildings, repairing appliances and food preparation (Section 4.1). Reasons given for not engaging in other forms of physical exercise besides walking included lack of time, fear of being laughed at by neighbours and colleagues and lack of knowledge about other forms of physical exercise to engage in.

Table 5.6: Frequency of Responses to Interview Questions Relating to Participants' Lifestyle with Hypertension

Questions raised	Number of participants	
	Pre-intervention	Post-intervention
Frequency of alcohol consumption		
Never	22	23
Occasionally	21	17
Once a week	2	4
Twice a week	0	1
Everyday	0	0
Number of cigarettes smoked per day		
0 – 4	42	41
>4	3	4
Most common method of meat preparation		
Frying	4	5
Boiling	41	40
Consumption of 'fast foods' (take aways)		
Very rarely or not at all	43	44
Frequently	2	1
Preference for stairs as opposed to elevators		
Always use elevator	2	1
Mostly use elevator	9	11
Mostly use stairs	24	28
Always use stairs	2	3
Use both equally	8	2
Addition of salt to cooked food		
Often	0	0
Never	39	39
Sometimes	6	6





5.3.7 Effect of Hypertension on Daily Living

Table 5.7 shows the participants' responses to the questions that were raised concerning the effect of hypertension on their day to day living. Of the 20 participants on ACE inhibiting agents before the intervention, three (15%) reported experiencing a dry cough, a commonly reported side effects of these agents. After the intervention all 16 participants who were still taking these agents

reported that they were not experiencing the cough. Of the three who had been experiencing the cough before the intervention, one started using another type of anti-hypertensive medication during the course of the intervention. This change was made by her medical doctor at the participant's request. The participant had complained to the investigator that she was always coughing and had tried various medicines to stop the cough, but none had worked. The investigator advised the participant to discuss the issue with her medical practitioner. The medical practitioner then changed the participant's anti-hypertensive medication. The other two participants were no longer experiencing the cough.

Table 5.7: Frequency of Responses to Interview Questions Relating to Effect of Hypertension on Participants' Day-to-Day Living

Questions raised	Number of participants	
	Pre-intervention	Post-intervention
Concerns about medication		
Side effects	2	2
Quantity of anti-hypertensive medication taken	2	0
Having to take medication indefinitely	3	0
Medication did not appear to be working	1	0
Falling ill if medication he/she stopped medication	1	0
None	39	43
Effect of hypertension on life		
Sometimes felt too dizzy to do anything	2	0
Could not do much when blood pressure was elevated	1	0
Had to sit down often to rest	3	0
Felt dizzy when going up a steep incline	3	1
Frequent headaches	0	1
Recommended lifestyle measures restricting	0	1
Effect of anti-hypertensive medication on life		
Drowsiness	0	1
None	45	44
Effect of hypertension on job		
Sometimes felt too dizzy to work	2	0
Could not do much when blood pressure was elevated	2	0
Had to sit down often to rest	2	1
Felt dizzy when going up a steep incline or on a ladder	2	0
Swollen ankles made it difficult to work	1	0
At times felt too weak to work	0	1
Effect of anti-hypertensive medication on job		
Drowsiness	0	1
None	45	44

5.3.8 Satisfaction with Health Care Services in Grahamstown

Tables 5.8 to 5.10 show the participants' responses to questions that were raised regarding their satisfaction with local health care service delivery. Although most of the participants visited the university sanatorium, there were some that had also visited the PHC and local hospital for medical attention. They were therefore also asked for their opinion of these two facilities. None of the participants reported asking pharmacists health-related questions for help both before and after the study, even though they could do so at the PHC, local hospital or pharmacies without having to pay any money. Seven (15.6%) participants before and five (11.1%) after the intervention, reported that they had never asked their HCPs questions about their health, the reason being that the HCPs appeared very busy and did not seem to have time to answer patients' questions.

Table 5.8: Participants' Satisfaction with Local Health Care Service Delivery.

Questions raised	Number of participants	
	Pre-intervention	Post-intervention
Satisfaction with health care service delivery at the university sanatorium		
Not happy	2	2
Satisfied	11	28
Very happy	25	8
Had never used the facility	7	7
Satisfaction with health care service delivery at the PHC		
Not happy	3	3
Satisfied	17	25
Very happy	10	2
Had never used the facility	15	15
Satisfaction with health care service delivery at the local hospital		
Not happy	1	1
Satisfied	7	10
Very happy	4	3
Had never used the facility	33	31
Received sufficient information about hypertension from HCPs		
Insufficient information	18	19
Sufficient information	27	26
Sources of health-related information		
Nurses	30	27
Medical doctors	16	44
Pharmacists	0	0
Never asked for information	15	7

One of the participants reported that there were prayer meetings held in the mornings at the PHC, in the patients' waiting area, before the facility was open for patients to see HCPs. This participant stated that these meetings were inconvenient for those patients who were not interested in taking part as they would be sitting in the same waiting area. The participant suggested that the prayer meetings be held in a separate area and involve only those who were interested.

Table 5.9: Complaints about Local Health Care Service Delivery

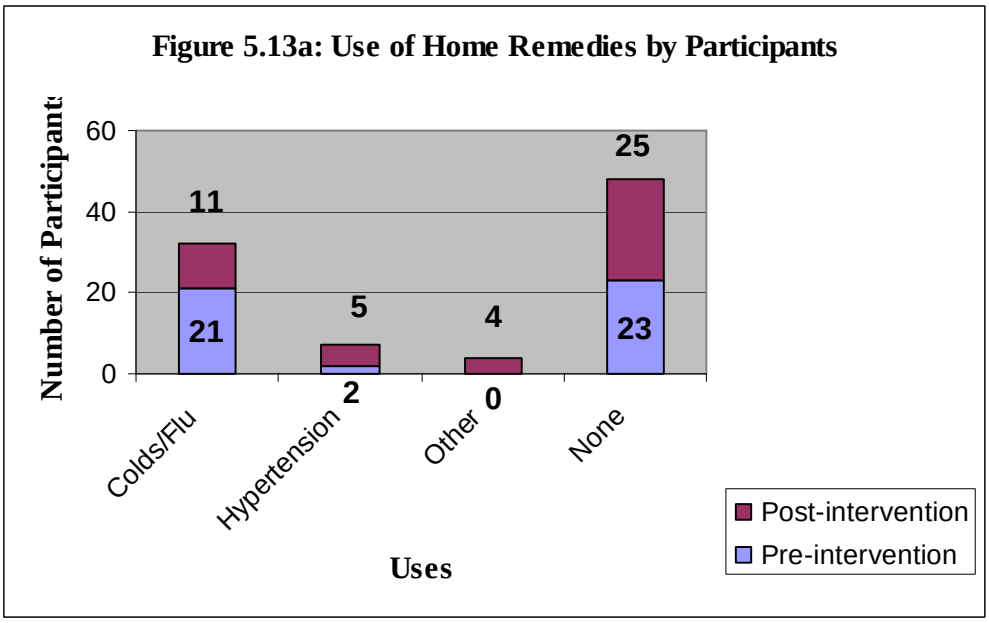
Complaints	Number of participants	
	Pre-intervention	Post-intervention
PHC and hospital not hygienic	1	2
Not enough medicines, beds and equipment at hospital and clinics	2	8
Some sanatorium nursing sisters did not give off-sick days	1	0
Staff at PHC harassed patients who were late for refills	7	0
Staff at PHC were disrespectful	1	3
Long queues and slow service at PHC	12	3
Medical Insurance levies	1	0
Some nurses at the sanatorium merely gave out medicines without examining patients	1	0
Not being given medication if late for refill collection (PHC)	1	0
Lack of medical specialists or private hospitals in Grahamstown	0	2
Poor food given at Hospital	0	1
No complaints	18	27

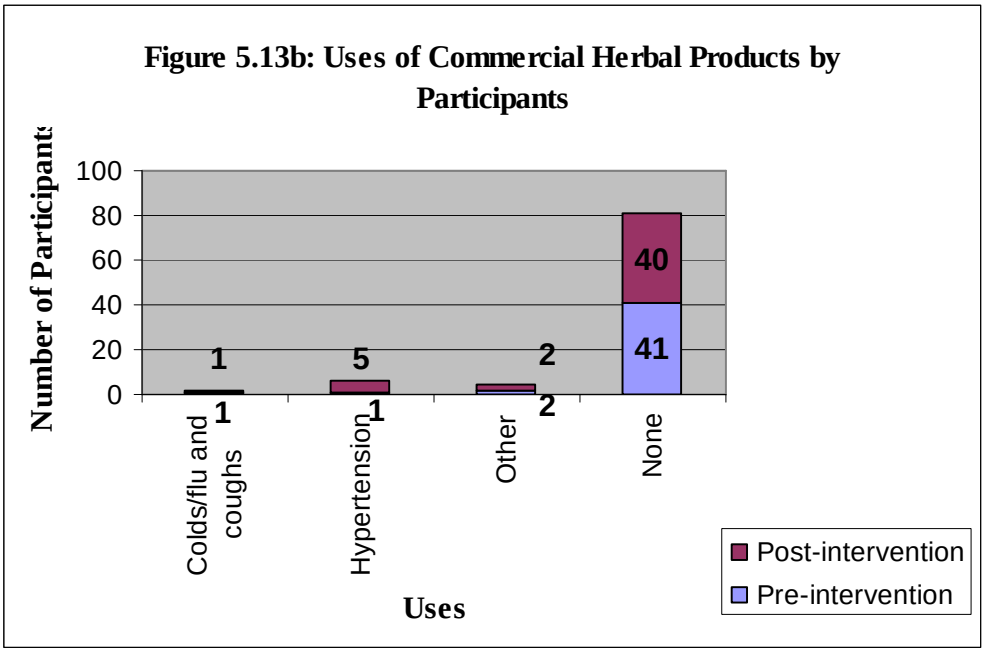
Table 5.10: Possible Suggestions on how to Improve Local Health Care Service Delivery

Suggestions	Number of participants	
	Pre-intervention	Post-intervention
Improvement on hygiene	0	2
Staff must be more respectful and caring towards patients	0	2
More staff members needed at health care facilities	4	0
Change the staff members	2	0
Provide enough medicines, beds and equipment at health care facilities	2	8
Need private hospitals and medical specialists in Grahamstown	1	3
Patients must be given their medication even if they are late for refills	2	0
Nurses must take their tea breaks at different times	0	1
No suggestions	31	29

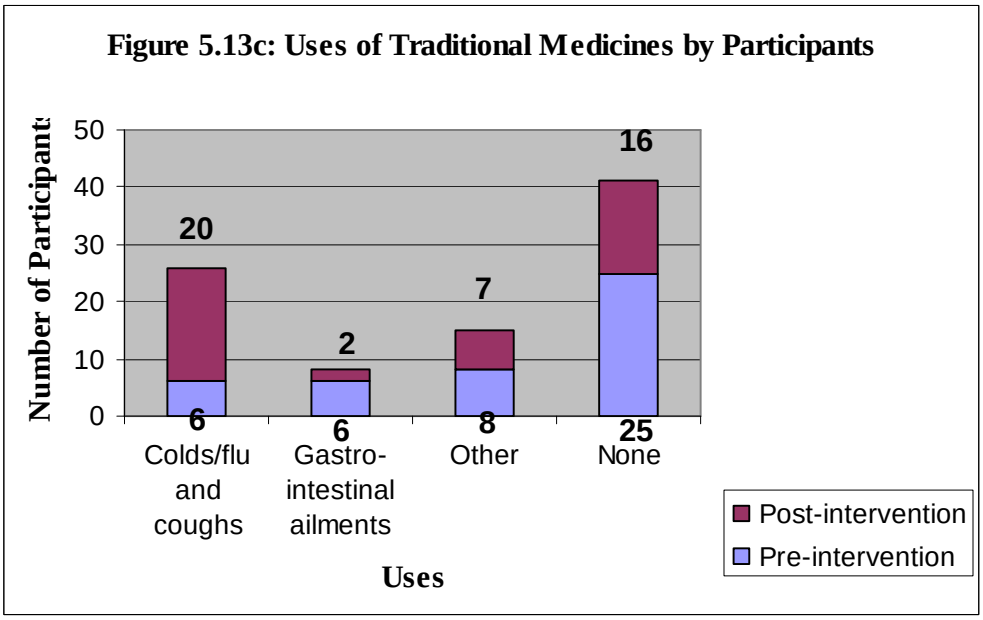
5.3.9 Use of Alternative Therapy

Figures 5.13 a, b and c show the number of participants that used alternative therapy for various ailments. Home remedies used included garlic, ginger, lemons and honey. Two (4.4%) participants before, and five (11.1%) after the intervention, reported using garlic to control their BP. None of the participants who had used commercial herbal products could remember the names of the products. The majority of the participants who had not used commercial herbal remedies were not overly familiar with these products.





Before the intervention eight (17.8%) participants reported that they had consulted a Sangoma (traditional healer) at some point in their life. This number increased to 10 (22.2%) after the intervention. The most commonly used traditional medicine was the bitter tasting plant *Artemisia afra* [212] commonly known as 'Mhlonyane', which was used for the relief of colds and coughs.



This plant was highly recommended by the local HCPs and some did not dispense medicines for colds and coughs, advising patients to use 'Mhlonyane.' One of the local television shows ran a programme on this plant, describing its properties and its usefulness in treating colds, coughs and sinusitis. Some participants reported that the National Minister of Health had also recommended the use of 'Mhlonyane' for colds and coughs. The participants reported that this plant was effective and accessible though some of them still preferred to use 'modern' medicines for the treatment of colds or coughs. Other uses for traditional medicines included using such products for good luck and another product which participants reported to be a cure for all kinds of ailments. The participants did not give names for the other traditional medicines that they used.

Two copies of the interview questionnaire are included as Appendix C. The first copy shows the responses given by the participants to the questions during the pre-intervention interviews, whilst the second one shows the responses they gave during the post-intervention interviews. The responses to the open-ended questions were summarised and are included in Appendix C.

5.4 Responses to the Self-Administered Questionnaires Testing Knowledge about Hypertension and its Treatment

All 45 participants had an opportunity to complete the self-administered questionnaires testing knowledge about hypertension and its treatment. Copies of the self-administered questionnaires are included as Appendix D. Tables 5.11, 5.12, 5.13 and 5.14 show the number of participants who answered questions correctly whilst completing the pre-, post- and post-post intervention questionnaires.

There were no responses given to some questions. The most common question left unanswered was the question asking participants to list the names of their medicines for hypertension. 18 (40%) participants did not answer this particular question in the post-post intervention questionnaires. Fewer questions were left blank in the post-post intervention questionnaires. This was because these questionnaires were given to the participants during one of the monthly meetings and the participants completed the questionnaires in the presence of the investigator who pointed out questions that the participants left out and encouraged them to answer the questions. However, due to time constraints the investigator was not able to do this with all the

participants hence some questionnaires were not completed fully. The investigator encouraged the participants to answer all the questions.

Table 5.11: Questions, from the Self-Administered Questionnaire, on the Nature of Hypertension

Question	Number of Participants who gave correct responses		
	Pre-intervention questionnaires	Post-intervention questionnaires	Post-post intervention questionnaires
1	10	10	18
2	18	28	36
3	23	30	36
4	34	35	41
5	20	25	39
6	20	23	31
7	22	27	32
8	28	38	43

The pre-intervention and post-intervention questionnaires were answered during the talks and discussions held with all the participants present. The participants were asked to place the completed questionnaires in a box on their way out. Questions that had been left blank by participants where only noticed at a later stage when the investigator was recording the different responses given by the participants.

Table 5.12: Questions, from the Self-Administered Questionnaire, on Anti-Hypertensive Medicines

Question	Number of Participants who gave correct responses		
	Pre-intervention questionnaires	Post-intervention questionnaires	Post-post intervention questionnaires
1	21	20	27
2	13	25	35
3	18	20	36
4	4	6	6
5	28	34	41
6	21	35	41
7	34	38	44
8	34	37	44

Table 5.13: Questions, from the Self-Administered Questionnaire, on Adherence to Anti-Hypertensive Therapy

Question	Number of Participants who gave correct responses		
	Pre-intervention questionnaires	Post-intervention questionnaires	Post-post intervention questionnaires
1	40	40	43
2	39	42	44
3	27	31	37
4	39	41	43
5	40	40	43
6	38	39	41
7	40	40	43

Table 5.14: Questions, from the Self-Administered Questionnaire, on Diet and Lifestyle for Hypertensive Individuals

Question	Number of Participants who gave correct responses		
	Pre-intervention questionnaires	Post-intervention questionnaires	Post-post intervention questionnaires
1	9	16	26
2	42	39	43
3	43	44	45
4	44	44	44
5	36	35	44
6	40	38	39
7	29	32	42

The question asking participants if they believed that taking their medication would definitely result in adequate BP control was answered poorly (Question 4 in Table 5.12). This was despite the participants attending a talk where the investigator emphasised that medicines alone were not enough to control BP.

With regard to the questions that were not used for assessing level of knowledge about hypertension (Section 4.7.2.1), only two participants wrote down that they had consulted a traditional healer about their hypertension.

The pre-intervention self-administered questionnaires showed that 36 (80%) participants thought they had been told everything about hypertension and its therapy by their HCPs. However, the post and post-post intervention questionnaires showed that three of these individuals were not

certain about the issue. Two participants reported, in all three questionnaires, that they were not sure whether they had been given enough information about high BP and its therapy. One participant, whilst completing the pre-intervention questionnaire, reported not being certain about having received enough information about hypertension and its therapy. However, the post- and post-post intervention questionnaires indicated that the participant thought HCPs had told him/her everything that he/she needed to know about hypertension and its therapy.

5.5 Beliefs about Medicines

5.5.1 Participants' Beliefs about Medicines

All 45 participants completed the BMQ although two did not answer all the questions before the intervention and five after the intervention. This happened in instances where the investigator left the questionnaire with the participants because they did not have enough time to complete the questionnaire in her presence. In cases where the BMQ was answered in the presence of the investigator, she pointed out statements that the participants had skipped. In this way the participants responded to all the statements on the BMQ.

Participants believed that their anti-hypertensive medicines were necessary to prevent their condition from worsening and to maintain their health. This was indicated by a high mean ± standard deviation, necessity score of 21.31 ± 3.36 before and 21.44 ± 3.90 after the intervention. After the intervention 38 (84.4%) participants believed that their life would be impossible without anti-hypertensive medicines, the other seven did not agree. At the beginning of the study 33 (73.3%) participants believed that without their anti-hypertensive medicines they would be very ill and this number increased to 40 (88.9%) after the intervention. There were also concerns raised regarding the potential undesirable effects of these medicines. For example, 35 (77.8%) participants agreed that they were worried about the long term effects of their medicines before the intervention, but this number decreased to 23 (51.1%) after the intervention.

Before the intervention, 36 (80%) participants admitted to worrying about becoming too dependent on their medicines, but this number decreased to 25 (55.6%) after the intervention. The mean score ± standard deviation for concerns was 17.91 ± 4.04 before the intervention and 15.58 ± 4.37 afterwards. This decrease in the level of concern about undesirable effects of anti-

hypertensive medication was also reflected by the increase in the NCD, which was 3.40 ± 3.96 before the intervention and 5.87 ± 5.03 afterwards. The concerns scores ranged from 5 to 25 whilst the necessity scores ranged from 8 to 25. Before the intervention 23 (51.1%) of the participants stated that anti-hypertensive medications did not disrupt their lives. By the end of the intervention the number had increased to 30 (66.7%).

With regard to general beliefs about medicines, the mean score for beliefs about the harmful nature of medicines was 11.07 ± 2.62 before the intervention and 9.47 ± 3.01 after the intervention. The mean score for beliefs about doctors' prescribing patterns was 14 ± 3.27 before and 13.13 ± 3.14 after the intervention. After the intervention 17 (37.8%) participants believed that doctors prescribed excessively and 20 (44.4%) participants believed fewer medicines would be prescribed if doctors' consultation times with patients were longer. Before the intervention five (11.1%) participants believed all medicines to be poisonous and eight (17.8%) stated that they caused more harm than good. After the intervention only two (4.4%) participants believed all medicines to be poisonous whilst seven (15.6%) maintained that they caused more harm than good.

5.5.2 Health Care Providers' Beliefs about Medicines

There were 20 HCPs who completed the general section of the BMQ of which three (15%) were medical doctors, six (30%) pharmacists, four (20%) pharmacist's assistants and seven (35%) nursing sisters. 12 (60%) agreed that doctors prescribed too many medicines whilst three (15%) stated that people on multiple-drug therapy should stop their treatment occasionally. 16 (80%) and 14 (70%) believed that doctors placed too much trust in medicines and would prescribe fewer medicines if they spent more time with patients respectively. Nine (45%) of these HCPs agreed that natural remedies were safer than 'modern' medicines, whilst six (30%) were not sure and five (25%) did not agree.

Appendix B shows three copies of the BMQ. The first two show the responses of participants before and after the intervention respectively and the third one shows the HCPs' responses.

5.6 Participants' Levels of Adherence

5.6.1 Pill counts

There were 37 (82.22%) participants whose medications were quantified often enough for their data from pill counts to be admissible. The mean percentage adherence level was 15.27± 18.61 before the intervention, 16.87 ± 13.91 during the intervention and 12.28 ± 11.17 after the intervention. After the intervention 20 (54%) of these participants had adherence levels above the mean value.

5.6.2 Punctuality in Collecting Prescription Refills

The 36 (80%) participants with data admissible for this method were punctual in collecting their anti-hypertensive medications, on average, 63.38% ± 30.07 of the time before, 66.88% ± 32.17 during and 74.59% ± 31.26 of the time after the intervention. The adherence levels ranged from 0 to 100%.

5.6.3 Self-Reports

5.6.3.1 One-on-One Interviews

Before the intervention the participants reported a mean adherence level of 81.78 ± 13.36% which increased to 83.56 ± 10.69% after the intervention. All 45 participants were interviewed and therefore had data admissible for this method.

5.6.3.2 Medication Diaries

Only eight (17.78%) participants returned enough medication diaries for the investigator to calculate adherence levels for the three time periods of the study. The data from medication diaries was therefore not included in the final adherence levels recorded for the participants.

5.7 Participants' Blood Pressure Readings and Body Mass Indexes

Systolic BP, throughout the study, ranged from 102 mm Hg, which was the post-intervention average BP for one of the participants, to 186 mm Hg which was the average for another participant during the intervention period. The mean systolic BP readings were 134.78 ±12.94 mm Hg before, 139.44 ± 16.77 mm Hg during and 140.20 ± 18.94 mm Hg after the intervention. The systolic BP readings for the males were significantly higher during and after the intervention

(p = 0.011 and 0.049 respectively). With regard to diastolic BP readings, the mean before the intervention was 84.91 ± 8.31, 89.02 ± 11.58 mm Hg during the intervention and 89.27 ± 13.18 mm Hg after the intervention. The most common diastolic pressure was 86 mm Hg, which was recorded eight times throughout the study. The male participants had significantly higher diastolic BPs during the intervention period than the female participants (p = 0.008).

The participants' BMIs ranged from 22 kg/m^2 to 54 kg/m^2 before the intervention with a mean of 34.71 ± 7.39 kg/m^2. After the intervention, the figures ranged from 21 kg/m^2 to 53 kg/m^2 with a mean of 35.33 ± 8.10 kg/m^2. Throughout the whole study, female participants had significantly higher BMIs than the male participants (p = 0.005 before, 0.004 during and 0.007 after the intervention).

5.8 Statistical Analyses

These were performed accordingly in the form of Analysis of Variance, t-tests for dependent, as well as independent samples and the Pearson correlation coefficient (Section 4.9). Significance of the results was tested using the p-value. A p-value of less than 0.05 meant that the observed changes in, or correlations between, the various parameters were significant [213].

5.8.1 Testing the Effect of Age on:

5.8.1.1 Participants' Levels of Knowledge about Hypertension and its Therapy

All 45 participants completed the three self-administered questionnaires and were interviewed before and after the intervention. 13 (28.9%) were aged below 46 years, 11 (24.4%) between 46 and 50 years and 21 (46.7%) above 50 years. A one-way ANOVA analysis with levels of knowledge measured using self-administered questionnaires or one-on-one interview responses as the dependent variables and age as a factor (3 levels: < 46 yrs, 46-50 yrs, >50 yrs) was used. The test statistics results are listed in Table 5.15.

a) Measured using self-administered questionnaires

The participants below 46 years of age obtained a mean ± standard deviation percentage score of 62.05 ± 11.10% for the pre-intervention questionnaires, 70.77 ± 7.84% for the post-intervention ones and 83.08 ± 9.57% for the post-post intervention questionnaires. Those individuals aged

between 46 and 50 years had a mean percentage score of 63.94 ± 10.42% for pre-intervention, 66.97 ± 11.87% for post-intervention and 79.39 ± 15.55% for post-post intervention questionnaires. The mean percentage score for the pre-intervention questionnaires completed by those over 50 years was 63.26 ± 14.66%, 72.22 ± 18.21% for post-intervention questionnaires and 85.87 ± 10.69% for post-post intervention questionnaires.

b) Measured using scores from one-on-one interviews

For participants aged below 46 years the percentage of questions relating to knowledge about hypertension and its treatment answered correctly before the intervention was 48.42 ± 16.84% and 79.19 ± 10.36% after the intervention. Those aged between 46 and 50 years answered 52.94 ± 14.17% of the questions correctly before the intervention and 80.21 ± 11.84% after the intervention. Participants above 50 years had a mean percentage score of 61.06 ± 15.05% before and 81.23 ± 13.23% after the intervention.

Table 5.15: Effect of Age on the Participants' Levels of Knowledge about Hypertension and its Therapy (n = 45).

		Method of measuring levels of knowledge about hypertension		Degrees of freedom
		Self-administered questionnaires	Interviews	
Pre-intervention questionnaires and interviews	F value	0.061	2.904	2,42
	p-value	0.941	0.066	2,42
Post-intervention questionnaires	F value	0.479	N/A	2,42
	p-value	0.623	N/A	2,42
Post-post intervention questionnaires/ post-intervention interviews	F value	1.107	0.116	2,42
	p-value	0.340	0.891	2,42

There was no significant age effect ($p>0.05$)

5.8.1.2 Participants' Beliefs about Medicines

All 45 participants completed the BMQ, before and after the intervention. A one-way ANOVA analysis with beliefs about medicines as the dependent variables and age as a factor (3 levels: < 46 yrs, 46-50 yrs, >50 yrs) was used. The test statistics results are listed in Table 5.16.

a) Perception of necessity of anti-hypertensive agents (n)

The participants who were below 46 years of age had a mean necessity score of 20.77 ± 2.98 out of a possible 25 before the intervention and 22.23 ± 3.92 after the intervention. For those participants aged between 46 and 50 years of age the mean score was 20.27 ± 3.98 before the intervention and 19.00 ± 5.39 afterwards. The participants over 50 years of age had a mean necessity score of 22.19 ± 3.16 before the intervention and 22.24 ± 2.32 after the intervention. Table 5.16 shows the test statistics results.

b) Concerns about the undesirable effects of anti-hypertensive medication (c)

The participants who were below 46 years of age had a mean concerns score of 17.62 ± 3.55 out of a possible 25 before the intervention and 14.62 ± 3.15 after the intervention. For those participants aged between 46 and 50 years of age the mean score was 17.91 ± 4.23 before the intervention and 13.64 ± 4.57 afterwards. The participants over 50 years of age had a mean concerns score of 18.10 ± 4.40 before the intervention and 17.19 ± 4.50 after the intervention.

Table 5.16: Effect of Age on the Participants' Beliefs about Medicines (n=45).

Beliefs about medicines	Degrees of freedom	F value		p-value	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
n	2,42	1.445	3.136	0.247	0.054
c	2,42	0.054	3.098	0.947	0.056
NCD	2,42	0.715	1.125	0.495	0.334
o	2,42	1.401	0.357	0.258	0.702
h	2,42	2.893	0.050	0.067	0.100

There was no significant age effect ($p > 0.05$).

c) The Necessity-Concerns Differential

Participants aged below 46 years had a mean NCD of 3.15 ± 2.94 before the intervention and 7.62 ± 5.50 at post-intervention stage. Those aged between 46 and 50 had a mean NCD of 2.36 ± 4.06 before and 5.36 ± 5.39 after the intervention. The participants over 50 years had a mean NCD of 4.10 ± 4.47 before the intervention and 5.05 ± 4.49 afterwards.

d) Beliefs about the overuse of medicines by doctors (o)

The participants below 46 years had a mean score of 12.77 ± 2.49, out of a possible 20 before the intervention and 13.00 ± 3.24 after the intervention. The mean score for those aged between 46 and 50 was 14.18 ± 3.46 before the intervention and 12.55 ± 3.05 afterwards. The mean score for participants above 50 years was 14.67 ± 3.51 before the intervention and 13.52 ± 3.22 after the intervention.

e) Beliefs about the harmful nature of medicines in general (h)

The participants below 46 years had a mean score of 10.54 ± 1.61, out of a possible 20 before the intervention and 9.46 ± 2.63 after the intervention. The mean score for those aged between 46 and 50 was 9.91 ± 2.51 before the intervention and 9.55 ± 4.44 afterwards. The mean score for participants above 50 years was 12.00 ± 2.93 before the intervention and 9.43 ± 2.42 after the intervention.

5.8.1.3 Participants' Levels of Adherence

A one-way ANOVA analysis with adherence levels measured using pill counts, punctuality when collecting refills or self-reports as the dependent variables and age as a factor (3 levels: < 46 yrs, 46-50 yrs, >50 yrs) was used. The test statistics results are listed in Table 5.17.

a) Measured using pill counts

The mean percentage adherence level ± standard deviation for the participants below 46 years of age before the intervention was 14.72 ± 20.95%, 17.99 ± 17.70% during and 14.23 ± 13.19% after the intervention. The mean percentage adherence levels for individuals aged between 46 and 50 years were as follows: pre-intervention: 17.9 ± 13.68, intervention: 20.24 ± 13.44 and post-intervention: 14.903 ± 13.36. Participants above 50 years of age had the following mean adherence levels: 13.99 ± 20.49% before, 13.99 ± 11.40% during and 9.303 ± 7.70% after the intervention.

b) Measured using punctuality when collecting prescription refills

Participants below 46 years of age were punctual in collecting their prescription refills 62.6 ± 36.85% of the time at the pre-intervention stage, 75.52 ± 24.17% during the intervention and

71.27 ± 33.43% at post intervention stage. The individuals aged between 46 and 50 years collected their refills punctually 47.66 ± 36.39% of the time before, 53.13 ± 39.87% during and 73.01 ± 30.82% of the time after the intervention. Participants above 50 years of age were punctual in collecting their prescription refills 71.28 ± 18.96% of the time before, 67.76 ± 32.50% during and 73.01 ± 30.82% of the time after the intervention.

c) Measured using self-reports during the one-on-one interviews

The participants below 46 years of age reported a mean adherence level of 79.23 ± 21.00% before, and 83.08 ± 13.16%, after the intervention. Participants aged between 46 and 50 years of age reported a mean adherence level of 88.18 ± 7.51% before, and 81.82 ± 8.74%, after the intervention. For the participants above 50 years of age the reported mean percentage adherence level was 80.00 ± 8.37% before the intervention and 83.56 ± 10.69% afterwards.

Table 5.17: Effect of Age on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	2,34	2,33	2,42
Pre-intervention	F value	0.136	1.756	1.742
	p-value	0.874	0.188	0.188
Intervention	F value	0.661	1.144	N/A
	p-value	0.523	0.331	N/A
Post-intervention	F value	1.012	0.138	0.282
	p-value	0.374	0.872	0.755

There was no significant age effect ($p > 0.05$).

5.8.2 Testing the Effect of Education Level on:

5.8.2.1 Participants' Levels of Knowledge about Hypertension and its Therapy

There were 13 (28.9%) participants with less than eight years of formal schooling, 16 (35.6%) with between eight and nine years and 16 (35.6%) with more than nine years of formal education. A one-way ANOVA analysis with levels of knowledge measured using self-administered questionnaires or interview responses as the dependent variables and number of years of formal schooling as a factor (3 levels: < 7 yrs, 8-9 yrs, >9 yrs) was used. The test

statistics results are listed in Table 5.18. The participants with less than eight years of schooling answered significantly less questions correctly than the rest of the participants during the post-intervention interviews.

a) Measured using self-administered questionnaires

The participants with less than eight years of schooling scored a mean of 57.18 ± 12.90% for the pre-intervention questionnaires, 63.85 ± 11.53% for the post-intervention ones and 81.80 ± 7.15% for the post-post intervention questionnaires. Those individuals with between eight and nine years of schooling had a mean score of 60.42 ± 14.24%, 68.75 ± 12.99% and 82.71 ± 12.06% for pre-, post- and post-post intervention questionnaires respectively. The mean score for the pre-intervention questionnaires completed by those with more than nine years of formal schooling was 71.04 ± 13.76%, 77.71 ± 15.04% for post-intervention questionnaires and 83.48 ± 11.78% for post-post intervention questionnaires. The participants with more than nine years of schooling answered significantly more questions correctly in the pre- and post-intervention self-administered questionnaires than their counterparts with less than eight years of schooling.

Table 5.18: Effect of Education Level on the Participants' Levels of Knowledge about Hypertension and its Therapy (n = 45)

		Method of measuring level of knowledge about hypertension		Degrees of
			Interviews	
Pre-intervention questionnaires and	F value	4.210	0.174	2,42
	p-value	0.022*	0.841	2,42
Post-intervention	F value	4.065	N/A	2,42
	p-value	0.024*	N/A	2,42
Post-post intervention questionnaires /	F value	0.421	5.656	2,42
	p-value	0.659	0.007*	2,42

*Effect significant as indicated by p-value < 0.05

b) Measured using scores from one-on-one interviews

For participants with less than 8 years of formal schooling the percentage of interview questions relating to knowledge about hypertension and its treatment answered correctly before the intervention was 53.39 ± 13.68% and 71.95 ± 9.95% after the intervention. Those with between eight and nine years of schooling answered 56.99 ± 12.47% of the questions correctly before the intervention and 83.09 ± 10.27% after the intervention. Participants with more than nine years of formal education answered 55.52 ± 21.04% of the interview questions correctly before the intervention and 84.56 ± 11.94% afterwards.

5.8.2.2 Participants' Beliefs about Medicines

A one-way ANOVA analysis with beliefs about medicines as the dependent variables and number of years of formal schooling as a factor (3 levels: < 7 yrs, 8-9 yrs, >9 yrs) was used. The test statistics results are listed in Table 5.19.

a) Perception of necessity of anti-hypertensive agents (n)

The participants who had below eight years of formal schooling had a mean necessity score of 21.69 ± 2.98 out of a possible 25 before the intervention and 23.31 ± 2.21 after the intervention. For those participants with between eight and nine years of formal schooling the mean score was 21.44 ± 3.31 before the intervention and 21.56 ± 2.39 afterwards. The participants with more than nine years of formal education had a mean necessity score of 20.88 ± 3.83 before the intervention and 19.81 ± 5.39 after the intervention.

b) Concerns about the undesirable effects of anti-hypertensive medication (c)

The participants who had below eight years of formal schooling had a mean concerns score of 17.77 ± 4.38 out of a possible 25 before the intervention and 16.08 ± 4.63 after the intervention. For those participants with between eight and nine years of formal education the mean score was 17.69 ± 3.86 before the intervention and 17.00 ± 4.12 afterwards. The participants with more than nine years of formal education had a mean concerns score of 18.25 ± 4.19 before the intervention and 13.75 ± 4.01 after the intervention.

b) The Necessity-Concerns Differential

Participants with less than eight years of formal education had a mean NCD of 3.92 ± 3.17 before the intervention and 7.23 ± 5.00 at post-intervention stage. Those with between eight and nine years of schooling had a mean NCD of 3.75 ± 3.87 before and 4.56 ± 3.54 after the intervention. The participants with more than 9 years of schooling had a mean NCD of 2.63 ± 4.69 before the intervention and 6.06 ± 6.18 afterwards.

d) Beliefs about the overuse of medicines by doctors (o)

The participants with below eight years of formal education had a mean score of 14.00 ± 2.67, out of a possible 20 before the intervention and 13.77 ± 3.47 after the intervention. The mean score for those with between eight and nine years of formal schooling was 13.31 ± 3.67 before the intervention and 12.81 ± 2.93 afterwards. The mean score for participants with more than nine years of schooling was 14.69 ± 3.34 before the intervention and 12.94 ± 3.19 after the intervention.

e) Beliefs about the harmful nature of medicines in general (h)

The participants with less than eight years of formal schooling had a mean score of 11.15 ± 1.99, out of a possible 20 before the intervention and 10.85 ± 1.99 after the intervention. The mean score for those with between eight and nine years of formal education was 11.31 ± 3.34 before the intervention and 9.00 ± 2.37 afterwards. The mean score for participants with more than nine years of schooling was 10.75 ± 2.38 before the intervention and 8.81 ± 3.92 after the intervention.

Table 5.19: Effect of Education Level on the Participants' Beliefs about Medicines

Beliefs about medicines	Degrees of freedom	F value		p-value	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
n	2,42	0.222	3.179	0.802	0.052
c	2,42	0.085	2.487	0.919	0.095
NCD	2,42	0.470	1.029	0.628	0.366
o	2,42	0.698	0.371	0.503	0.692
h	2,42	0.187	2.034	0.830	0.144

There was no significant education level effect ($p > 0.05$)

5.8.2.3 Participants' Levels of Adherence

A one-way ANOVA analysis with adherence levels measured using pill counts, punctuality when collecting refills or self-reports as the dependent variables and number of years of formal schooling as a factor (3 levels: < 7 yrs, 8-9 yrs, >9 yrs) was used. The test statistics results are listed in Table 5.20.

b) Measured using pill counts

The individuals with less than eight years of formal schooling had a pre-intervention mean percentage adherence level of 22.25 ± 23.59%, 21.75 ± 16.23% during and 11.67 ± 11.99% after the intervention. Participants with between eight and nine years of formal education had the following mean adherence levels: 9.65 ± 13.71% at pre-intervention, 17.17 ± 11.49 during the intervention and 14.30 ± 9.12 at post-intervention stage. Participants with more than nine years of formal education had the following means and standard deviations for adherence: 14.59 ± 17.34% before, 12.77 ± 13.54% during and 11.02 ± 12.59% after the intervention.

b) Measured using punctuality when collecting prescription refills

Participants with less than eight years of formal education collected their refills punctually 84.33 ± 22.04% of the time before, 72.22 ± 36.32 % of the time during and 70.44 ± 35.17% of the time after the intervention. The individuals with between eight and nine years of formal schooling collected their refills punctually 62.49 ± 25.92% of the time before, 71.51 ± 26.02% during and 81.21 ± 25.85% of the time after the intervention. Participants with more than nine years of formal education and they collected their prescription refills punctually 48.78 ± 32.80%, 57.08 ± 36.25% and 69.44 ± 35.45% of the time before, during and after the intervention respectively. The participants with less than eight years of schooling collected their prescription refills punctually on significantly more occasions before the intervention than the participants with more than nine years of schooling.

Table 5.20: Effect of Education Level on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	2,34	2,33	2,42
Pre-intervention	F value	1.356	4.283	1.256
	p-value	0.271	0.022*	0.295
Intervention	F value	1.309	0.828	N/A
	p-value	0.283	0.446	N/A
Post-intervention	F value	0291	0.566	0.020
	p-value	0.749	0.575	0.981

*Effect significant as indicated by p-value < 0.05

c) Measured using self-reports during the one-on-one interviews

For the participants with less than eight years of formal schooling the mean reported adherence level at pre-intervention stage was 76.92 ± 16.53% and 83.85 ± 11.21% after the intervention. The participants with between eight and nine years of formal education reported mean adherence levels of 83.13 ± 10.15% before the intervention and 83.75 ± 9.57% afterwards. Participants with more than nine years of formal schooling had a mean reported adherence level of 84.38 ± 13.15% before the intervention and 83.56 ± 10.69% afterwards.

5.8.3 Testing the Effect of Gender on

5.8.3.1 Participants' Levels of Knowledge about Hypertension and its Therapy

All 45 participants completed all the questionnaires and were interviewed before and after the intervention. A t-test for independent samples with levels of knowledge measured using self-administered questionnaires or interview responses as the dependent variables and gender as an independent variable was used. The test statistics results are listed in Table 5.21.

Table 5.21: Effect of Gender on the Participants' Levels of Knowledge about Hypertension and its Therapy

		Method of measuring level of knowledge about hypertension		Degrees of
			Interviews	
Pre-intervention questionnaires and	t value	0.965	0.550	43
	p-value	0.340	0.585	43
Post-intervention	t value	1.588	N/A	43
	p-value	0.120	N/A	43
Post-post intervention questionnaires /	t value	0.635	-0.913	43
	p-value	0.529	0.366	43

There was no significant gender effect ($p > 0.05$).

a) Measured using self-administered questionnaires

The male participants scored a mean of 66.97 ± 10.27% for the pre-intervention questionnaires, 76.36 ± 10.16% for the post-intervention ones and 85.46 ± 5.83% for the post-post intervention questionnaires. The female participants scored a mean percentage score of 62.06 ± 15.76% for pre-intervention questionnaires, 68.63 ± 15.02% for post-intervention questionnaires and 82.84 ± 13.16% for post-post intervention questionnaires.

b) Measured using scores from one-on-one interviews

For male participants, the mean percentage of interview questions relating to knowledge about hypertension and its treatment answered correctly before the intervention was 57.75 ± 13.11% and 77.54 ± 11.10% after the intervention. Female participants answered 54.67 ± 16.98% of the interview questions correctly before the intervention and 81.32 ± 12.16% after the intervention.

5.8.3.2 Participants' Beliefs about Medicines

A t-test for independent samples with beliefs about medicines as the dependent variables and gender as an independent variable was used. The test statistics results are listed in Table 5.22.

Table 5.22: Effect of Gender on the Participants' Beliefs about Medicines

Beliefs about medicines	Degrees of freedom	t value		p-value	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
n	43	0.161	1.264	0.873	0.213
c	43	0.680	-1.061	0.500	0.295
NCD	43	-0.556	1.954	0.581	0.057
o	43	-0.105	-0.105	0.917	0.706
h	43	0.166	0.906	0.869	0.370

There was no significant gender effect ($p > 0.05$).

a) Perception of necessity of anti-hypertensive agents (n)

For the males, there was a mean necessity score of 21.45 ± 3.17 before the intervention and 22.73 ± 2.28 after the intervention. For females, the mean score was 21.26 ± 3.46 before and 21.03 ± 4.24 after the intervention.

b) Concerns about the undesirable effects of anti-hypertensive medication (c)

The males had a mean concerns score of 18.64 ± 3.33 before, and 14.36 ± 3.44 after, the intervention whilst the females had a mean score of 17.68 ± 4.27 before the intervention and 15.97 ± 4.61 afterwards.

c) The Necessity-Concerns Differential

Males had a mean NCD of 2.82 ± 2.93 before the intervention and 5.06 ± 4.91 at post-intervention stage whilst females had a mean NCD of 3.59 ± 4.27 before and 5.06 ± 4.91 after the intervention.

d) Beliefs about the overuse of medicines by doctors (o)

The male participants had a mean score of 13.91 ± 2.51 before the intervention and 12.82 ± 2.93 after the intervention. The mean score for female participants was 14.03 ± 3.51 before the intervention and 13.24 ± 3.24 afterwards.

e) Beliefs about the harmful nature of medicines in general (h)

Male participants had a mean score of 11.18 ± 1.72 before the intervention and 10.18 ± 3.89 after the intervention whilst their female counterparts had a mean score of 11.03 ± 2.88 before the intervention and 9.24 ± 2.69 afterwards.

5.8.3.3 Participants' Levels of Adherence

T-tests for independent samples were used with adherence levels measured using pill counts, punctuality when collecting refills or participants' self-reports as the dependent variables and gender as the independent variable. The test statistics results are listed in Table 5.23.

a) Measured using pill counts

The mean percentage adherence level at the pre-intervention stage for males was 22.86 ± 22.49%, 25.56 ± 19.05% during and 11.82 ± 12.94% after the intervention. For the females, the mean percentage adherence levels were as follows: 12.45 ± 16.55%, 13.65 ± 10.13% and 12.45 ± 10.71% before, during and after the intervention respectively. During the intervention period, the female participants adhered to their anti-hypertensive therapy more significantly than the male participants.

b) Measured using punctuality when collecting prescription refills

For the male participants, the mean percentage adherence levels were as follows: 75.29 ± 29.52% at pre-intervention, 63.89 ± 35.60% at intervention and 70.64 ± 30.90% at post-intervention stages. For the females, the mean percentage adherence level before the intervention was 59.41 ± 29.73%, 67.88 ± 31.60 % during and 75.91 ± 31.85% after the intervention.

c) Measured using self-reports during the one-on-one interviews

For males, the mean reported adherence level at the pre-intervention stage was 80.91 ± 19.73% and 81.82 ± 14.01% after the intervention. The females reported a mean adherence level of 82.06 ± 10.95% before the intervention and 84.12 ± 9.57% afterwards.

Table 5.23: Effect of Gender on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	35	34	43
Pre-intervention	t value	1.539	1.390	-0.245
	p-value	0.133	0.174	0.807
Intervention	t value	2.472	-0.318	N/A
	p-value	0.018*	0.752	N/A
Post-intervention	t value	-0.150	-0.433	-0.616
	p-value	0.882	0.668	0.541

*Effect significant as indicated by p-value < 0.05

5.8.4 Testing the Effect of the Number of Anti-Hypertensive Medicines on:

5.8.4.1 Participants' Beliefs about Medicines

A one-way ANOVA analysis with beliefs about medicines as the dependent variables and number of anti-hypertensive medicines as a factor (3 levels: 1 medicine, 2 medicines, >2 medicines) was used. The test statistics results are listed in Table 5.24.

Table 5.24: Effect of Number of Anti-Hypertensive Medications on the Participants' Beliefs about Medicines

Beliefs about medicines	Degrees of freedom	F value		p-value	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
n	2,42	0.581	1.555	0.564	0.223
c	2,42	1.797	2.780	0.178	0.073
NCD	2,42	0.518	2.842	0.599	0.070
o	2,42	0.280	1.055	0.757	0.357
h	2,42	2.369	0.824	0.106	0.446

The number of anti-hypertensive medicines had no significant effect (p > 0.05)

a) Perception of necessity of anti-hypertensive agents (n)

For the participants taking one anti-hypertensive medicine, there was a mean necessity score of 20.76 ± 3.38 before the intervention and 20.43 ± 4.65 after the intervention. For those taking two anti-hypertensive agents, the mean score was 22.00 ± 3.37 before the intervention and

21.93 ± 3.22 afterwards. Participants taking three or more anti-hypertensive agents had a mean necessity score of 21.50 ± 3.44 before the intervention and 22.90 ± 2.47 afterwards.

b) Concerns about the undesirable effects of anti-hypertensive medication (c)

For the participants taking one anti-hypertensive agent there was a mean concerns score of 16.90 ± 4.04 before the intervention and 14.90 ± 4.29 after the intervention. For those taking two anti-hypertensive agents, the mean score was 19.50 ± 4.20 before the intervention and 17.71 ± 3.79 afterwards. Participants taking three or more anti-hypertensive agents had a mean score of 17.80 ± 3.46 before the intervention and 14.00 ± 4.57 afterwards.

c) The Necessity-Concerns Differential

For the participants taking one medicine for hypertension, there was a mean NCD score of 3.86 ± 4.78 before the intervention and 5.52 ± 4.50 after the intervention. For those taking two anti-hypertensive agents, the mean score was 2.50 ± 3.72 before the intervention and 4.21 ± 3.79 afterwards. Participants taking three or more anti-hypertensive agents had a mean score of 3.70 ± 2.06 before the intervention and 8.90 ± 6.57 afterwards.

d) Beliefs about the overuse of medicines by doctors (o)

For the participants taking one medicine for hypertension, there was a mean score of 13.62 ± 3.01 before the intervention and 12.67 ± 3.26 after the intervention. For those taking two anti-hypertensive agents, the mean score was 14.21 ± 3.92 before the intervention and 14.14 ± 3.30 afterwards. Participants taking three or more anti-hypertensive agents had a mean score of 14.50 ± 3.03 before the intervention and 12.70 ± 2.54 afterwards.

e) Beliefs about the harmful nature of medicines in general (h)

For the participants taking one medicine for hypertension, there was a mean score of 10.43 ± 1.99 before, and 8.95 ± 2.33 after, the intervention. For those taking two anti-hypertensive agents, the mean score was 12.29 ± 2.99 before the intervention and 10.29 ± 2.70 afterwards. Participants taking three or more anti-hypertensive agents had a mean score of 10.70 ± 2.91 before the intervention and 9.40 ± 4.45 afterwards.

5.8.4.2 Participants' Levels of Adherence

A one-way ANOVA analysis with adherence levels measured using pill counts, punctuality when collecting refills or self-reports as the dependent variables and number of anti-hypertensive medicines as a factor (3 levels: 1 medicine, 2 medicines, >2 medicines) was used. The test statistics results are listed in Table 5.25.

a) Measured using pill counts

The pre-intervention mean percentage adherence level for those taking one anti-hypertensive medicine was 10.87 ± 12.27%, 15.84 ± 11.05% during and 10.00 ± 6.99% after the intervention. For those taking two anti-hypertensive medicines, the mean adherence levels were 19.07 ± 21.27% before, 20.70 ± 17.47% during and 14.42 ± 14.66% after the intervention. For the participants taking three or more medicines for hypertension, the mean percentage adherence levels were as follows: 19.82 ± 25.39 at pre-intervention stage, 14.66 ± 15.55% during the intervention period and 14.47 ± 14.01% at post-intervention stage.

Table 5.25: Effect of Number of Anti-Hypertensive Medications on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	2,34	2,33	2,42
Pre-intervention	F value	0.979	0.397	0.576
	p-value	0.386	0.675	0.567
Intervention	F value	0.528	0.110	N/A
	p-value	0.595	0.896	N/A
Post-intervention	F value	0.719	0.864	0.230
	p-value	0.494	0.431	0.796

The number of anti-hypertensive medicines had no significant effect ($p > 0.05$)

b) Measured using punctuality when collecting prescription refills

Those participants taking one anti-hypertensive agent collected their refills punctually 58.73 ± 19.99% of the time before, 68.45 ± 27.84% of the time during and 67.87 ± 37.01% of the time

after the intervention. Participants taking two medicines were punctual in collecting their refills 69.29 ± 30.18%, 63.25 ± 37.35% and 75.00 ± 28.05% of the time before, during and after the intervention respectively. For those taking three or more anti-hypertensive agents, the mean percentage adherence levels were 63.26 ± 43.72% before, 69.11 ± 34.96% during and 85.26 ± 24.16% after the intervention.

c) Measured using self-reports during the one-on-one interviews

Participants taking one anti-hypertensive agent reported a mean adherence level of 83.33 ± 10.65% before and 83.33 ± 12.38% after the intervention. Those taking two medications reported a mean percentage adherence level of 78.57 ± 16.10% before the intervention and 85.00 ± 10.92% afterwards. The participants taking three or more medications reported a mean adherence level of 83.00 ± 14.94% before the intervention and 82.00 ± 6.33% afterwards.

5.8.5 Testing the Effect of Having Medical Insurance on:

5.8.5.1 Participants' Levels of Adherence

T-tests for independent samples were used with adherence levels measured using pill counts, punctuality when collecting refills or participants' self-reports as the dependent variables and availability of medical insurance as the independent variable. The test statistics results are listed in Table 5.26.

a) Measured using pill counts

The mean percentage adherence level for those without medical insurance was 14.16 ± 17.71% before, 19.02 ± 14.44% during and 12.09 ± 11.78% after the intervention. For those with medical insurance the mean adherence levels were 20.00 ± 23.02% before, 7.62 ± 5.58% during and 13.08 ± 8.76% after the intervention. During the intervention period the pill counts showed significantly higher adherence levels for participants with medical insurance compared to those without.

b) Measured using punctuality when collecting prescription refills

The participants without medical insurance collected their refills punctually on average 61.40 ± 30.40% of the time before, 63.99 ± 32.43% during and 72.45 ± 32.16% of the time after the

intervention. The participants with medical insurance were punctual in collecting their refills 79.25 ± 24.95%, 90.00 ± 20.00% and 91.75 ± 16.50% of the time before, during and after the intervention respectively.

c) Measured using self-reports during the one-on-one interviews

For the participants without medical insurance the mean reported adherence level at was 81.89 ± 14.11% at pre-intervention and 85.14 ± 9.89% at post-intervention stages. Those with medical insurance reported a mean adherence level of 81.25 ± 9.91% before the intervention and 76.25 ± 11.88% afterwards. During the post-intervention interviews, the participants with medical insurance reported significantly higher adherence levels than those without medical insurance.

Table 5.26: Effect of Having Medical Insurance on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	35	34	43
Pre-intervention	t value	-0.743	-1.124	0.122
	p-value	0.462	0.269	0.904
Intervention	t value	2.036	-1.555	N/A
	p-value	0.049*	0.129	N/A
Post-intervention	t value	-0.207	-1.170	2.225
	p-value	0.837	0.250	0.031*

*Effect significant as indicated by p-value < 0.05

5.8.6 Testing the Effect of Length of Time since Diagnosis of Hypertension on:

5.8.6.1 Participants' Level of Knowledge about Hypertension and its Therapy

17(37.8%) of the participants had been hypertensive for less than five years, 16 (35.6%) had been hypertensive for between five and 10 years and 12 (26.7%) had been hypertensive for more than 10 years. A one-way ANOVA with levels of knowledge measured using self-administered questionnaires or interview responses as the dependent variables and number of years since diagnosis of hypertension as a factor (3 levels: <5 yrs, 5-10 yrs, >10 yrs) was used. The test statistics results are listed in Table 5.27.

a) Measured using self-administered questionnaires

The participants with less than five years since diagnosis scored a mean of 61.77 ± 12.70% for the pre-intervention questionnaires, 70.39 ± 12.85% for the post-intervention ones and 81.96 ± 14.77% for the post-post intervention questionnaires. Those individuals who had been hypertensive for between five and 10 years had a mean percentage score of 62.29 ± 16.13% for pre-intervention questionnaires, 70.42 ± 14.34% for post-intervention questionnaires and 84.58 ± 10.74% for post-post intervention questionnaires. The mean percentage score for the pre-intervention questionnaires completed by those with more than 10 years since diagnosis was 66.67 ± 15.89%, 70.83 ± 17.18% for post- and 84.17 ± 8.66% for post-post intervention questionnaires.

b) Measured using scores from one-on-one interviews

For participants who had been hypertensive for less than five years, the percentage of interview questions relating to knowledge about hypertension and its treatment answered correctly before the intervention was 48.78 ± 17.62% and 79.93 ± 12.31% after the intervention. Those participants with between five and 10 years since diagnosis answered 59.56 ± 15.17% of the questions correctly before, and 78.68 ± 12.87% after, the intervention. Participants with 10 or more years since diagnosis had a mean percentage score of 59.31 ± 12.40% before the intervention and 83.33 ± 10.29% afterwards.

Table 5.27: Effect of Length of Time since Diagnosis of Hypertension on the Participants' Levels of Knowledge about Hypertension and its Therapy

		Method of measuring level		Degrees of
			Interviews	
Pre-intervention questionnaires and	F value	0.436	2.500	2,42
	p-value	0.650	0.094	2,42
Post-intervention	F value	0.004	N/A	2,42
	p-value	0.996	N/A	2,42
Post-post intervention questionnaires /	F value	0.224	0.534	2,42
	p-value	0.801	0.590	2,42

5.8.6.2 Participants' Beliefs about Medicines

A one-way ANOVA analysis with beliefs about medicines as the dependent variables and number of years since diagnosis of hypertension as a factor (3 levels: <5 yrs, 5-10 yrs, >10 yrs) was used. The test statistics results are listed in Table 5.28.

a) Perception of necessity of anti-hypertensive agents (n)

The participants who had been hypertensive for less than five years had a mean necessity score of 20.41 ± 3.81 before the intervention and 19.24 ± 5.01 after the intervention. For those participants who had been hypertensive for between five and 10 years, the mean score was 22.06 ± 2.84 before the intervention and 22.63 ± 2.50 afterwards. The participants who had been diagnosed more than 10 years prior to the study had a mean necessity score of 21.58 ± 3.29 before and 23.00 ± 1.91 after the intervention. After the intervention, the necessity scores for participants who had been hypertensive for less than five years were significantly lower than those for the other participants.

b) Concerns about the undesirable effects of anti-hypertensive medication (c)

The participants who had been hypertensive for less than five years had a mean concerns score of 18.00 ± 3.41 before the intervention and 14.53 ± 3.92 after the intervention. For those participants who had been hypertensive for between five and 10 years, the mean score was 17.81 ± 4.74 before the intervention and 16.00 ± 4.73 afterwards. The participants who had been diagnosed more than 10 years prior to the study had a mean necessity score of 17.92 ± 4.23 before the intervention and 16.50 ± 4.54 after the intervention.

c) The Necessity-Concerns Differential

The participants who had been hypertensive for less than five years had a mean NCD core of 2.41 ± 3.82 before, and 4.71 ± 5.11 after, the intervention. For those participants who had been hypertensive for between five and 10 years, the mean score was 4.25 ± 3.82 before the intervention and 6.63 ± 5.39 afterwards. The participants who had been diagnosed more than 10 years prior to the study had a mean NCD score of 3.67 ± 4.36 before the intervention and 6.50 ± 4.50 after the intervention.

d) Beliefs about the overuse of medicines by doctors (o)

The participants who had been hypertensive for less than five years had a mean score of 13.59 ± 3.16 before, and 13.47 ± 3.02 after the intervention. For those participants who had been hypertensive for between five and 10 years, the mean score was 13.94 ± 3.36 before the intervention and 12.88 ± 3.52 afterwards. The participants who had been diagnosed more than 10 years prior to the study had a mean score of 14.67 ± 3.47 before the intervention and 13.00 ± 2.99 afterwards.

e) Beliefs about the harmful nature of medicines in general (h)

The participants who had been hypertensive for less than five years had a mean score of 11.06 ± 2.02 before, and 9.12 ± 2.42 after, the intervention. For those participants who had been hypertensive for between five and 10 years, the mean score was 10.38 ± 2.19 before the intervention and 8.88 ± 3.05 afterwards. The participants who had been diagnosed more than 10 years prior to the study had a mean score of 12.00 ± 3.67 before the intervention and 10.75 ± 3.52 after the intervention.

Table 5.28: Effect of Length of Time since Diagnosis of Hypertension on the Participants' Beliefs about Medicines

Beliefs about medicines	Degrees of freedom	F value		p-value	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
n	2,42	1.053	5.274	0.358	0.009*
c	2,42	0.008	0.824	0.992	0.446
NCD	2,42	0.921	0.720	0.406	0.492
o	2,42	0.377	0.157	0.689	0.855
h	2,42	1.336	1.558	0.274	0.222

*Effect significant as indicated by p-value < 0.05

5.8.6.3 Participants' Levels of Adherence

A one-way ANOVA analysis was used with adherence levels measured using pill counts, punctuality when collecting refills or self-reports as the dependent variables and number of years since diagnosis of hypertension as a factor (3 levels: <5 yrs, 5-10 yrs, >10 yrs). The test statistics results are listed in Table 5.29.

a) Measured using pill counts

Participants who had been hypertensive for less than five years had mean adherence levels of 16.07 ± 12.96% before, 13.53 ± 12.89% during and 12.28 ± 10.40% after the intervention. The individuals who had been hypertensive for between five and 10 years had mean adherence levels of 15.19 ± 21.76% before, 17.23 ± 16.06% during and 14.89 ± 13.55% after the intervention. The participants who been hypertensive for more than 10 years had the following mean adherence levels: 14.49 ± 20.20% before, 19.95 ± 11.63% during and 8.10 ± 6.41% after the intervention.

b) Measured using punctuality when collecting prescription refills

The participants diagnosed with hypertension less than five years prior to the study collected their prescription refills punctually, on average, 62.78 ± 24.08% of the time before the intervention. During and after the intervention, they collected their refills punctually 70.14 ± 26.74% and 72.40 ± 22.85% of the time respectively. Those individuals who had been hypertensive for between five and 10 years collected their refills punctually 56.04 ± 34.26% of the time before, 65.29 ± 34.76% during and 69.02 ± 40.27% of the time after the intervention. Participants who had had hypertension for more than 10 years collected their refills punctually 74.38 ± 29.90% of the time before, 65.20 ± 37.20% during and 85.03 ± 25.38% of the time after the intervention.

Table 5.29: Effect of Length of Time since Diagnosis of Hypertension on the Participants' Levels of Adherence

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	2,34	2,33	2,42
Pre-intervention	F value	0.018	1.094	1.446
	p-value	0.982	0.347	0.247
Intervention	F value	0.554	0.088	N/A
	p-value	0.580	0.916	N/A
Post-intervention	F value	1.149	0.800	2.643
	p-value	0.329	0.458	0.083

c) Measured using self-reports during the one-on-one interviews

The participants had been hypertensive for less than five years reported a mean adherence level 78.82 ± 13.67% before the intervention and 80.00 ± 10.00% after the intervention. Those participants who had been diagnosed with hypertension between five and 10 years prior to the study reported a mean adherence level of 86.25 ± 15.86% before and 88.13 ± 11.09% after the intervention. The pre-intervention mean adherence level for participants who had been hypertensive for more than 10 years was 80.00 ± 7.40% and at the post-intervention stage it was 82.50 ± 9.65%.

5.8.7 Comparing Data before, during and after the Intervention

The data collected before, during and after the educational intervention was compared using t-tests for dependent samples. This data included participants' adherence levels, beliefs about medicines, levels of knowledge about hypertension, BP readings and BMIs.

5.8.7.1 Participants' Levels of Knowledge about Hypertension and its Therapy

When determined using the self-administered questionnaires (Appendix D), the mean percentage score for the pre-intervention questionnaires was 63.26 ± 14.66% and this increased significantly to 70.52 ± 14.28% for the post-intervention ones then increased significantly again to 83.48 ± 11.78% for the post-post intervention questionnaires (Table 5.30). Using scores from the one-on-one interviews, the mean before the intervention was 55.43 ± 16.04% and increased significantly to 80.39 ± 11.90% after the intervention.

Table 5.30: Comparing Participants' Levels of Knowledge about Hypertension and its Therapy before and after the Intervention (n = 45, degrees of freedom = 44)

		edge about hypertension	
		es	Interviews
	t value	-5.132	-10.091
	p-value	0.000*	0.000*
	B	0.001	<0.0001
	effect size	0.374	0.698
	t value	-12.548	N/A
	p-value	0.000*	N/A
	B	<0.0001	
	effect size	0.782	
	t value	-8.208	N/A
	p-value	0.000*	N/A
	B	<0.0001	
	effect size	0.605	

*Change significant as indicated by p-value < 0.05

The observed probability β of not detecting a difference in participants' levels of knowledge due to the educational intervention when in actuality there is a difference and estimate of the effect size of the tests are also shown in Table 5.30. β of each test is below 0.001 and the proportions of total variability attributed to the intervention are above 0.60 for both pre- and post-post and post- and post-post intervention tests.

5.8.7.2 Participants' Beliefs about Medicines

The mean necessity score (n) before the intervention was 21.31 ± 3.36 and this increased slightly to 21.44 ± 3.90 afterwards. The mean concerns score (c) was 17.91 ± 4.04 before the intervention and decreased significantly to 15.58 ± 4.37 after the intervention (Table 5.31). The mean NCD value was 3.40 ± 3.96 before the intervention and increased significantly to 5.87 ± 5.03 after the intervention. In terms of the beliefs about the overuse of medicines by doctors (o), participants had a mean score of 14.00 ± 3.27 before the intervention and this decreased, though not significantly, to 13.13 ± 3.14 after the intervention. The mean score for the beliefs about the harmful nature of medicines in (h) was 11.07 ± 2.62 before the intervention and this decreased significantly to 9.47 ± 3.01 after the intervention.

The observed probability β and estimate of the effect size, for the participants' beliefs about medicines, of the tests are shown in Table 5.31. The proportions of total variability attributed to the intervention are low for these tests.

Table 5.31: Comparing Participants' Beliefs about Medicines before and after the Intervention (n = 45, degrees of freedom = 44)

Statistical Parameters	n	C	NCD	o	h
p-values	0.835	0.003*	0.003*	0.121	0.005*
t values	-0.210	3.130	-3.105	0.121	2.944
β	0.945	0.135	0.141	0.660	0.179
effect size	0.001	0.182	0.180	0.054	0.165

*Change significant as indicated by p-value < 0.05

5.8.7.3 Participants' Levels of Adherence

Using pill counts, the mean adherence level before the intervention was 15.27 ± 18.61%, decreased[5] slightly to 16.87 ± 13.91 during the intervention period and then increased, again not significantly, to 12.28 ± 11.17% at the post-intervention stage. Using punctuality when collecting prescription refills, the mean percentage adherence level was 63.38 ± 30.07% at the pre-intervention stage, increased slightly to 66.88 ± 32.17% during the intervention and then significantly to 74.59 ± 31.26% after the intervention (Table 5.32). Using self-reports during the interviews, the participants had a mean percentage adherence level of 81.78 ± 13.36% before and this increased, though not significantly, to 83.56 ± 10.69% after the intervention.

The observed probability β and estimate of the effect size, for the participants' adherence levels, of the tests are shown in Table 5.32.

[5] According to the formula used to calculate adherence levels using pill counts (Section 4.6.4.3.1), the smaller the percentage the higher the adherence level. Hence an adherence level of 15.27% is a better than one of 16.87%.

Table 5.32: Comparing Participants' Levels of Adherence before, during and after the Intervention

		Method of measuring adherence		
				Self-reports (n = 45)
	Degrees of	36	35	44
	t value	-0.469	-0.650	N/A
		0.642	0.520	N/A
		0.926	0.903	N/A
		0.006	0.012	N/A
Pre- and post-intervention	t value	0.820	-2.041	-0.892
	p-value	0.418	0.049*	0.377
		0.874	0.490	0.859
		0.018	0.106	0.018
During and post-intervention	t value	1.448	-1.224	N/A
	p-value	0.156	0.229	N/A
		0.709	0.778	N/A
		0.055	0.041	N/A

*Change significant as indicated by p-value < 0.05

5.8.7.4 Blood Pressure Readings and Body Mass Indices

The mean systolic BP readings ± standard deviation was 134.78 ± 12.94 mm Hg before the intervention and increased significantly to 139.44 ± 16.77 mm Hg during the intervention then increased again, though not significantly, to 140.20 ± 18.94 mm Hg after the intervention. The p-values are shown in Table 5.33. There were 37 (82.22%) and 27 (60%) participants with average systolic BP readings below 140 mm Hg before and after the intervention respectively. The mean diastolic BP reading before the intervention was 84.91 ± 8.34 mm Hg, increased significantly to 89.02 ± 11.55 mm Hg during the intervention and further increased, though slightly, to 89.27 ± 13.18 mm Hg after the intervention. 34 (75.56%) participants had average diastolic BPs below 90 mm Hg before the intervention and 27 (60%) after the intervention.

Table 5.33: Comparing Participants' Blood Pressure Readings and Body Mass Indices before, during and after the Intervention (n = 45, degrees of freedom = 44)

		Comparing		
				BMI (kg/m^2)
	Degrees of	2,34	2,33	2,42
Pre- and during intervention	t value	-2.410	-2.869	-2.411
	p-value	0.020*	0.006*	0.020*
	t value	-2.833	-2.561	-2.564
	p-value	0.007*	0.014*	0.014*
During and Post-intervention	t value	-0.448	-0.195	-0.680
	p-value	0.606	0.846	0.519

*Change significant as indicated by p-value < 0.05

The mean BMI was 34.71 ± 7.39 kg/m^2 before the intervention, increased significantly to 35.27 ± 8.03 kg/m^2 during the intervention and then slightly more to 35.33 ± 8.10 kg/m^2 after the intervention. The p-values are also shown in Table 5.33 with those for BP readings. Through out the three (6.67%) of the participants had acceptable body weight, that is BMIs below 25 kg/m^2, nine (20%) were overweight (BMIs between 25 and 29.9 kg/m^2) before, as well as after, the intervention and 10 (22.22%) during the intervention [24].

5.8.8 Correlations Analysis

Statistical analyses were performed using the Pearson correlation coefficient to test for correlations between the different variables.

5.8.8.1 Participants' Levels of Knowledge about Hypertension and Specific Beliefs about Medicines

Tables 5.34 a and b show the test statistics results obtained when analyses were performed using the Pearson correlation coefficient to test for correlations between participants' level of knowledge about hypertension, as well as its therapy, and their specific beliefs about medicines (n, c, NCD) before and after the intervention [130]. Based on the statistical analysis, there was no

significant correlation between participants' level of knowledge about hypertension and its treatment and specific beliefs about medicines ($p > 0.01$).

Table 5.34a: Correlation between Participants' Levels of Knowledge about Hypertension and Pre-Intervention Specific Beliefs about Medicines

Specific beliefs about medicines		Level of knowledge about hypertension and its therapy indicated by:				
		Interviews		Self-administered questionnaires		
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Post-post intervention
n	r	0.246	-0.158	-0.129	-0.239	0.024
	p-value	0.103	0.298	0.399	0.114	0.877
c	r	0.022	-0.259	-0.130	-0.146	-0.032
	p-value	0.886	0.085	0.393	0.338	0.837
NCD	r	0.186	0.130	0.024	-0.053	0.052
	p-value	0.221	0.393	0.876	0.728	0.733

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/5 = 0.01$, where k is the number of pairs.

Table 5.34b: Correlation between Participants' Levels of Knowledge about Hypertension and Post-Intervention Specific Beliefs about Medicines

Specific Beliefs about medicines		Level of knowledge about hypertension and its therapy indicated by:				
		Interviews		Self-administered questionnaires		
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Post-post intervention
n	r	0.194	-0.119	0.015	-0.093	0.096
	p-value	0.203	0.436	0.921	0.545	0.531
c	r	-0.009	-0.019	-0.213	-0.251	0.053
	p-value	0.951	0.902	0.160	0.096	0.731
NCD	r	0.158	-0.076	0.197	0.147	0.028
	p-value	0.299	0.620	0.194	0.337	0.853

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/5 = 0.01$, where k is the number of pairs.

5.8.8.2 Participants' Levels of Knowledge about Hypertension and Adherence Levels

Table 5.35a: Correlation between Participants' Levels of Knowledge about Hypertension and Pre-Intervention Levels of Adherence

Method of measuring adherence		Level of knowledge about hypertension and its therapy indicated by:				
		Interviews		Self-administered questionnaires		
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Post-post intervention
Pill counts (n = 37)	r	0.044	-0.166	0.077	0.009	-0.107
	p-value	0.797	0.327	0.650	0.957	0.527
Punctuality when collecting refills (n = 36)	r	0.130	-0.134	-0.027	0.132	0.040
	p-value	0.450	0.436	0.877	0.442	0.815
Self-reports (n = 45)	r	0.204	0.098	0.117	0.094	-0.021
	p-value	0.180	0.521	0.445	0.538	0.891

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/5 = 0.01$, where k is the number of pairs.

Table 5.35b: Correlation between Participants' Levels of Knowledge about Hypertension and Intervention Levels of Adherence

Method of measuring adherence		Level of knowledge about hypertension and its therapy indicated by:				
		Interviews		Self-administered questionnaires		
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Post-post intervention
Pill counts (n = 37)	r	0.088	-0.171	-0.030	-0.070	-0.018
	p-value	0.605	0.311	0.861	0.681	0.918
Punctuality when collecting refills (n = 36)	r	0.005	-0.088	-0.025	0.053	0.010
	p-value	0.979	0.608	0.883	0.757	0.955

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/5 = 0.01$, where k is the number of pairs.

Table 5.35c: Correlation between Participants' Levels of Knowledge about Hypertension and Post-Intervention Levels of Adherence

Method of measuring adherence		Level of knowledge about hypertension and its therapy indicated by:				
		Interviews		Self-administered questionnaires		
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Post-post intervention
Pill counts (n = 37)	r	0.063	0.228	0.150	-0.067	0.212
	p-value	0.711	0.175	0.376	0.693	0.208
Punctuality when collecting refills (n = 36)	r	0.332	0.101	0.140	0.094	0.041
	p-value	0.048	0.556	0.414	0.584	0.812
Self-reports (n = 45)	r	0.127	-0.039	-0.288	-0.112	-0.112
	p-value	0.407	0.802	0.055	0.466	0.462

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/5 = 0.01$, where k is the number of pairs.

Tables 5.35 a, b and c show the test statistics results obtained when analyses were performed using the Pearson correlation coefficient to test for correlations between participants' levels of knowledge about hypertension, as well as its therapy, and their levels of adherence to therapy determined using three methods (pill counts, punctuality in collecting refills and participants' self-reports). There was no significant correlation between the levels of knowledge about hypertension reflected by the participants and their adherence levels ($p > 0.01$).

5.8.8.3 Participants' Specific Beliefs about Medicines and Levels of Adherence

Tables 5.36 a, b and c show the test statistics results obtained when analyses were performed using the Pearson correlation coefficient to test for correlations between participants' specific beliefs about medicines and their levels of adherence to therapy determined using three methods (pill counts, punctuality in collecting refills and self-reports).

Table 5.36a: Correlation between Participants' Specific Beliefs about Medicines and Pre-Intervention Levels of Adherence

Method of measuring adherence		Specific beliefs about medicines					
		Pre-intervention			Post-Intervention		
		n	c	NCD	n	c	NCD
Pill counts (n = 37)	r	0.109	0.265	-0.181	-0.155	0.164	-0.271
	p-value	0.521	0.113	0.284	0.358	0.331	0.105
Punctuality when collecting refills (n = 36)	r	-0.003	-0.070	0.074	0.261	-0.032	0.219
	p-value	0.987	0.684	0.666	0.124	0.852	0.199
Self-reports (n = 45)	r	-0.114	-0.233	0.141	0.076	-0.037	0.092
	p-value	0.456	0.124	0.356	0.619	0.807	0.550

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.

At 10% level: $\alpha/k = 0.1/6 = 0.017$

Table 5.36b: Correlation between Participants' Specific Beliefs about Medicines and Intervention Levels of Adherence

Method of measuring adherence		Specific beliefs about medicines					
		Pre-intervention			Post-Intervention		
		n	C	NCD	n	c	NCD
Pill counts (n = 37)	r	0.100	-0.011	0.097	0.017	-0.207	0.208
	p-value	0.555	0.947	0.569	0.919	0.218	0.216
Punctuality when collecting refills (n = 36)	r	0.399	0.039	0.283	0.364	0.021	0.246
	p-value	0.016*	0.820	0.095	0.029	0.903	0.149

*Correlation significant at 10% level as indicated by p-value < 0.017

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.

At 10% level: $\alpha/k = 0.1/6 = 0.017$

Table 5.36c: Correlation between Participants' Specific Beliefs about Medicines and Post-Intervention Levels of Adherence

Method of measuring adherence		Specific beliefs about medicines					
		Pre-intervention			Post-Intervention		
		n	C	NCD	n	c	NCD
Pill counts (n = 37)	r	-0.017	0.086	-0.104	-0.015	0.323	-0.316
	p-value	0.919	0.612	0.542	0.929	0.051	0.057
Punctuality when collecting refills (n = 36)	r	-0.038	0.000	-0.031	0.091	-0.331	0.364
	p-value	0.827	0.998	0.856	0.597	0.049	0.029
Self-reports (n = 45)	r	0.000	-0.355	0.363	0.021	-0.079	0.085
	p-value	0.999	0.017	0.014*	0.890	0.606	0.578

*Correlation significant at 10% level as indicated by p-value < 0.017

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.

At 10% level: $\alpha/k = 0.1/6 = 0.017$

There was a significant positive correlation between perceived necessity of anti-hypertensive medicines before the intervention and adherence calculated through punctuality when collecting refills during the intervention period. There was also a significant positive correlation between pre-intervention NCD values, and post-intervention self-reported adherence.

5.8.8.4 Participants' Blood Pressure Readings and Levels of Adherence

Table 5.37a: Correlation between Participants' Blood Pressure Readings and Pre-Intervention Levels of Adherence

Method of measuring adherence		Blood Pressure Readings					
		Systolic			Diastolic		
		Pre-intervention	Intervention	Post-intervention	Pre-intervention	Intervention	Post-intervention
Pill counts (n = 37)	r	0.037	-0.118	-0.027	0.218	-0.033	0.044
	p-value	0.829	0.485	0.875	0.195	0.845	0.797
Punctuality when collecting refills (n = 36)	r	0.103	0.015	-0.132	0.111	0.006	-0.118
	p-value	0.550	0.933	0.444	0.518	0.971	0.494
Self-reports (n = 45)	r	0.077	0.002	0.005	-0.241	-0.071	-0.050
	p-value	0.614	0.987	0.975	0.110	0.643	0.742

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.

At 10% level: $\alpha/k = 0.1/6 = 0.017$

Table 5.37b: Correlation between Participants' Blood Pressure Readings and Intervention Levels of Adherence

Method of measuring adherence		Blood Pressure Readings					
		Systolic			Diastolic		
		Pre-intervention	Intervention	Post-intervention	Pre-intervention	Intervention	Post-intervention
Pill counts (n = 37)	r	0.332	0.400	0.185	0.195	0.363	0.152
	p-value	0.044	0.014*	0.274	0.248	0.027	0.369
Punctuality when collecting refills (n = 36)	r	0.027	0.120	0.038	-0.019	0.131	0.041
	p-value	0.875	0.485	0.827	0.910	0.446	0.812

*Correlation significant at 10% level as indicated by p-value < 0.017

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs. At 10% level: $\alpha/k = 0.1/6 = 0.017$

Tables 5.37 a, b and c show the test statistics results obtained when analyses were performed using the Pearson correlation coefficient to test for correlations between participants' levels of adherence to therapy and their BP readings. There was a significant positive correlation between intervention systolic BP readings and adherence levels measured using the pill count method during the same period. The statistical analyses did not show any other significant correlations ($p < 0.017$).

Table 5.37c: Correlation between Participants' Blood Pressure Readings and Post-Intervention Levels of Adherence

Method of measuring adherence		Blood Pressure Readings					
		Systolic			Diastolic		
		Pre-intervention	Intervention	Post-intervention	Pre-intervention	Intervention	Post-intervention
Pill counts (n = 37)	r	-0.113	-0.059	0.013	-0.122	-0.021	0.059
	p-value	0.504	0.731	0.939	0.473	0.903	0.731
Punctuality when collecting refills (n = 36)	r	0.155	0.242	0.042	-0.032	0.242	0.062
	p-value	0.365	0.154	0.810	0.852	0.155	0.718
Self-reports (n = 45)	r	-0.037	-0.095	-0.098	-0.218	-0.148	-0.133
	p-value	0.810	0.534	0.523	0.150	0.332	0.055

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.
At 10% level: $\alpha/k = 0.1/6 = 0.017$

5.8.8.5 Participants' Blood Pressure Readings and Body Mass Indices

Table 5.38 shows the test statistics results obtained when analyses were performed using the Pearson correlation coefficient to test for correlations between participants' BP readings and

their BMIs. Although not significant ($p > 0.017$), there were positive correlations between both mean systolic and diastolic BP readings and the participants' mean BMI throughout the study.

Table 5.38: Correlation between Participants' Blood Pressure Readings and Body Mass Indices before, during and after the Intervention

Method of measuring adherence		Blood Pressure Readings					
		Systolic			Diastolic		
		Pre-intervention	Intervention	Post-intervention	Pre-intervention	Intervention	Post-intervention
Pre-intervention BMIs	r	0.163	-0.046	0.118	0.088	-0.018	0.108
	p-value	0.284	0.766	0.440	0.567	0.908	0.481
Intervention BMIs	r	0.152	-0.069	0.109	0.091	-0.047	0.101
	p-value	0.317	0.653	0.475	0.551	0.760	0.508
Post-intervention BMIs	r	0.171	-0.055	0.138	0.093	-0.034	0.127
	p-value	0.260	0.719	0.367	0.543	0.823	0.405

Bonferroni adjustment at 5% level: $\alpha/k = 0.05/6 = 0.008$, where k is the number of pairs.

At 10% level: $\alpha/k = 0.1/6 = 0.017$

5.8.9 Analysis of the BMQ Using Cronbach's Alpha Analysis

The pre- and post-intervention Cronbach's alpha (CA) values [203,204] are shown in Table 5.39 below. The Cronbach's alpha analysis was performed to test the internal consistency reliability of the BMQ section addressing participants' specific beliefs, the section addressing general beliefs about medicines and the whole questionnaire.

Table 5.39: Cronbach's Alpha Analysis of the BMQ

Section of BMQ	Cronbach's Alpha values	
	Pre-intervention	Post-intervention
Specific beliefs	0.823	0.773
General beliefs	0.710	0.737
All beliefs	0.849	0.812

5.9 Summary of Hypotheses

The hypotheses proposed at the beginning of this study (Section 3.5) are listed below together with a summary of the conclusions reached after statistical analyses were carried out to test the hypotheses. The findings of the statistical analyses are discussed in more detail in chapter six.

5.9.1 Demographic Factors

1. H_0: Demographic factors (age, gender and number of years of formal schooling) had no effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

   H_1: Demographic factors (age, gender and number of years of formal schooling) had an effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

Based on the statistical analyses, age, gender and the number of formal education that the participants in this study received did not have any significant effect on their levels of knowledge about hypertension and its therapy, their beliefs about medicines or adherence levels.

5.9.2 Medical History

2. H_0: The length of time since diagnosis of hypertension had no effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

   H_1: The length of time since diagnosis of hypertension had an effect on participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

Overall, the length of time since diagnosis with hypertension did not have a significant effect on the participants' levels of knowledge about hypertension and its therapy, beliefs about medicines or their adherence levels.

3. H_0: The number of anti-hypertensive medicines that participants were taking had no effect on participants' beliefs about medicines and their adherence levels.

H_1: The number of anti-hypertensive medicines that participants were taking had an effect on participants' beliefs about medicines and their adherence levels.

According to the statistical analyses performed, the number of anti-hypertensive medicines that participants were taking had no significant effect on their beliefs about medicines or their adherence levels.

4. H_0: Having medical insurance had no effect on participants' adherence levels.
   H_1: Having medical insurance had an effect on participants' adherence levels.

Overall, the statistical analyses results showed that the adherence levels of the participants with medical insurance did not differ significantly from the levels of participants without medical insurance.

5.9.3 Comparing Pre- and Post-Intervention Data

5. H_0: There was no change in the participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.
   H_1: There were changes in participants' levels of knowledge about hypertension and its therapy, their beliefs about medicines and adherence levels.

According to the statistical analyses, the participants' levels of knowledge about hypertension and its therapy after the educational intervention were significantly higher than the levels of before the intervention. The statistical analyses also showed that the participants' concerns and negative perceptions about medicines decreased significantly after the intervention whilst their perceived level of necessity of anti-hypertensive medicines did not change significantly.

The participants' levels of adherence after the intervention were not significantly different from those before the intervention.

6. H_0: There was no change in participants' systolic and diastolic BP readings, as well as Body Mass Indices (BMIs) after the programme.

H_1: There was a change in participants' systolic and diastolic BP readings, as well as BMIs after the programme.

The participants' systolic and diastolic BP readings, as well as BMIs increased significantly after the intervention.

5.9.4 Correlation Analysis

7. H_0: There was no correlation between the participants' specific beliefs about their anti-hypertensive medicines and their adherence to the therapy.
   H_1: There was a correlation between participants' specific beliefs about their anti-hypertensive medicines and their adherence to therapy.

Overall the statistical analyses did not show significant correlation between participants' specific beliefs about medicines and their adherence levels.

8. H_0: There was no correlation between the participants' levels of knowledge about hypertension and its therapy and their levels of adherence to therapy.
   H_1: There was a correlation between the participants' levels of knowledge about hypertension, as well as its therapy, and their levels of adherence to therapy.

According to the Pearson correlation coefficient, there was no significant correlation between the participants' levels of knowledge about hypertension and its therapy and their levels of adherence to therapy.

9. H_0: There was no correlation between the participants' level of knowledge about hypertension and its therapy and their specific beliefs about anti-hypertensive medication.
   H_1: There was a correlation between the participants' level of knowledge about hypertension, as well as its therapy, and their specific beliefs about anti-hypertensive medication.

The statistical analyses did not show a significant correlation between the participants' levels of knowledge about hypertension and its therapy and their specific beliefs about anti-hypertensive medication.

10. H_0: There was no correlation between the participants' BP readings and their levels of adherence to therapy.
    H_1: There was a correlation between the participants' BP readings and their levels of adherence to therapy.

    Generally, there were no significant correlations between the participants' systolic BP readings and their levels of adherence.

11. H_0: There was no correlation between participants' BMIs and their BP readings.
    H_1: There was a correlation between participants' BMIs and their BP readings.

The statistical analyses did not show significant correlations between the participants' BMIs and their BP readings.

5.10 Participants' Opinions of the Educational Intervention

Appendix I shows the self-administered questionnaire used to gather participants' opinions about the educational intervention and the frequency of responses given by the participants which are also summarised in Table 5.40. The questionnaire was available to the participants in English as well as isiXhosa and the responses given in isiXhosa were translated into English and included in Appendix I.

Table 5.40 Summary of Participants' Responses to Questions Regarding their Opinions of the Educational Intervention

Questions raised	Participants' Responses		
Overall opinion of the programme	Very helpful (n = 43)	Helpful just a little bit (n = 2)	Not helpful at all (n = 0)
Did not understand some aspects about hypertension before the programme	Yes (n = 31)	No, understood everything (n = 14)	
Understood everything about hypertension after the programme	Yes (n = 42)	No (n = 3) All 3 did not write down what they still did not understand.	
Most liked aspects of the programme			
• Being able to ask the investigator questions about hypertension and its therapy	(n = 33)		
• The written information provided	(n = 32)		
• The talks and discussions	(n = 35)		
• Having the investigator check blood pressure and weight every month	(n = 38)		
Similar programmes should be carried out for other conditions, for example, diabetes	Yes (n = 39)	No (n = 1)	No response (n = 5)
Would encourage others to take part in similar programmes	Yes (n = 40)	No (n = 1)	No response (n = 4)

Listed below are the aspects of hypertension and its therapy that participants reported as not having known before the educational intervention. These were gathered from the self-administered questionnaire that the participants completed (Appendix I).

- Definition of high BP.
- Hypertensive individuals have to take their anti-hypertensive medication indefinitely.
- Fatty substances can deposit in the blood vessels and block them.
- Dietary requirements for hypertensive individuals.
- Causes and predisposing factors of hypertension.
- Consequences of uncontrolled hypertension.
- Hypertensive individuals must consult a HCP before using other medication, even traditional remedies, other than the anti-hypertensive agents prescribed for them.
- Hypertension has no cure.
- Medication alone is not adequate to keep BP under control.
- Not to take double dose of medication if previous dose was missed

The following are suggestions that were made by the participants on how the educational intervention programme could have been improved.

- More time needed with the investigator.
- Having space dedicated for the meetings instead of meeting at work stations where there can be disturbances.
- Workshops for hypertensive individuals to share and encourage each other on health issues.
- Similar programme for education of diabetic patients and screening individuals for diabetes.
- Education through videos that show people living with high BP.
- Physical exercise sessions at least twice a week.
- Educate the people in the community about high BP.
- More effective medicines to be supplied by HCPs.

Participants also made a few other comments regarding the educational intervention. These are listed below.

- "Now we can teach others about high BP"
- "If there were more education for people on high BP, then less people would have it."
- "Clarris (investigator) taught us how to stay healthy with our high-high."
- "I now take my tablets correctly and I've reduced the amount of salt and fat in my food."
- "Thank you Clarris, you helped us a lot"

The implications of the results presented in this chapter are discussed in the following chapter. Chapter 7 gives a brief summary of these findings and the conclusions reached based on these results are presented in Chapter 8. The findings from this study have also been presented at scientific conferences [214-218].

CHAPTER SIX
DISCUSSION

6.1 Introduction

Poor adherence to anti-hypertensive therapy is one of the main causes of poor BP control [22,160,187]. The problem of poor adherence exists worldwide and HCPs have a role to play in reducing the extent of this problem [22,80]. One of the reasons for poor adherence to therapy is lack of pertinent information for patients [19,61,71,93]. Poor communication between HCPs and patients is also a cause of poor adherence to therapy [74,132,133]. Whether or not patients choose to ignore health-related advice, HCPs, especially pharmacists, have a key role to play in educating patients about the role of their therapy, how it is to be used, the consequences of poor adherence to therapy and the recommended lifestyle changes to supplement the medicinal therapy [60-62].

6.2 Patient Education in Makana Local Services Area

From the FGD (Appendix F) held with the nursing sisters at the PHC in the MLSA in South Africa, it was apparent that the existing patient education system lacked structure and was inefficient. From the one-on-one interviews and self-administered questionnaires administered during the study at the university, the investigator gathered that some of the participants felt the information that they had been given by their HCPs, regarding hypertension and its therapy, was inadequate.

During the pre-intervention interviews nine (20%) participants reported not having been told about the appropriate diet for hypertensive individuals when they were first diagnosed with hypertension (Table 5.3). One participant even reported not having been told to return for a prescription refill after being given the first month's supply of anti-hypertensive medicines (Section 5.3.4.1). This could have been due to either the HCPs incorrectly assuming that the participant was aware that anti-hypertensive therapy was lifelong or; perhaps forgetting to tell him that he had to return for a prescription refill. During the FGD held at the PHC, the nursing sisters stated that it was possible for HCPs to forget to mention some pertinent information when they were educating patients during their visits to the facility (Section 5.2).

As mentioned in Section 3.3.1.1, the talks given at the local PHC, by CHWs and HCPs, did not benefit many of the hypertensive patients who attended this facility since they occurred randomly. Another major constraining factor was the lack of monitoring of the information presented. This could have resulted in repetition of information whilst some important issues were not addressed.

Another interesting point noted from the participants' interview responses was that none of them consulted pharmacists for health-related information. The participants in this study might not have been well-informed about the role of pharmacists in educating patients. Although pharmacists are health information experts, patients do not always consult them, even on matters relating to medicines [219,220].

Most of the participants in this study did not have access to written medicines information (Section 3.3.1). One study revealed that patients do not always see information leaflets that are enclosed in medication packages. Since these leaflets are not handed directly to the individuals, this may lead them to believe, if they do notice them, that the leaflets are not relevant to them. During the pre-intervention interviews, 13 (28.89%) participants reported having read about hypertension at some point before they were invited to join the study (Table 5.3). The sources of information included books, magazines, information leaflets, posters and one participant reported having searched the Internet. After the intervention, the number of participants who had read about hypertension increased to 41 (91.11%), with the majority of these individuals (90.20%) having read the summary leaflets (Appendix E) which were designed by the investigator during the study and were handed personally to each of the participants as part of the educational intervention. This shows that if patients are given written medicines information and made aware that it is for them to read, they may read and benefit from it [221].

The post-post intervention self-administered questionnaires showed a significant increase in participants' levels of knowledge about hypertension and its therapy ($p = 0.000$) indicating that the summary leaflets were beneficial. This coincides with reports that state that written information is an adjunct to verbal advice and helps patients to retain more information [70,107,109].

6.3 Levels of Knowledge about Hypertension and its Therapy

The participants' levels of knowledge about hypertension and its therapy increased significantly after the intervention, as reflected by both the responses to the self-administered questionnaires and interviews (Table 5.30). This is in line with previous findings in the literature, which show that patient education programmes can be utilised to increase patients' knowledge about hypertension [20,21]. In a study similar to the present one, hypertensive individuals took part in a educational intervention which resulted in a significant increase in their levels of knowledge about hypertension when measured four months after the intervention [21].

The post-intervention self-administered questionnaires showed a mean score of 70.52%, but this was still much less than the possible score of 100%. This demonstrates that the participants did not retain all the information they learnt during the talks and discussions held two to three weeks prior to the participants completing the post-intervention questionnaires (Table 5.30). The statistical p-value of 0.000 showed that the summary leaflets significantly increased the amount of information retained by the participants [213]. They still remembered this information about two and a half months later when the investigator conducted post-intervention interviews.

Using two different methods of measuring participants' levels of knowledge about hypertension (self-administered questionnaires and one-on-one interviews) meant that both retention and understanding of the knowledge by participants could be measured. Using more than one method to measure outcomes validates the findings of each method and results in sound conclusions being drawn from the data collected [96]. Whilst increases in the scores on the self-administered questionnaires could have been due to participants cramming the information from the talks and summary leaflets, possibly copying their colleagues or even guessing the correct responses, this was not the case with the one-on-one interviews.

During the interviews, participants gave their responses using their own words. There was nobody to tell them the right answers to the questions. Since an interpreter was available the participants were able to express themselves in the language that they were comfortable with. Based on the responses given by the participants during these interviews, the investigator could

ascertain whether the participants actually understood what they were saying or were merely repeating words that they had heard during the talks or read from the leaflets.

With regard to names of anti-hypertensive medicines, participants seemed more able to write the names down compared to saying them out. 27 participants wrote down the correct names of their medication on the post-post intervention questionnaires (Table 5.12) whilst 24 gave the correct names during the post-intervention interviews (Table5.4). This was probably because the participants did not have enough confidence to pronounce the sometimes long and 'tongue-twisting' names of their medicines.

6.4 Beliefs about Medicines

Statistical analyses of the participants' beliefs before and after the intervention showed that participants developed more positive attitudes towards their anti-hypertensive medications and towards all medicines in general. The changes in the participants' level of perception about the necessity of anti-hypertensive medication (21.31 to 21.44) and the beliefs about the prescribing habits of doctors (14.00 to 13.13) were not significant. However, they were favourable, that is the mean necessity score (n) increased and the score for the belief that doctors over-prescribed (o), decreased. The NCD increased significantly ($p = 0.003$) and the level of concern about undesirable effects of anti-hypertensive agents decreased significantly ($p = 0.003$), as did the scores for the beliefs about the harmful nature of all medicines in general ($p = 0.005$).

The post-intervention interviews also showed a decrease in participants' concerns about their hypertension and its therapy. The changes in the beliefs about medicines are in line with other studies that suggest that educational interventions can lead to the modification of patients' attitudes towards therapy [18,19,73,74]. During this study, participants had the opportunity to ask questions during the monthly meetings with the investigator and when the educational talks were conducted. The content of the educational talks, or the answers to questions that the participants raised during the study could have helped clear some of the misconceptions that participants had about their hypertension and its therapy. This could have reduced the concerns about their therapy and other medicines in general [89].

Comparing HCPs' and patients' general beliefs about medicines, both believed that doctors prescribed too many medicines. In the study there were only three (15%) doctors amongst the HCPs who completed the BMQ, the rest being mostly pharmacy staff. This indicates that the other HCPs also believed that doctors over-prescribe which is not surprising considering the lack of effective communication between HCPs from different fields regarding approaches to managing health conditions [15,18,222].

6.5 Levels of Adherence

The simplest method for determining medication-taking behaviour, during this study, was using the participants' punctuality in collecting their prescription refills. This was because the investigator could retrieve this information during one or two of the monthly meetings unlike the pill counts which had to be carried out at each of these meetings. The information about participants' prescription refill collection dates could be gathered from their health passports or reports from HCPs in the private health sector and was therefore considered reliable.

The self-report and pill count method had the potential for being influenced by the participants [128,132,134,147-149,151]. For example, a participant might have deliberately not presented all their medication for counting during the monthly meetings. Another example of participants' influence is during the interviews when they could have reported what they believed the investigator wanted to hear and not their actual behaviour. Data obtained from measuring adherence using punctuality in collection of refills did not guarantee the medication was used as directed or used at all [150].

The pill count and self-report methods of measuring adherence showed increases, though not statistically significant ($p = 0.418$ and 0.377 respectively), in the participants' levels of adherence from the pre- to post-intervention stage. There was a marginally significant increase in punctuality when collecting prescription refills from the pre- to the post-intervention stages ($p = 0.049$). There was a slight decrease in the levels of adherence measured using pill counts, from the pre-intervention to intervention stages. The lack of significant increases in adherence is similar to findings of a previous study where changes in knowledge and attitudes towards therapy did not lead to an improvement in medication-taking behaviour [223]. However, two

other studies showed significant increases in adherence levels after an educational intervention [20,224]. Another study reported lower adherence levels in participants who had a lower understanding of their condition (cancer) and those with a lower perception of their vulnerability compared to their more knowledgeable counterparts [99].

In this study significantly higher levels of adherence were expected after the educational intervention (Section 3.5.3), but this was not the case. This was probably due to the decrease in adherence levels between the pre-intervention and intervention periods. There was a Christmas break during this time when most of the participants did not meet with the investigator or any HCPs. The participants who received their medication from the university sanatorium or the PHC were given enough medication for two months at the end of November or beginning of December 2004. The next refill date was at the end of January or beginning of February 2005 when most, if not all, of them were back at work.

Before the intervention, three (6.67%) participants reported that their colleagues at work reminded them to take their medication, whilst 21 (46.67%) stated that they kept their medication in their bag, which they carried to work. Without these reminders during the holidays, participants might have forgotten to take some of their medication leading to them having extra medication when the investigator counted it in March 2005 for the intervention period measurements. This behaviour could have influenced the average adherence levels recorded for the intervention period. During the short period between the end of the educational intervention programme and the end of the whole study, the levels of adherence measured using the pill counts ($p = 0.156$) and punctuality in collecting prescription refills ($p = 0.229$) increased, though not significantly. These increases might have continued if measurements of adherence had continued for a longer period. These findings prove that patients need constant reminders and encouragement to take their medication and that patient education is not a once-off event [77,100].

6.6 Blood Pressure Readings and Body Mass Indices

There were significant increases in systolic as well as diastolic BP readings and BMIs from the pre-intervention to the intervention time periods ($p = 0.020$, 0.006 and 0.002 respectively). It

may be assumed that the major increase occurred due to participants indulging in unhealthy behaviour during the 2004 Christmas holidays which is a common, but dangerous, practice throughout the world [225-227]. The increase in the systolic as well as diastolic BP readings and BMIs from the intervention to the post-intervention stage was not significant ($p = 0.656$, 0.846 and 0.519 respectively).

More than half (62%) of the participants reported that their form of exercise was walking to and from work. Most of their jobs also required a considerable amount of physical effort. During the Christmas break the amount of physical activity undertaken by participants was probably reduced, leading to an increase in BP readings and BMIs [5,72]. Although the participants' BP increased significantly during the study, 27 (60%) of the participants had mean systolic and diastolic BP readings below 140 and 90 mm Hg respectively after the intervention. Therefore, the BP for more than half of the participants was controlled [4,5,7]. However, only three (6.67%) participants had weight under control (BMI < 25 kg/m^2) throughout the whole study.

6.7 Findings from the One-on-One Interviews

6.7.1 Participants' Use of Alternative Therapy

Compared to traditional medicines and home remedies, commercial herbal products were not commonly used among the participants. One of the reasons could have been that these products had to be purchased from retailers or pharmacies where the prices were not affordable for most of the participants. Another reason for not purchasing commercial herbal products might have been that the participants were not well informed about the products. Home remedies were more accessible to the participants and they probably had learnt about these from their families and peers. The use of garlic for lowering BP has been documented [228,229] and in this study participants also reported using this vegetable to lower their BP.

Although not pleasant tasting 'Mhlonyane' (*Artemisia afra*) [212], used for colds and coughs, was accessible to the participants and it was widely used, probably because the HCPs recommended it and in some cases did not give patients conventional cough medicines. Patients have been reported to use alternative medicines when, for various reasons, they have no access to conventional medicines. One of the main reasons for resorting to complementary medicines is

the affordability of these products in comparison to conventional ones [201]. This is especially the case when the alternative therapy being utilised is an everyday household item, for example, garlic.

6.7.2 Effect of Demographic Factors

As in some other studies [128,129,134-136], demographic factors such as gender, age and level of education did not have an effect on the participants' levels of adherence. The only exceptions were firstly before the intervention when the participants with less than eight years of formal education collected their refills punctually more often the participants with more than nine years of schooling (0.022). Secondly, based on the intervention period pill counts, male participants were significantly more adherent than their female counterparts ($p = 0.018$). Demographic factors did not affect the participants' beliefs about medicines.

According to the pill counts, participants with medical insurance were less adherent during the intervention period than those without medical insurance. The difference was only marginally significant as shown by a p-value of 0.049. According to self-reports during the post-intervention interviews, those without medical insurance were significantly less adherent. Studies have listed cost of therapy as a source of poor adherence to therapy [22,73,119,138]. In this study the participants without medical insurance received their medication free of charge whilst those with medical insurance had to pay the recently introduced dispensing fee [207] which was not covered by their medical insurances. Such extra costs might have made these participants adhere more to their therapy so that they could put their money to good use.

6.7.3 Effect of Number of Anti-hypertensive Medicines

One of the reported causes of poor adherence to therapy is the complexity of the therapeutic regimen. Patients' level of adherence decrease with an increase in the number of medications that they have to take [230,231]. However, this was not the case with the participants in this study. According to the one way ANOVA carried out, there was no significant difference in adherence between participants taking one, two and three, or more, anti-hypertensive medications (Table 5.25). These findings are inline with results of two studies carried out where the complexity of the therapeutic regimen did not have an effect on participants' adherence

levels [93,99]. These studies suggested that patients' levels of adherence are influenced more by beliefs about illnesses and medication than by factors such as the number as medicines that are taken by the patients. This corresponds to findings in this study where beliefs about medicines were found to influence participants' adherence levels (Section 6.8.1).

6.7.4 Effect of Length of Time since Diagnosis of Hypertension

Having hypertension for a longer period did not make participants more knowledgeable about their condition. Their beliefs about medicines were also not affected except after the intervention when those with less than five years since diagnosis had a significantly lower level of perception of the necessity (n) of their anti-hypertensive medicines than those who had been hypertensive for more than five years ($p = 0.009$).

A study carried out in New York showed that duration of treatment did not have an effect on adherence levels [99]. However, a study carried out in Athens, Greece, showed that individuals who had been on anti-hypertensive therapy for longer periods were less adherent than their counterparts [20]. This was contrary to this study carried out in Grahamstown, South Africa, where participants who had been on anti-hypertensive therapy for more than 10 years adhered more to their therapy than those participants who had been hypertensive for a shorter period. This trend was observed when adherence was measured using the pill count method, as well as punctuality in collecting refills at the pre- and post-intervention stages. The longer period, since their diagnosis, might have enabled these participants to adjust their behaviour and take their medication correctly [20,232].

6.8 Correlation Analysis

6.8.1 Specific Beliefs about Medicines and Levels of Adherence

According to the participants' adherence levels measured using self-reports during the interviews, those with higher NCD values before the intervention adhered more significantly to their therapy after the intervention. The participants with higher perceived levels of the necessity of anti-hypertensive medicines before the intervention collected their prescription refills more punctually during the intervention period. Although not significant, the other correlations were also in line with findings from previous studies where participants with higher NCD values, as

well as necessity scores, and lower concerns scores had higher adherence levels than their counterparts [88,90,91,168].

6.8.2 Levels of Knowledge about Hypertension and Adherence

The participants' levels of knowledge about hypertension were not correlated to their levels of adherence. Previous studies have noted that although patients might possess the knowledge on how to manage their diseases and conditions, they are not always prepared to follow their HCPs' recommendations [126,158,233]. Patients may have different goals from their HCPs [81,158]. For example, based on the FGD held at the PHC (Appendix F), participants might have desired to have high BP levels so that they could get some time off from work.

There are other factors which influence adherence to medication. These include the relationship between HCPs and patients and patients' beliefs about illnesses and the prescribed therapy [19,80,83,90,128,129]. Therefore, even though patients are knowledgeable about the role of therapy in their illnesses, they might not use it correctly because of other factors which exert more influence on their health-related behaviour.

6.8.3 Levels of Knowledge about Hypertension and Specific Beliefs about Medicines

Knowledge affects beliefs and educating patients can modify their beliefs about their medicines [18,19,73,74]. In this study there was a significant increase in knowledge about hypertension, as well as a positive change in the participants' beliefs about medicine. However, according to the Pearson Correlation coefficient, these changes did not seem to be directly related.

6.8.4 Blood Pressure Readings and Levels of Adherence

There were generally negative, though not significant, correlations between systolic as well as diastolic BP readings and adherence levels. That is to say that those participants who were less adherent had higher BP levels than those individuals who had higher levels of adherence to therapy. This is in line with the literature, which states that higher adherence level to therapy will result in lower BP readings [22,160,187].

6.9 Behaviour Change

Patient education interventions have been cited as effective for increasing knowledge about a condition and its therapy [20,21], modifying beliefs about illnesses and their therapies [18,19,73,74], improving health-related outcomes such as BP [75,78] and increasing adherence levels to therapy [75,76]. The results of this study show that participants' levels of knowledge about hypertension increased and their beliefs about medicines were modified positively. However, this did not result in significant changes in their levels of adherence.

The number of participants used in a study affects the power of statistical tests. That is, the sample size can lead to the acceptance of the null hypotheses that there was no significant change in a parameter whilst significant changes did actually occur. In this study, the sample size of 45 participants might not have been sufficient for significant changes in adherence levels to be observed. This is supported by the high β values (Table 5.32) obtained for the paired t-tests performed to compare the adherence levels before, during and after the educational intervention [195,211].

One likely reason for the lack of significant increases in adherence could have been that changing behaviour is a process that occurs over a long period of time [20,232]. The post-intervention measurements were performed less than 12 weeks after the final talk and distribution of summary leaflets to the participants. This might not have been sufficient time for adequate behaviour changes to occur resulting in increased adherence and/or improved BP levels, as well as BMIs. In one study where improvements in adherence levels and health-related parameters, due to an educational intervention, were observed, the post-intervention measurements were performed after a period ranging from 23 to 77 weeks [75].

Behaviour change occurs when beliefs are modified [234]. This study reflected a positive change in participants' beliefs about their anti-hypertensive medicines, as evidenced by the significant decrease in the level of concern about the undesirable effects of these agents ($p = 0.003$). There was also a significant increase in the NCD, as shown by a p-value of 0.003. Levels of adherence to therapy increased, though not significantly. With time, significant changes might have occurred [20,232] leading to decreases in BP levels and BMIs.

With regard to the participants' BMIs, there are also socio-economic and cultural factors to consider. For example, the meat, be it red or white, that was affordable for most of the participants contains highly refined fats that are not healthy and lead to weight gain and obesity. Another factor is that in communities where HIV is highly prevalent such as South Africa, loss of weight can be associated with being infected with HIV, something with a social stigma attached to it. Patients might also not perceive their weight as being a problem though in this study, at Rhodes University, 42 (93.3%) of the participants believed that body weight affected BP. These two previous factors can limit patients' motivation to lose weight [235-237].

A barrier to most South African women losing weight is that in their culture, weight gain is a sign that a husband is providing well for his family. It can even be considered disrespectful to the husband's family if his wife loses weight. Some members of the community, particularly males, believe that when a married woman starts losing weight the intention is to attract the attention of other men besides her husband. In this study, the female participants' mean BMIs were significantly higher than those for the male participants. These female participants, like many other African women, probably faced the challenges described above. It is not a simple task to alter patients' belief structures and as long as the community is not well informed about the health risks of weight gain, it will not be easy for those who want to lose weight to do so [236,237].

Another reason for lack of significant changes in adherence levels could have been that educational interventions alone are not always sufficient to result in patients altering their behaviour. Other measures such as motivating patients and equipping them with the necessary behavioural skills have been reported to result in significant changes in patient behaviour. Examples of behavioural skills include providing training for patients on useful physical exercises that they can engage in. With regard to motivation, patients need to be encouraged to discuss important questions and concerns with their HCPs [5,8,10,177,238,239]. Another factor to consider when planning behavioural change interventions is that patients' behaviour is also influenced by the perceptions of other members of the community. It is therefore essential to involve them in the care of patients [46,177,239]. In this study only the participants were involved and whilst they might have been aware of the importance of their medication and

altering their lifestyles, they might not have had the necessary support to follow the HCPs' advice. For example, some participants reported that the reason why they did not engage in physical exercises was because they feared being ridiculed by their neighbours (Section 5.3.6).

During the post-intervention interviews, 26 (57.8%) participants reported that they sometimes forgot to take their anti-hypertensive medication. However, of these participants, only 13 (50%) reported that their family members or colleagues reminded them to take their medication. The rest relied on other methods, such as keeping their medication somewhere conspicuous, to remind them to take their medication. The support of family and community members is important in the management of chronic diseases [46,177].

6.10 Cronbach's Alpha Analysis of the Beliefs about Medicines Questionnaire

The CA analysis that was used to test the internal consistency reliability of the BMQ showed values above 0.70 (Section 5.8.9), indicating that the data obtained using this instrument was a reliable measure of participants' beliefs about medicines [204].

6.11 Participants' Opinions of the Educational Intervention

The positive feedback received from the participants in this study regarding the educational intervention (Appendix I and Section 5.9) is similar to another study and indicates that patients appreciate educational intervention programmes [94]. The participants' responses showed that they learnt new concepts from the intervention, some of which affect patients' levels of adherence, for example, the correct procedure after missing a dose, and the potential for interactions between hypertension, or its medication, and other medicines. Patients can buy over-the-counter preparations, which interact with their hypertension or their medicines.

With regard to the suggestions made, participants desired that this intervention be available all the time in an area allocated specifically for patient education. In this way, individuals can participate in educational programmes without disturbances from work commitments or colleagues. There was also a request for workshops similar to HIV/AIDS support groups where hypertensive individuals could meet and share their experiences with the condition. This is

similar to a request made in Cape Town, South Africa, where patients suggested the establishment of hypertension clubs [240].

6.12 Limitations of the Study

6.12.1 Number of Participants

The reasons why this was not a controlled study have already been discussed (Section 4.5). Although there were many hypertensive patients at the PHC who could have been recruited for the study, this was not feasible as this study required regular follow-up of the participants by the investigator. The effect of a sample size on the statistical analysis of results has also been addressed (Section 6.9). The number of participants at the beginning of this study was 69 and this had decreased to 56 by the end of the study. Of these 56 participants, 45 (80.4%) met the final admissibility criteria.

It was a challenge for the investigator to meet with all the participants every month. At times some of them would be too busy to settle down long enough for their BP to be measured and their tablets counted. A common occurrence was that participants forgot to bring their medication and health passports to these monthly meetings even though appointments were made in advance. There were also some participants who lost interest in the study and would avoid meeting with the investigator.

In most cases, the supervisors and heads of department were supportive and helped to remind the participants about the monthly meetings and also excused them from their duties for the duration of the meetings. However, some supervisors did not offer support to the investigator or their hypertensive staff members and this presented problems especially in instances where the participants could only be contacted through their supervisors. In one department, the individuals worked around the university campus and were never in one place for a long time. The only way of meeting the participants from this department was for the investigator to arrange with the supervisor to meet the participants at the department's headquarters. At times none of the participants would be present at the arranged time because they had not been informed of the meeting, despite the supervisor reassuring the investigator that he would inform the participants. At other times, participants from this department would be present, but some of them without

their medication or health passports. The reason was that the supervisor would only have informed them of the meeting on the actual day and they would have left their medication and health passports at home. The investigator arranged the meetings with the supervisor at least two days before the actual day, with a reminder on the day before the meeting. There were 13 (28.89%) participants from this particular department, two retired from work during the pre-intervention stage of the study and none of the remaining 11 met the admissibility criteria at the end of the study.

Different results might have been observed if the sample size had only consisted of participants with uncontrolled hypertension. In this way, only those who needed to change their behaviour would have been targeted for the study. However, it is not certain whether this would have made a difference. The sample size of participants with uncontrolled hypertension would probably not have been large enough for statistically significant conclusions to be reached.

Loss of participants during interventions is a common occurrence. Patients are not always willing to take part in educational interventions; this can be the reason why some are lost during follow up of studies [241]. In this study, participants may have initially volunteered to take part in the programme at their supervisors' or heads of departments' suggestions. However, during the study, they might have lost interest and decided to merely stop taking part without informing the investigator or their supervisors of their decision.

6.12.2 Medication Diaries

These were a new concept to the participants and most either lost them or forgot to fill them in. In the end only eight (17.8%) of the participants had filled in enough diaries to provide data for all three periods of the study, that is, pre-intervention, intervention and post-intervention. The adherence levels indicated by the medication diaries were therefore not included in the final statistical analysis of the results.

6.12.3 Measurements

It was not always possible to perform all measurements using the ideal technique. For example, BP should ideally be measured with the individual first having sat down for approximately five

minutes. He or she must then remain seated whilst all the measurements are done. However, due to the participants' workloads, this was not always possible. Sometimes participants walked around in between the three BP measurements to attend to pressing commitments. Since time was a limiting factor, it was not always possible to allow the participants five minutes rest before taking the first reading and then two minutes between each of the three readings [242,243]. The times when the participants could meet with the investigator were limited due to their workloads. Most participants were not willing to meet with the investigator during their tea and lunch breaks or at the end of their work shifts.

The investigator used 'trial and error' to determine which cuff (large or obese size) to use when measuring the participants' BPs. There was one participant whose upper arm was too large and her BP had to be measured by putting the cuff around the wrist. This participant reported that this was how her BP was measured at the PHC as well. An obese cuff was not suitable to use because her upper arm had skin folds that made it difficult to position the cuff properly. The sphygmanometer showed the word 'error' instead of a BP reading when her upper arm was used to measure BP.

The pre-intervention data for BP included the participants' six most recent recorded readings prior to the study. These were not always available, especially for participants who visited private doctors and the PHC. These participants did not always have their BP measured during visits to HCPs. The instruments used during these six months prior to the study varied since the participants visited different health care facilities. Readings using the same instrument for all the participants during the pre-intervention stage were obtained in November and December 2004. The differences in the instruments used to measure the participants' BP, at the different health care facilities, during these six months before the study could have limited the comparability of these readings with those taken during the study. The above factors, which influenced consistency of BP measurements, limited the conclusions of the results in terms of BP readings.

6.12.4 Time Period over which Study was Conducted

Different findings might have been observed, especially for weight and BP, had the study taken place over a different time period. As mentioned before (Section 6.6), the participants' BP and

weight increased significantly between the pre-intervention and intervention stages most probably to participants eating unhealthily and also due to decreased physical activity over the 2004 festive holidays. The effect of this behaviour was not taken into consideration during the planning of this study. However, even after this effect was noted, the time periods of the study could not be changed. Extending the study would have meant taking up more of the participants' time. Since a number of them had lost interest by the end of the study, the final sample size would have been even smaller than 45.

The main objectives of this study were to address the participants' level of knowledge about hypertension and its therapy, as well as their beliefs about medicines. It was hypothesised that there would be no change in the participants' level of knowledge or beliefs about medicines after the educational intervention. The results and statistical analysis showed that there was sufficient evidence to reject hypothesis 3.5.3 (Section 3.5) and accept the alternative hypotheses, which proposed that the participants' levels of knowledge about hypertension, as well as their beliefs about medicines, changed after the intervention.

CHAPTER SEVEN
SUMMARY AND RECOMMENDATIONS

7.1 Summary of the Study

The main aim of this study was to increase participants' levels of knowledge and understanding of hypertension, its therapy, the role of lifestyle factors and the importance of adherence to anti-hypertensive therapy. The investigator also set out to address the participants' specific and general beliefs about medicines.

At baseline level there were 69 participants and this number had decreased to 56 by the end of the study. Of the 56 final participants, 45 had sufficient data admissible for the statistical analysis. One-on-one interviews and self-administered questionnaires were used before, during and after the intervention to measure participants' levels of knowledge about hypertension and its therapy. The results obtained during the three time periods of the study were compared to determine whether or not there had been significant changes. The participants' beliefs about medicines were measured, using the BMQ, before as well as after the intervention and compared to determine whether or not there was a change after the intervention. The participants' levels of adherence to their anti-hypertensive therapy were measured using pill counts, self-reports and participants' punctuality in collecting prescription refills. BP and BMIs were recorded regularly throughout the study. Comparisons were also done to determine whether or not there were changes in these health-related outcomes during and after the intervention period.

There was a significant increase in the participants' level of knowledge about hypertension and its therapy when measured using both interviews and self-administered questionnaires. There was also a decrease in participants' levels of concern about the undesirable effects of their anti-hypertensive medications (c). The NCD increased significantly after the educational intervention, whilst the perceived level of necessity of anti-hypertensive medication (n) started and remained high after the intervention. Although not significant, there was an increase in the participants' levels of adherence to their anti-hypertensive medication. With regard to health-related outcomes, there were increases in the systolic and diastolic BP readings, as well as the BMIs after the intervention. This was probably due to reduced physical exercise and participants

indulging in, for example, unhealthy eating habits during the festive season between the pre-intervention and intervention stages.

The educational intervention was effective in increasing participants' levels of knowledge about hypertension and its therapy, as well as in positively modifying their beliefs about medicines.

7.2 Recommendations

7.2.1 Recommendations for Current Health Care Service Delivery

The following recommendations can help to improve the delivery of health care services to patients and the community as the whole.

- Talks can be planned and given at the PHC in MLSA. The planning would involve evaluation of the information to be presented to the patients. Pilot studies can be carried out to test the suitability of the information for those receiving it. These talks can be advertised widely so that all patients and other community members interested may get an opportunity to attend. The talks should be repeated in order to accommodate all the people interested. HCPs themselves, lecturers or students from Rhodes University can present the talks. There is definitely a role to be played by pharmacists in the design, implementation and evaluation of patient education programmes.

- In a similar manner, FGDs involving patients and other patient education activities can also be conducted at the PHC. There is an extra waiting area at the PHC which can be utilised for such programmes. In this way those patients attending the PHC and participating in the programmes can do so without any inconvenience to, or from, the other patients visiting the facility that day who are not involved in the programme.

- HCPs responsible for patient education should receive training in the design, implementation and evaluation of patient education programmes.

- As they do for patients on Anti-Retroviral medications (ARVs) in Grahamstown, CHWs can be trained to educate patients individually or give talks to large groups of patients. This can be done once a month and then the CHWs can spend the reminder of the month training and educating patients whilst HCPs continue with their daily routine.

- HCPs should encourage patients to ask questions and express concerns about their health and therapies. This can be done by CHWs, as well as through the use of written material, such as posters and information leaflets. Medication packages, at present, are blank at

the back. Information about the importance of adherence, as well as consulting HCPs about any health concerns can be included in this space.

- Pharmacists can raise awareness of their expertise through these patient education programmes. In this way the community will know that they can also consult pharmacists about matters pertaining to their health. The participants in this study reported that they either consult doctors or nurses, but not pharmacists, when they have questions pertaining to their health (Table 5.8).

- To reduce the chances of HCPs forgetting to address pertinent issues whilst educating patients, a checklist may be designed with all the points that need to be addressed during patient education sessions.

- Written information about different conditions and their therapy, designed for patients, would be useful in helping patients retain the verbal advice they receive during visits to HCPs. This information should be in a language that patients understand and handed directly to the individuals rather than being 'hidden' in medication packages. Written information for patients is more useful as an adjunct to verbal advice and when handed directly to patients instead of being placed inside the medication package or left around the health care facility for patients to pick up for themselves. Handing information leaflets directly to the patient shows them that the information is specifically for them and this increases their likelihood of reading the information.

Educating patients at the local PHC through talks is a cost-effective intervention which will probably require fewer resources than those used in this study. For example, there are CHWs at the PHC and this eliminates the need to hire interpreters. It would also probably be easier to attract patients to attend talks since they have to go to the PHC to collect their medicine refills. This intervention would also be sustainable, as all the talks would be taking place at one venue with most tasks being performed by the staff members at the PHC. The existence of the Pharmacy faculty at Rhodes University provides a source of speakers for the talks as well as information that local HCPs can use. One of the biggest expenses in running this intervention

programme would be the provision of written information to the patients. However, this would be a necessary expense to be incurred for the sake of educating patients as part of an intervention to change their behaviour.

7.2.2 Recommendations for Future Studies

The findings from this study can be used to guide future research in the field of patient education and behaviour change. Researchers can use this study to formulate ideas on what aspects to focus on when planning interventions for changing behaviour in hypertensive patients. Examples are given below.

- The reasons why individuals drop out or do not volunteer for interventions and studies that could potentially benefit them can be investigated.

- A study similar to this one can be carried out over a longer period of time to investigate whether or not this will have a significant effect on participants' levels of adherence and health outcomes.

- HCPs or researchers can equip patients with lifestyle measures for hypertensive individuals. For example, physical exercises which they engage in order to lower their BP and reduce their body weight.

CHAPTER EIGHT
CONCLUSION

This study showed that patient education programmes can be useful in increasing patients' levels of knowledge about hypertension, the role of medicinal therapy, the importance of adhering to prescribed therapy and recommended lifestyle changes for hypertensive individuals. There was a significant increase in the participants' level of knowledge about hypertension and its therapy after the educational intervention. This change was evident from responses to both the interviews and the self-administered questionnaires.

Patients' beliefs about medicines can also be modified through educational interventions. In this study, the perceived necessity of anti-hypertensive medicines (n) was high at the pre-intervention stage and increased slightly after the intervention whilst the level of concern about the undesirable effects of these agents (c) decreased significantly. The NCD values increased significantly indicating that participants believed that the benefits of their anti-hypertensive agents, in maintaining their health, outweighed the potential risks associated with using these medicines. The participants' beliefs about the harmful nature of medicines (h) also decreased significantly.

The participants' levels of adherence to therapy increased though not significantly. Specific beliefs about medicines did have an effect on the participants' levels of adherence whilst levels of knowledge about hypertension and its therapy did not seem to be correlated to participants' levels of adherence. However, it can be assumed that the changes in adherence levels were due to the educational intervention since the participants did not take part in other interventions throughout the duration of the study. Demographic factors such as age, gender and education level also did not affect the levels of adherence to therapy; neither did they influence the participants' beliefs about medicines. The numbers of anti-hypertensive medicines that the participants were taking, the length of time since diagnosis of hypertension and having medical insurance did not have a bearing on the participants' levels of adherence, their beliefs about medicines or how much they knew about hypertension and its therapy.

Participants in this study appreciated the educational intervention, as shown by the positive feedback given at the end of this study. Participants stated that such interventions should be carried out for other conditions besides hypertension and that they would recommend their friends and family members to participate in such programmes. This was the first time that such a programme was conducted at this university and participants were very grateful that the investigator spent time with them educating them about their hypertension. The participants reported that they learnt a substantial amount of information during the study and that they had opportunities to ask questions relating to their health, which was something they were not always able to do when they visited their HCPs.

Such programmes are effective and will run more smoothly if everyone involved is convinced of their value. This does not only include the participants, but also their care givers and work supervisors where applicable. As seen in this study, none of the participants from the department where the supervisor was unsupportive of the programme met the final admissibility criteria (Section 6.12.1). Most of the final participants were from departments where supervisors were convinced of the benefits of the programme.

This study also showed that patients attending the local PHC do not always receive adequate patient information about hypertension and its therapy. This was indicated by participants during the interviews when they reported that they had not been told, for example, about reducing the amount of salt they consumed with their food. During the FGD, the nursing sisters also admitted that it was possible for them to forget to address some pertinent issues whilst providing verbal advice to patients. The FGD also revealed the lack of a structured patient education programme at the PHC where most of the participants and other patients in Grahamstown received their chronic medication.

This study showed that patients do not always alter their lifestyle even if they are told the benefits of doing so and the risks of not heeding to the advice given by HCPs. HCPs cannot force patients to take their medication or adjust their lifestyles accordingly. However, they can create an environment that enables patients to make informed decisions regarding their health.

Reference List

[1] Steyn K. Director's report for the Chronic Diseases of Lifestyle Unit 2002-2006. Medicines Research Council 2002.

[2] Chronic conditions: The global burden. Available: http://www.who.int/chronic_conditions/burden/en/ Accessed 24 July 2006.

[3] Bradshaw D, Groenwald P, Laubscher R, Nannan N, Nojilana B, Norman R et al. Initial burden of disease estimates for South Africa, 2000. Report published in 2003.

[4] Trilling JS, Froom J. The urgent need to improve hypertension care. Archives of Family Medicine 2000; 9:794-801.

[5] The Merck Manual of Medicinal Information-Home Edition. New York: Zelko Gary. 1999.

[6] Group visits to improve hypertension management. Available: http://www.hsrd.research.va.gov/research/abstracts/TRH_01-173.htm Accessed 1 December 2005.

[7] Neal L, Benowitz MD. Antihypertensive agents. In: Katzung BG, ed. Basic and Clinical Pharmacology. USA: Lange Medical Books. 2004.

[8] Appel LJ. Lifestyle modification as a means to prevent and treat high blood pressure. Journal of the American Society of Nephrology 2003; 14:S99-S102.

[9] The Trials of Hypertension Prevention Collaborative Research Group: Stamler J, Agras WS, Baum MK, Hawkins M, Kotchen TA, McCullough L et al. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. Archives of Internal Medicine 1997; 157(6):657-667.

[10] Writing Group of the PREMIER Collaborative Research Group. Effects of comprehensive lifestyle modification on blood pressure control. Journal of the American Medical Association 2003; 289(16):2083-2093.

[11] Dubbert PM. Behavioural (lifestyle) modification in the prevention and treatment of hypertension. Clinical Psychology Review 1995; 15(3):187-216.

[12] IRIN world health day web special: Taking Africa's pulse. Available: http://www.irinnews.org/webspecials/health/providing_healthcare.asp Accessed 27 March 2006.

[13] World Health Day 2006 celebrates health workers. Available: http://www.paho.org/English/DD/PIN/pr060407.htm Accessed 10 April 2006.

[14] World 'lacks 4m health workers'. Available: http://news.bbc.co.uk/2/hi/health/4877376.stm Accessed 10 April 2006.

[15] WHO. Therapeutic patient education. Continuing education programmes for health care providers in the field of the prevention of chronic diseases. 1998.

[16] South African Medicines Formulary. 6th ed. Cape Town, South Africa: South African Medical Association. 2003.

[17] Baker L, Pharmanet Amayeza Info Centre. Query about services provided at your centre. 2005.

[18] Wade AH, Weir DN, Cameron AP, Tett SE. Using a Problem Detection Study (PDS) to identify and compare health care provider and consumer views of antihypertensive therapy. Journal of Human Hypertension 2003; 17:397-405.

[19] Meyer D, Leventhal H, Gutmann M. Common-sense models of illness: The example of hypertension. Health Psychology 1985; 4(2):115-135.

[20] Saounatsu M, Patsi O, Fasoi G, Stylianou M, Kavga A, Economou O et al. The influence of the hypertensive patient's education in compliance with their medication. Public Health Nursing 2001; 18(6):436-442.

[21] Roca B, Nadal E, Rovira RE, Valls S, Lapuebla C, Lloria N. Usefulness of a hypertension education program. Southern Medical Journal 2003; 96(11):1133-1137.

[22] WHO. Adherence to long term therapies: Evidence for action. Available: http://www.who.int/chronic_conditions/adherencereport/en/ Accessed 26 July 2005.

[23] Cardiovascular disorders and treatments. In: Daly S, ed. Cardiovascular Drug Therapy, ProfessionaL Quick reference. Pennsylvania: Springhouse Corporation. 1995: 1-58.

[24] Your guide to lowering high blood pressure. Available: http://www.nhlbi.nih.gov/hbp/index.html Accessed 20 July 2005.

[25] High blood pressure (hypertension). Available: http://www.mayoclinic.com/health/high-blood-pressure/DS00100 Accessed 22 August 2005.

[26] Arakawa K, Saruta T, Abe K, Iimura O, Ishii M, Ogihara T et al. Improvement of accessory symptoms of hypertension by TSUMURA Orengedokuto extract, a four herbal drugs containing Kampo-Medicine granules for ethical use: A double-blind, placebo-controlled study. Phytomedicine 2006; 13(1-2):1-10.

[27] Shayne PH, Pitts SR. Severely increased blood pressure in the emergency department. Annals of Emergency Medicine 2003; 41(4):513-529.

[28] A look at hypertension in young African-American men. Available: http://findarticles.com/p/articles/mi_qa3958/is_200301/ai_n9192027 Accessed 23 August 2006.

[29] Know your blood pressure. Available: http://hsc.utoledo.edu/whl/know.html Accessed 12 October 2005.

[30] High blood pressure overview. Available: http://www.emedicinehealth.com/fulltext/11073.htm Accessed 11 October 2005.

[31] ABC of hypertension: The pathophysiology of hypertension. Available: http://www.bmj.com/cgi/reprint/322/7291/912 Accessed 9 November 2006.

[32] Dominant role of the kidney in long-term regulation of arterial pressure and in hypertension: The integrated system for pressure control. In: Guy AC, Hall JE, eds. Textbook of Medical Physiology. Pennsylvania: WB Saunders Company. 2000: 195-207.

[33] Cardiovascular Homeostasis. In: Ganong WF, ed. Review of Medical Physiology. California: Lange Medical Publications. 1979: 484-496.

[34] Kotze PL. The role of the physician in hypertension. Specialist Medicine 1993; XV(1):8-11.

[35] Zarnke KB, Feagan BG, Mahon JL, Feldman RD. A randomized study comparing a patient-directed hypertension management strategy with usual office-based care. American Journal of Hypertension 1997; 10(1):58-67.

[36] Vasan RS, Larson MG, Leip EP, Evans JC, O'Donnell CJ, Kannel WB et al. Impact of high-normal blood pressure on the risk of cardiovascular disease. New England Journal of Medicine 2001; 345(18):1291-1297.

[37] MacMahon S, Peto R, Collins R, Godwin J, MacMahon S, Cutler J et al. Blood pressure, stroke, and coronary heart disease : Part 1, prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. The Lancet 335[8692], 765-774. 3-31-1990.

[38] Connor M, Rheeder P, Bryer A, Meredith M, Beukes M, Dubb A et al. The South African stroke risk in general practice study. South African Medical Journal 2005; 95:334-339.

[39] Pickering G. Hypertension : Definitions, natural histories and consequences. The American Journal of Medicine 1972; 52(5):570-583.

[40] Lalouel JM, Rohrwasser A, Terreros D, Morgan T, Ward K. Angiotensinogen in essential hypertension: From genetics to nephrology. Journal of the American Society of Nephrology 2001; 12(3):606-615.

[41] Molecular biology. Available: http://www.bioscience.utah.edu/mb/mbFaculty/lalouel/lalouel.html#research Accessed 16 November 2005.

[42] Gavin K. New genetic link to high blood pressure found. American Journal of Hypertension 2005; 18(9):1206-1210.

[43] Doris PA. Hypertension genetics, single nucleotide polymorphisms, and the common disease: Common variant hypothesis. Hypertension 2002; 39(2):323-331.

[44] Fries RS, Mahboubi P, Mahapatra NR, Mahata SK, Schork NJ, Schmid-Schoenbein GW et al. Neuroendocrine transcriptome in genetic hypertension: Multiple changes in diverse adrenal physiological systems. Hypertension 2004; 43(6):1301-1311.

[45] Genetics of essential hypertension. Available: http://hmg.oxfordjournals.org/cgi/content/abstract/13/suppl_1/R169 Accessed 21 August 2006.

[46] Theory of Reasoned Action. Available: http://www.ciadvertising.org/student_account/fall_01/adv382j/brent/yes.html#wh Accessed 21 November 2005.

[47] Matthews KA, Katholi CR, Mccreath H, Whooley MA, Williams DR, et al. Blood pressure reactivity to psychological stress predicts hypertension in the Cardia Study. Circulation 2004; 110[1]:74-78.

[48] Larkin KT. Stress and hypertension. Examining the relation between psychological stress and high blood pressure. Yale University Press. 2005.

[49] John Henryism and cardiovascular health. Available: http://www.workhealth.org/risk/rfbjh.html Accessed 16 November 2005.

[50] Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. New England Journal of Medicine 2001; 344(1):3-10.

[51] Smoking affects hypertension gene. Available: http://www.incirculation.net/18471_30358.aspx?usechannel Accessed 21 November 2005.

[52] Health consequences of smoking. Available: http://sprojects.mmi.mcgill.ca/smoking/smokedf/health_consequences_smoking.html Accessed 21 November 2005.

[53] Beilin LJ, Puddey IB, Burke V. Alcohol and hypertension-kill or cure? Journal of Human Hypertension 1996; 10(Supplement 2):S1-S5.

[54] Fleming M, Mihic SJ, Harris RA. Ethanol. In: Hardman JG, Limbird LE, Goodman GA, eds. The Pharmacological basis of Therapeutics. USA: McGraw-Hill. 2001: 429-445.

[55] Gorelick PB. Stroke prevention. Archives of Neurology 1995; 52(4):347-355.

[56] Department of Health. Standard Treatment Guidelines and Essential Drugs List. 3rd edition. Pretoria: The National Department of Health, South Africa. 2003.

[57] Essential Medicines. Available: http://www.who.int/topics/essential_medicines/en/ Accessed 2 June 2006.

[58] He FJ, MacGregor GA. How far should salt intake be reduced? Hypertension 2003; 42:1093-1099.

[59] WHO, In, Mwingira B. Development and assessment of antiretroviral medicines information for HIV/AIDS patients in sub-Saharan Africa, MSc Thesis, Rhodes University (2005).

[60] South African Pharmacy Council. General guidelines regarding the role of the pharmacist in health and pharmaceutical care. In: Putter S, Hattingh D, eds. Good Pharmacy Practice in South Africa. Pretoria: Photoscan Link. 1997.

[61] Kessler D. Communicating with patients about their medications. New England Journal Of Medicine 1991; 325:1650-1652.

[62] Department of Health. National Drug Policy for South Africa. 1-26. 1996.

[63] Koo MM, Krass I, Aslani P. Factors influencing consumer use of written drug information. Annals of Pharmacotherapy 2003; 37:259-267.

[64] Levin-Zamir D, Peterburg Y. Health literacy in health systems: perspectives on patient self-management in Israel. Health Promotion International 2001; 16(1):87-94.

[65] Health policy implications for patient education in physical therapy. Available: http://www.findarticles.com/p/articles/mi_qa3956/is_199901/ai_n8843473 Accessed 11 April 2006.

[66] Al-Sowielem LS, Elzubier AG. Compliance and knowledge of hypertensive patients attending PHC centres in Al-Khobar, Saudi Arabia. Eastern Mediterranean Health Journal 1998; 4(2):301-307.

[67] Howard J, Wildman K, Blain J, Wills S, Brown D. The importance of drug information from a patient perspective. Journal of Social and Administrative Pharmacy 1999; 16(3/4):115-126.

[68] Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. American Journal of Health-System Pharmacy 1990; 47(3):533-543.

[69] Mwingira B. Development and assessment of antiretroviral medicines information for HIV/AIDS patients in sub-Saharan Africa, MSc Thesis, Rhodes University (2005).

[70] Morris LA. Rationale for patient package insert. American Journal of Hospital Pharmacy 1978; 35:179-184.

[71] Huang LH, Chen SW, Yu YP, Chen PR, Lin YC. The effectiveness of health promotion education programs for community elderly. Journal of Nursing Research 2002; 10(4):261-270.

[72] WHO. Integrating prevention into health care. Available: http://www.who.int/mediacentre/factsheets/fs172/en/ Accessed 10 April 2006.

[73] Horne R. One to be taken as directed: Reflections on non-adherence (non-compliance). Journal of Social and Administrative Pharmacy 1993; 10(4):150-156.

[74] Weinman J. Providing written information for patients: psychological considerations. Journal of the Royal Society of Medicine 1990; 83:303-305.

[75] Gruesser M, Hartmann P, Schlottmann N, Lohmann FW, Sawiki PT, Joergens V. Structured patient education for out-patients with hypertension in general practice: A model project in Germany. Journal of Human Hypertension 1997; 11:501-506.

[76] McDonald M, et al, In, Gruesser M, Hartmann P, Schlottmann N et al. Structured patient education for out-patients with hypertension in general practice: A model project in Germany. Journal of Human Hypertension 1997; 11:501-506.

[77] Hornung WP, Kieserg A, Feldmann R, Buchkremer G. Psychoeducational training for schizophrenic patients: background, procedure and empirical findings. Patient Education and Counseling 1996; 29(3):257-268.

[78] Melnyk PS, Shevchuk YM, Remillard AJ. Impact of a dial access drug information service on patient outcome. Annals of Pharmacotherapy 2000; 34(5):585-92.

[79] Goudswaard AN, Stolk RP, Zuithoff NP, de Valk HW, Rutten GE. Long-term effects of self-management education for patients with Type 2 diabetes taking maximal oral hypoglycaemic therapy: A randomised trial in primary care. Diabetic Medicine 2004; 21(5):491-496.

[80] WHO. Adherence to Long-term Therapies: Policy for Action. Meeting Report 4-5 June 2001.

[81] Lane C, Huws-Thomas M, Hood K, Rollink S, Edwards K, Robling M. Measuring adaptations of motivational interviewing: the development and validation of the Behaviour Change Counselling Index (BECCI). Patient Education and Counseling 2005; 56:166-173.

[82] Hermann F, Herxheimer A, Lionel ND. Package inserts for prescribed medicines: what minimum information do patients need? British Medical Journal 1978; 2(6145):1132-1135.

[83] Kruger SH, Gerber JJ. Health beliefs and compliance of black South African outpatients with antihypertensive medication. Journal of Social and Administrative Pharmacy 1998; 15(3):201-209.

[84] Gao X, Nau DP, Rosenbluth SA, Scott V, Woodward C. The relationship of disease severity, health beliefs and medication adherence among HIV patients. AIDS Care 2000; 12(4):387-398.

[85] Health Belief Model. Available at: http://www.tcw.utwente.nl/theorieenoverzicht/Theory%20clusters/Health%20Communication/Health_Belief_Model.doc/ Accessed 10 November 2005.

[86] Counte MA, Christman LP. Interpersonal behaviour and health care. Boulder, Colorado: Westview Press. 1981.

[87] Viswanathan H, Anderson R, Thomas III J. Evaluation of an antiretroviral medication attitude scale and relationships between medication attitudes and medication nonadherence. AIDS Patient Care & STDs 2005; 19(5):306-316.

[88] Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic illness. Journal of Psychosomatic Research 1999; 47(6):555-567.

[89] Beliefs about sources of gastrointestinal illness: What factors are associated with people's beliefs that a meal eaten outside of the home made them sick? Available: http://www.cdc.gov/nceh/ehs/EHSNet/Docs/EHS-Net_Beliefs_about_GI_Illness-IAFP-2004.pdf Accessed 17 November 2005.

[90] Horne R, Buick D, Fisher M, Leake H, Cooper V, Weinman J. Doubts about necessity and concerns about adverse effects: Identifying the types of beliefs that are associated with non-adherence to HAART. International Journal of STD and AIDS 2004; 15:38-44.

[91] Ross S, Walker RS, MacLeod MJ. Patient compliance in hypertension: Role of illness perceptions and treatment beliefs. Journal of Human Hypertension 2004; 18(9):607-613.

[92] Weinman J, Petrie KJ. Illness perceptions: A new paradigm for psychosomatics? Journal of Psychosomatic Research 1997; 42(2):113-116.

[93] Iihara N, Tsukamoto T, Morita S, Miyoshi C, Takabatake K, Kurosaki Y. Beliefs of chronically ill Japanese patients that lead to intentional non-adherence to medication. Journal of Clinical Pharmacy and Therapeutics 2004; 29(5):417-424.

[94] Schreurs KMG, Colland VT, Kuijer RG, de Ridder DTD, van Elderen T. Development, content, and process evaluation of a short self-management intervention in patients with chronic diseases requiring self-care behaviours. Patient Education and Counseling 2003; 51:133-141.

[95] Thorne SE, Harris SR, Mahoney K, Con A, McGuinness L. The context of health care communication in chronic illness. Patient Education and Counseling 2004; 54:299-306.

[96] Cooper H, Booth K, Gill G. Using combined research methods for exploring diabetes patient education. Patient Education and Counseling 2003; 51:45-52.

[97] Tankova T, Dakovska G, Koev D. Education and quality of life in diabetic patients. Patient Education and Counseling 2004; 53:285-290.

[98] El-Shazly M, Zeid M, Osman A. Risk factors for eye complications in patients with diabetes mellitus: Development and progression. Eastern Mediterranean Health Journal 2000; 6(2/3):313-325.

[99] Tamaroff MH, Festa RS, Aderman AR, Walco GA. Therapeutic adherence to oral medication regimens by adolescents with cancer. II. Clinical and psychologic correlates. The Journal of Pediatrics 1992; 120(5):812-817.

[100] Smith DL, In, Mwingira B. Development and assessment of antiretroviral medicines information for HIV/AIDS patients in sub-Saharan Africa, MSc Thesis, Rhodes University (2005).

[101] WHO. Improving access and use of psychotropic medicines. Available: http://www.who.int/mental_health/policy/improving_access_final_10_01_05.pdf Accessed 10 April 2006.

[102] Oparil S, Calhoun DA. Managing the patient with hard-to-control hypertension. American Family Physician 1998; 57(5):1007-1015.

[103] WHO. The safety of medicines. Available: http://www.who.int/mediacentre/factsheets/fs293/en/ Accessed 10 April 2006.

[104] WHO In, Bruttomesso D, Gagnayne R, Leclercq D, Crazzolara D, Busata E et al. The use of degree of certainity to evaluate knowledge. Patient Education and Counseling 2003; 51:29-37.

[105] Zwaenepoel L, Bilo R, De Boever W, De Vos M, Reyntens J, Hoorens V et al. Desire for information about drugs: a survey of the need for information in psychiatric in-patients. Pharmacy World & Science 2005; 27(1):47-53.

[106] Greig C. A survey of information given during pregnancy by midwives to parents about neonatal unit care, whether or not the baby was likely to require such care. Midwifery 1998; 14(1):54-60.

[107] Buck ML. Providing patients with written medication information. Annals of Pharmacotherapy 1998; 32(9):962-969.

[108] Vander Stichele RH, Van Haecht CH, Braem MD, Bogaert MG. Attitude of the public toward technical package inserts for medication information in Belgium. Annals of Pharmacotherapy 1991; 25(9):1002-1006.

[109] Johnson MW, Mitch WE, Sherwood J, Lopes L, Schmidt A, Hartley H. The impact of a drug information sheet on the understanding and attitude of patients about drugs. The Journal of the American Medical Association 1986; 256(19):2722-2724.

[110] Positive patient outcomes mean education. Audio-visual reviews. Available: http://www.findarticles.com/p/articles/mi_m0FSL/is_n3_v66/ai_19854938 Accessed 12 April 2006.

[111] Clinical benefits of interactive and audiovisual patient education material. Available: http://www.itherapies.com/support/support_downloads/Reimburse_SupportRefer_Full.pdf Accessed 12 April 2006.

[112] To err is human: Building a safer health system. Washington D.C: National Academy Press. 2000.

[113] WHO. Report of a third WHO consultative group on the role of the pharmacist. 599. 1997.

[114] Concise & evidence-based sources of pharmaceutical information. Available: http://www.amsa.org/hp/cleansources.cfm Accessed 11 April 2006.

[115] Baron ED, Levin-Zamir D, Satran-Argaman C, Livny N, Amit N. A participatory process for developing quality assurance tools for health education programs. Patient Education and Counseling 2004; 54:213-219.

[116] Wyeth launches unique Spanish-language patient education and support program for EFFEXOR XR depression patients. Available: http://sev.prnewswire.com/medical-pharmaceuticals/20060328/NYTU10428032006-1.html Accessed 11 April 2006.

[117] Language barrier an issue in South Africa. Available: http://www.monash.ac.za/news/2004/language_barrier.html Accessed 12 April 2006.

[118] South African languages web : Website dedicated to the eleven official languages of South Africa. Available: http://www.cyberserv.co.za/users/~jako/lang/ Accessed 11 April 2006.

[119] Dezil CM. Compliance and persistence with medication therapy. Special Supplement to Managed Care 2000; 9(9):2-12.

[120] Factors influencing patient adherence in diabetes. Available: http://www.calgaryhealthregion.ca/clin/adultpsy/Papers/diabetes.pdf Accessed 13 October 2005.

[121] Adherence to therapy: The ticking time bomb lurking within your pharmacy benefit. Available: http://www.medimpact.com/Clients/publicaitons/Clinical_Tablet/Clinical_Tablet_2004_Vol_09_Iss_03.pdf Accessed 13 October 2005.

[122] Vermeire E, Hearnshaw H, Van Royen P, Denekens J. Patient adherence to treatment: three decades of research. A comprehensive review. Journal of Clinical Pharmacy and Therapeutics 2001; 26(5):331-342.

[123] Friberg F, Scherman MH. Can teaching and learning perspective deepen understanding of the concept of compliance. A theoretical discussion. Scandinavian Journal of Caring Sciences 2005; 19(3):274-279.

[124] Barriers, best practices and measuring ROI for patient compliance programs. Available: http://www.eyeforpharma.com/briefing/pcusawriteup.pdf Accessed 13 October 2005.

[125] All-Party Pharmacy Group. Concordance and wasted medicines. A report to Health Ministers. 2000.

[126] Hashimoto H, Fukuhara S. The influence of locus of control on preferences for information and decision making. Patient Education and Counseling 2004; 55:236-240.

[127] Roter DL, et al, In, Harrington J, Noble LM, Newman SP. Improving patients' communication with doctors: a systematic review of intervention studies. Patient Education and Counseling 2004; 52:7-16.

[128] Chesney MA. Factors affecting adherence to antiretroviral therapy. Clinical Infectious Diseases 2000; 30(Suppl 2):S171-176.

[129] Conrad P. The meaning of medications: Another look at compliance. Social Science & Medicine 1985; 20(1):29-37.

[130] Horne R, Weinman J, Hankins M. The Beliefs about Medicines Questionnaire (BMQ): A new method for assessing cognitive representation of medication. Psychological Health 1999; 10:1-29.

[131] Horne R. Patients beliefs about treatment: The hidden determinant of treatment outcome? Journal of Psychosomatic Research 1999; 47(6):491-495.

[132] Raynor DK. Patient compliance: the pharmacist's role. International Journal of Pharmacy Practice 1992; 1:126-135.

[133] Morris LA, Halperin JA. Effects of written drug information on patient knowledge and compliance: A literature review. American Journal of Public Health 1979; 69(1):47-52.

[134] Homedes N, Ugalde A. Research on patient compliance in developing countries. Bulletin of PAHO 1994; 28(1):17-33.

[135] Williams AB, Burgess JD, Danvers K, Malone J, Winfield SD, Saunders L. Kitchen table wisdom: A Freirian approach to medication adherence. Journal of the Association of Nurses in AIDS Care 2005; 16(1):3-12.

[136] Katzenstein DA, Lyons C, Molaghan JB, Ungvarski P, Wolfe GS, Williams AB. HIV therapeutics: Confronting adherence. Journal of the Association of Nurses in AIDS Care 1997; 8(special supplement):46-58.

[137] The role of the pharmacist in improving patient adherence with medication regimens. Available: www.powerpak.com/index.asp?show=lesson&lsn_id=2957&page=courses/2957/lesson.htm Accessed 18 August 2005.

[138] Buabeng KO, Matowe L, Plange-Rule J. Unaffordable prices: the major cause of non-compliance with hypertension medication in Ghana. Journal of Pharmacy and Pharmaceutical Sciences 2004; 7(3):350-352.

[139] Hamilton GA. Measuring adherence in a hypertension clinical trial. European Journal of Cardiovascular Nursing 2003; 2:219-228.

[140] Hill MN. Adherence to antihypertensive therapy. In: Izzo JL, Black Sr, eds. Hypertension Primer. Dallas, Texas: American Heart Association. 1999: 348-351.

[141] Waeber B, et al, In, Junko O, Tomura S, Yanagi H. Treated hypertensives with good medication compliance are still in a state of uncontrolled blood pressure in the Japanese elderly. Environmental Health and Preventive Medicine 2002; 7(5):193-198.

[142] Williams GC, Rodin GC, Ryan RM, Grolnick WS, Deci EL. Autonomous regulation and long-term medication adherence in adult outpatients. Health Psychology 1998; 17(3):269-276.

[143] Sackett DL, In, Williams GC, Rodin GC, Ryan RM, Grolnick WS et al. Autonomous regulation and long-term medication adherence in adult outpatients. Health Psychology 1998; 17(3):269-276.

[144] Sackett DL, et al, In, Williams GC, Rodin GC, Ryan RM et al. Autonomous regulation and long-term medication adherence in adult outpatients. Health Psychology 1998; 17(3):269-276.

[145] Dunbar J. Issues in assessment. In: Cohen S, ed. New directions in patient compliance. Lexington, Massachusetts: Lexington Books. 1979: 41-57.

[146] Martínez C, et al, In, Homedes N, Ugalde A. Research on patient compliance in developing countries. Bulletin of PAHO 1994; 28(1):17-33.

[147] Urquhart J. Why has patient compliance become important? Clinical Research and Regulatory Affairs 1994; 11(1):81-106.

[148] Lee JY, Kusek JW, Greene PG, Bernhard S, Norris K, Smith D et al. Assessing medication adherence by pill count and electronic monitoring in the African American Study of Kidney Disease and hypertension (AASK) pilot study. American Journal of Hypertension 1996; 9(8):719-725.

[149] Haynes BR, Taylor WD, Sackett DL, Gibson ES, Bernholz CD, Mukherjee J. Can simple clinical measurements detect patient noncompliance. Hypertension 1980; 2:757-764.

[150] Hecht FM. Measuring HIV treatment adherence in clinical practice. AIDS Clinical Care 1998; 10(8):57-64.

[151] Straka RJ, Fish JT, Benson SR, Suh JT. Patient self-reporting of compliance does not correspond with electonic monitoring: An evaluation using isosorbide dinitrate as a model drug. Pharmacotherapy 1997; 17(1):126-132.

[152] Bradburn N. Response Effects. In: Rossi PH, Wright JD, Anderson A, eds. Handbook of survey research. New York: Academic Press. 1983: 289-328.

[153] Chisholm MA, Lance CE, Mulloy LL. Patient factors associated with adherence to immunosuppressant therapy in renal transplant recipients. American Journal of Health-System Pharmacy 2005; 62(17):1775-1781.

[154] Sherman J, Hutson A, Baumstein S, Hendeles L. Telephoning the patient's pharmacy to assess adherence with asthma medications by measuring refill rate for prescriptions. The Journal of Pediatrics 2000; 136(4):532-536.

[155] Meichenbaum D, Turk DC. Facilitating treatment adherence: a practitioner's guidebook. New York: Plenum. 1987.

[156] Feinstein AR. On white-coat effects and the electronic monitoring of compliance. Archives of Internal Medicine 1990; 150:1377-1378.

[157] Rudd P, Marshall G. Resolving problems of measuring compliance with medication monitors. Journal of Compliance and Health Care 1987; 2(1):23-35.

[158] Mash B. Motivating behaviour change in the diabetic patient. Available: http://www.sahealthinfo.org/motivational/motivational.pdf Accessed 15 January 2006.

[159] Meeting the challenge of patient adherence. Available: http://surgery.osu.edu/cardio/pdfs/LunchNursingSesAdherence.pdf Accessed 31 July 2006.

[160] Psaty BM, Koepsell TD, Wagner EH, LoGerfo JP, Inui T.S. The relative risk of incident coronary heart disease associated with recently stopping the use of beta-blockers. The Journal of the American Medical Association 1990; 263(12):1653-1657.

[161] After the diagnosis: Adherence and persistence with hypertension therapy. American Journal of Managed Care 11, S395-S399. 2005.

[162] Mant J, McManus RJ. Does it matter whether patients take their antihypertensive medication as prescribed? The complex relationship between adherence and blood pressure control. Journal of Human Hypertension 2006; 20:551-553.

[163] Lindholm LH, In, Mant J, McManus RJ. Does it matter whether patients take their antihypertensive medication as prescribed? The complex relationship between adherence and blood pressure control. Journal of Human Hypertension 2006; 20:551-553.

[164] WHO. Behavioural mechanisms explaining adherence. Available: http://www.who.int/chronic_conditions/en/annexes.pdf Accessed 31 July 2006.

[165] Gruman J, Von Korff M, Reynolds J, Wagner EH. Organising health care for people with seizures and epilepsy. Journal of Ambulatory Care Management 1998; 21(2):1-17.

[166] Smith B, Sullivan E, Bauman A, Powell-Davies G, Mitchell J. Lay beliefs about the preventability of major health conditions. Health Education Research 1999; 14(3):315-325.

[167] Ronis DL, In: Gao X, Nau DP, Rosenbluth SA, Scott V. The relationship of disease severity, health beliefs and medication adherence among HIV patients. AIDS Care 2000; 12(4):387-398.

[168] Roberts KJ, Mann T. Barriers to antiretroviral medication adherence in HIV-infected women. AIDS Care 2000; 12(4):377-386.

[169] Pound P, Britten N, Morgan M, Yardley L, Pope C, Daker-White G et al. Resisting medicines: A synthesis of qualitative studies of medicine taking. Social Science & Medicine 2005; 61:133-155.

[170] Farmer A, Kinmonth AL, Sutton S. Measuring beliefs about taking hypoglycaemic medication among people with Type 2 diabetes. Diabetic Medicine 2006; 23(3):265-270.

[171] Brown C, Battista DR, Bruehlman R, Sereika SS, Thase ME, Dunbar-Jacob J. Beliefs about antidepressant medications in primary care patients: Relationship to self-reported adherence. Medical Care 2005; 43(12):1203-1207.

[172] Botha KFH, Du Plessis WF, Van Rooyen JM, Wissing MP. Biopsychosocial determinants of self-management in culturally diverse South African patients with essential hypertension. Journal of Health Psychology 2002; 7(5):519-531.

[173] Cockburn J, Pit S. Prescribing behaviour in clinical practice: Patients' expectations and doctors' perceptions of patients' expectations-a questionnaire study. British Medical Journal 1997; 315:520-523.

[174] Sanchez-Menegay C, et al, In, Cockburn J, Pit S. Prescribing behaviour in clinical practice: patients' expectations and doctors' perceptions of patients' expectations-a questionnaire study. British Medical Journal 1997; 315:520-523.

[175] Bradley CP. Factors which influence the decision whether or not to prescribe: the dilemma facing general practitioners. British Journal of General Practice 1992; 42(364):454-458.

[176] Bradley CP, In, Cockburn J, Pit S. Prescribing behaviour in clinical practice: patients' expectations and doctors' perceptions of patients' expectations-a questionnaire study. British Medical Journal 1997; 315:520-523.

[177] Austin B, Wagner E, Hindmarsh M, Davis C. Elements of effective chronic care: A model for optimising outcomes for the chronically ill. Epilepsy and Behaviour 2000; 1:S15-S20.

[178] Jerant AF, Friederichs-Fitzwater MM, Moore M. Patients' perceived barriers to active self-management of chronic conditions. Patient Education and Counseling 2005; 57(3):300-307.

[179] Bayliss EA, Steiner JF, Fernald DH, Crane LA, Main DS. Descriptions of barriers to self-care by persons with comorbid chronic diseases. Annals of Family Medicine 2003; 1(1):15-21.

[180] How good is the quality of health care in the United States? Available: http://www.milbank.org/quarterly/830434schuster.pdf Accessed 1 December 2005.

[181] Harrington J, Noble LM, Newman SP. Improving patients' communication with doctors: A systematic review of intervention studies. Patient Education and Counseling 2004; 52:7-16.

[182] South Africa demographic and health survey. Available: http://www.doh.gov.za/facts/1998/sadhs98/chapter15.pdf Accessed 30 November 2005.

[183] Managing Procurement. In: Quick JD, Rankin JR, Laing RO, O'Connor RW, Hogerzeil HV, Dukes MNG et al eds. Managing Drug Supply. Connecticut: Kumarian Press. 1997: 163-183.

[184] Diseases forgotten in wake of HIV. Available: http://www.aegis.com/news/bbc/2004/BB040728.html Accessed 10 October 2005.

[185] The neglected epidemic of chronic disease. Available: http://www.psypress.co.uk/boynton/forum/forum_posts.asp?TID=61 Accessed 10 October 2005.

[186] Donovan JL, Blake DR. Patient non-compliance: Deviance or reasoned decision-making? Social Science & Medicine 1992; 34(5):507-513.

[187] Lucher TF. Compliance in hypertension: facts and concepts. Hypertension 1985; 3:S3-S9.

[188] Cochrane Controlled Trials Register. Available: www.nelh.nhs.uk/cochrane.asp Accessed 3 August 2005.

[189] Courneya KS, Friedenreich CM, Sela RA, Quinney AH, Rhodes RE. Correlates of adherence and contamination in a randomised controlled trial of exercise in cancer survivors: An application of the Theory of Planned Behaviour and the Five Factor Model of Personality. Annals of Behavioural Medicine 2002; 24(4):257-268.

[190] Ward WL, et al, In, Courneya K.S, Jones LW, Fairey AS et al. A randomised trial of exercise and quality of life in colorectal cancer survivors. European Journal of Cancer Care 2003; 12:347-357.

[191] Courneya KS, Jones LW, Fairey AS, Friedenreich CM, Quinney AH, Fields ALA. A randomised trial of exercise and quality of life in colorectal cancer survivors. European Journal of Cancer Care 2003; 12:347-357.

[192] Godin G, et al, In, Courneya KS, Jones LW, Fairey AS et al. A randomised trial of exercise and quality of life in colorectal cancer survivors. European Journal of Cancer Care 2003; 12:347-357.

[193] Mock V, Pickett M, Ropka ME, Muscari E, Stewart KJ, Rhodes VA et al. Fatigue and quality of life outcomes of exercise during cancer treatment. Cancer Practice 2001; 9(3):119-127.

[194] Abrahamson JH, Abrahamson ZH. Clinical trials. In: Churchill Livingstone, ed. Survey Methods in Community Medicine. 1999: 355-372.

[195] Rosner B. Fundamentals of Biostatistics. 4th ed. USA: Wadsworth Publishing Company. 1995.

[196] High blood pressure quiz: Should you be concerned? Available: http://www.mayoclinic.com/health/high-blood-pressure/QZ00033 Accessed 15 August 2004.

[197] High blood pressure quiz: Are you effectively managing your disease? Available: http://www.mayoclinic.com/health/high-blood-pressure/QZ00054 Accessed 15 August 2004.

[198] Test your medication IQ. Available: http://www.nhlbi.nih.gov/hbp/treat/iq_test.htm Accessed 20 September 2004.

[199] Mansoor LE. Medicines information for low-literate HIV/AIDS patients: Development, evaluation and impact on adherence, PhD Thesis, Rhodes University (2005).

[200] Community experience programme: Pharmacy administration and practice 4 practical manual. 2004.

[201] Pagan JA, Pauly MV. Access to conventional medical care and the use of complementary and alternative medicine. Health Affairs 2005; 24(1):255-262.

[202] Peltzer K. Health beliefs and prescription medication compliance among diagnosed hypertension clinic attenders in a rural South African Hospital. Curationis 2004; 27(3):15-23.

[203] Reynaldo J, Santos A. Cronbach's Alpha: A tool for assessing the reliability of scales. Available: http://www.joe.org/joe/1999april/tt3.html Accessed 12 August 2005.

[204] Cronbach's alpha. Available: http://en.wikipedia.org/wiki/Cronbach's_alpha Accessed 25 August 2005.

[205] Bjartveit K, Tverdal A. Health consequences of smoking 1-4 cigarettes per day. Tobacco Control 2005; 14(5):315-320.

[206] OMRON® Instruction manual. Available: http://www.omronhealthcare.com/enTouchCMS/FileUplFolder/HEM-907XL.pdf Accessed 20 January 2005.

[207] PSSA Pharmacy Law Compendium. Durban, South Africa: LexisNexis Butterworths. 2003.

[208] Garrud P, Wood M, Stainsby L. Impact of risk information in a patient education leaflet. Patient Education and Counseling 2001; 43:301-304.

[209] Lee YM, Francis K, Walker J, Lee SM. What are the information needs of Chinese breast cancer patients receiving chemotherapy? European Journal of Oncology Nursing 2004; 8:224-233.

[210] Liu L, Yiu CH, Yen DJ, Chou MH, Lin MF. Medication education for patients with epilepsy in Taiwan. Seizure 2003; 12:473-477.

[211] Cohen J. Statistical Power Analysis for the Behavioral Sciences. 2nd edition. Lawrence Erlbaum Associates, Inc., Publishers. 1988.

[212] *Artemisia afra* . Available: http://www.plantzafrica.com/plantab/artemisafra.htm Accessed 12 April 2006.

[213] Definition: p-value. Available: http://www.cmh.edu/stats/definitions/pvalue.htm Accessed 27 February 2006.

[214] Shiri C, Srinivas S, Futter W. Baseline study: The level of knowledge and understanding as well as the beliefs and perceptions about medicines of a selected group of hypertensive patients. Poster presentation: 14th Biennial Congress of the Southern African Hypertension Society, 2005.

[215] Shiri C, Srinivas S. Medicines information at a primary health care centre in Grahamstown. Poster presentation: 26th Annual Conference of the Academy of Pharmaceutical Sciences, 2005.

[216] Shiri C, Srinivas S, Radloff S. Effect of educational interventions in modifying health care receivers' beliefs about medicines. Poster presentation: Annual South African Association of Hospital and Institutional Pharmacists (SAAHIP) Conference, 2006.

[217] Shiri C, Srinivas S. Beliefs and perceptions about medicines among a group of employees at an Eastern Cape university in South Africa. Podium presentation: 25th Annual Conference of the Academy of Pharmaceutical Sciences, Grahamstown, South Africa, 2004.

[218] Srinivas S, Shiri C, Futter W. Pilot Study: Beliefs about medicines amongst health care providers and receivers. Poster presentation: Annual South African Association of Hospital and Institutional Pharmacists (SAAHIP) Conference, 2005.

[219] Re-engineering health care. Available: http://www.pjonline.com/pdf/hp/200011/hp_200011_conf.pdf Accessed 10 August 2006.

[220] Experiences with herbal products: A survey of community pharmacists in England. Available: http://www.escop.com/epj2pdfs/barnes2p.pdf Accessed 10 August 2006.

[221] Raynor DK, Knapp P. Do patients see, read and retain the new mandatory medicines information leaflets? The Pharmaceutical Journal 2000; 264(7083):268-270.

[222] Child care health consultants and trainers. Available: http://www.journal.naeyc.org/btj/200403/consultants.asp Accessed 5 April 2006.

[223] Sackett DL, et al, In, Meyer D, Leventhal H, Gutmann M. Common-sense models of illness: The example of hypertension. Health Psychology 1985; 4(2):115-135.

[224] Levine DM., Green LW, Deeds SG, Chwalow J, Russell RP, Finlay J. Health education for hypertensive patients. The Journal of the American Medical Association 1979; 241(16):1700-1703.

[225] How to survive the festive season gluttony. Available: http://www.vinum.ca/COLUMNS/2005COLUMNS/Howtosurvivethefestiveseasonglutt ony/tabid/836/Default.aspx Accessed 9 February 2006.

[226] Diet survivor: Christmas. Available: http://health.ninemsn.com.au/article.aspx?id=73326 Accessed 9 February 2006.

[227] Pub medic - Warning: Christmas can seriously damage your health. Available: http://www.studentbmj.com/issues/06/01/education/6.php Accessed 9 February 2006.

[228] Natural treatments for high blood pressure. Available: http://altmedicine.about.com/cs/herbsvitaminsek/a/Hypertension.htm Accessed 10 February 2006.

[229] Food remedies: High blood pressure. Available: http://www.wholehealthmd.com/hk/remedies/disp/1,1459,475,00.html Accessed 10 February 2006.

[230] Stone VE, Hogan JW, Schuman P, Rompalo AM, Howard AA, Korkontzelou C et al. Antiretroviral regimen complexity, self-reported adherence, and HIV patients' understanding of their regimens: Survey of women in the HERS study. Journal of Acquired Immune Deficiency Syndrome 2001; 28(2):124-131.

[231] Assessment of changes in adherence and quality of life after the simplification of antiretroviral treatment. Available: http://www.thebody.org/iapac/pdfs/jul03.pdf Accessed 5 April 2006.

[232] Rorer B, Tucker CM, Blake H. Long-term nurse-patient interactions: Factors in patient compliance or non-compliance to the dietary regimen. Health Psychology 2006; 7(1):35-46.

[233] Henwood et al, In, Fox NJ, Ward KJ, O'Rourke AJ. The 'expert patient': empowerment or medical dominance? The case of weight loss, pharmaceutical drugs and the Internet. Social Science & Medicine 2005; 60:1299-1309.

[234] Bundy C. Changing behaviour: Using motivational interviewing techniques. Journal of the Royal Society of Medicine 2004; 97(Supplement 44):43-47.

[235] Prentice AM. The emerging epidemic of obesity in developing countries. International Journal of Epidemiology 2006; 35(1):93-99.

[236] Edgcumbe W. No obstacle is too big for Sibongile. Weigh-Less Magazine, South African Edition 2006; 66:4-11.

[237] Faber M, Kruger HS. Dietary intake, perceptions regarding body weight, and attitudes toward weight control of normal weight, overweight, and obese black females in a rural village in South Africa. Ethnicity and Disease 2005; 15(2):238-245.

[238] Baird A. Change theory and health promotion. Nursing Standard 1998; 12(22):34-36.

[239] Fisher JD, Fisher WA. Changing AIDS-risk behaviour. Psychological Bulletin 1992; 111(3):455-474.

[240] Steyn K, Levitt N, Fourie J, Rossouw K, Martell R, Stander I. Treatment status and experiences of hypertension patients at a large health centre in Cape Town. Ethnicity and Disease 1999; 9(441):450.

[241] Harting J, van Assema P, van der Molen HT, Ambergen T, de Vries NK. Quality assessment of health counseling: performance of health advisors in cardiovascular prevention. Patient Education and Counseling 2004; 54:107-118.

[242] Proper measurement of blood pressure in the office. Available:http://www.clevelandclinicmeded.com/diseasemanagement/nephrology/initbp/table3.htm Accessed 10 August 2006.

[243] Blood vessels. Available: http://greenfield.fortunecity.com/rattler/46/bloodpressure.htm Accessed 10 August 2006.