FACTORS INFLUENCING MALNUTRITION AMONG CHILDREN UNDER 5 YEARS OF AGE IN KWENENG WEST DISTRICT OF BOTSWANA

by

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submitted in accordance with the requirements

for the degree of

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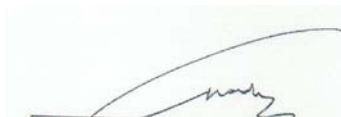
SUPERVISOR: PROF ES SELOILWE

NOVEMBER 2012

DECLARATION

I declare that **FACTORS INFLUENCING MALNUTRITION AMONG CHILDREN UNDER 5 YEARS OF AGE IN KWENENG WEST DISTRICT OF BOTSWANA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

_____

SIGNATURE

DR YANKINDA E KADIMA

<u>8 November 2012</u>

DATE

FACTORS INFLUENCING MALNUTRITION AMONG CHILDREN UNDER 5 YEARS OF AGE IN KWENENG WEST DISTRICT OF BOTSWANA

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ABSTRACT

The purpose of this study was to identify and determine the risk factors for malnutrition among children under the age of 5 years in Kweneng West District of Botswana. A case control study was conducted. The cases consisted of 37 underweight children under the age of 5 (n=37), and the controls consisted of 76 children less than 5 years of age (n=76) recruited concurrently among the under-five children attending Letlhakeng Child Welfare Clinic on a monthly basis. The controls were of good nutritional status. Data collection was done using a combination of a review of records (child welfare clinic registers, and child welfare clinic cards) and structured questionnaires. Following placement of the data in regression models, the factors that were found to be significantly associated with child malnutrition were small number of daily meals taken by the child (Adjusted OR=19.04, 95% CI 3.24-112.13), lack of knowledge of methods of prevention of child malnutrition by the parent (Adjusted OR=4.71, 95% CI 1.41-15.82), parent's unemployment (Adjusted OR=50.3, 95% CI 4.86-52.1), low birth weight (Adjusted OR=12.34, 95% CI 2.76-55.02), inadequate Vitamin A supplementation (Adjusted OR=13.27, 95% CI 1.94-90.46), child illness (OR=20.95, 95% CI 7.55-58.10), and child raised by a guardian (Adjusted OR=5.67, 95% CI 1.30-24.73). The findings from this study suggest that Socio-economic factors such as unemployment, a lack of knowledge about recommended infant and child feeding practices, the child raised by a guardian, and health-related factors such as low birth weight, inadequate Vitamin A supplementation, and child illness are predictors of malnutrition in under five. Therefore, increasing household food security and reinforcing educational interventions could contribute to a reduction in the prevalence of child malnutrition in the district.

ACKNOWLEDGEMENTS

Dedication

This dissertation is dedicated to my wife and sons Nathan, Elie and Gradi Kadima.

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List of abbreviations

ACSD	Accelerated Child Survival and Development
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
BNNSS	Botswana National Nutrition Surveillance System
CD4	Cluster of Differentiation 4
CI	Confidence Interval
DHMT	District Health Management Team
HIV	Human Immunodeficiency Virus
MDGs	Millennium Development Goals
OR	Odds ratio
PMTCT	Prevention of Mother-to-Child Transmission
SPSS	Statistical Package for the Social Sciences
UNICEF	United Nations International Children's Emergency Funds
VGFP	Vulnerable Group Feeding Programme
WHO	World Health Organization

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1   INTRODUCTION

The government of Botswana recognises good nutrition as being central to achieving the Millennium Development Goal 1 which advocates for the eradication of extreme poverty and hunger, and includes the target to reduce by half the number of underweight children by 2015 (Botswana Ministry of Health 2005:1). The aspect of nutrition is incorporated well in Vision 2016 and most of Botswana's existing national development plans, policies, and programmes (Botswana Ministry of Health 2005:14). Vision 2016 is an umbrella development policy, a long-term vision for a healthy and prosperous Botswana (Botswana Ministry of Health 2005:14).

However, Nnyepi, Mmopelwa and Codjia (2010:6) report that several population-based surveys have shown that child malnutrition is a persistent problem in the Republic of Botswana, and that there are significant disparities in its prevalence both across and within districts. Among the most vulnerable are children in households with poor socio-economic indicators and children in health districts in regions with poor poverty indicators (a high poverty head count index, or the number of poor people expressed as a percentage of the population), such as Mabutsane, Kweneng West, Kgalagadi, and some areas of Mahalapye (Nnyepi et al 2010:7; Mmegionline 2009). The 2007 Botswana Family Health Survey estimated that about 13% of children under 5 years of age in Botswana were underweight or too thin for their age, 26% were stunted or too short for their age, and 7.2% were wasted or thin for their age (Botswana Central Statistics Office 2009:2). The common nutrition problems that were identified were protein-energy malnutrition, micronutrient deficiencies (Vitamin A, iodine, and iron), and diet-related non-communicable diseases (Botswana Ministry of Health 2005:5). The case-control study used in this research sought to identify some of the demographic, socio-economic and health-related factors that may be contributing to the occurrence of the condition of underweight among children less than 5 years of age in the Kweneng West District of Botswana. A review of records (child welfare clinic registers, and child

welfare clinic cards) and interviews using a structured questionnaire with parents were conducted. Parent's unemployment which can lead to income poverty, household food insecurity, inadequate child care, unhealthy household environment and lack of health services, was found to be the leading predictor of child malnutrition in the district (Unite for sight website 2012).

1.2   BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

1.2.1   The source of the research problem

The research is motivated by reports from the Botswana National Nutrition Surveillance System (BNNSS), which once a month monitors the weight-for-age indicator of every child attending a child welfare clinic. This system, which is managed by the Nutrition and Food Control Division of the Ministry of Health, reveals that during the period 2005-2010, Kweneng West was one of the districts that consistently reported high annual underweight prevalences among children less than 5 years of age that attended child welfare clinics, as compared to the annual national averages reported during the same period (Botswana Ministry of Health, Food and Nutrition Unit 2006:2, 4; 2007:2, 3, 6; 2008: 2, 3, 5; Botswana Ministry of Health, Nutrition and Food Control Division 2010:2, 3, 5; 2011).

Table 1.1   Annual underweight prevalences among under-five children in Kweneng West District (2005-2010)

Year	Estimated under-five population in the district	Child welfare clinic attendance (as % of estimated under-five population)	% moderate underweight (% moderate underweight national average)	% severe underweight (% severe underweight national average)	% total underweight (% total underweight national average)
2005	5,923	5,805 (98)	6.5 (4.3)	1.3 (0.9)	7.8 (5.2)
2006	5,514	6,181 (104.5)	6.7 (3.9)	1.3 (0.9)	8 (4.8)
2007	5,275	6,258 (118.5)	6.6 (3.8)	1.2 (0.8)	7.8 (4.6)
2008	5,209	6,320 (121.4)	6.1 (3.5)	1.2 (0.8)	7.3 (4.3)
2009	5,315	6,547 (123.2)	4.7 (2.8)	0.9 (0.7)	5.6 (3.5)
2010	5,593	6,781 (121.3)	4.3 (2.6)	0.8 (0.6)	5.1 (3.2)

Letlhakeng Sub-District Council. *Child Welfare Clinic nutritional status reports 2005, 2006, 2007, 2008, 2009, and 2010.*

1.2.2 Study setting

Kweneng West District, also known as Letlhakeng Sub-District (the focus of this study), is primarily a rural district located 120 km west of Gaborone, the capital city of Botswana. The district borders Ghanzi District to the north, Kweneng East District to the east, and Kgalagadi District to the south-west. It comprises 24 villages and is commonly described as a sandy district with a poor resource base, a very low population density, and no significant industrial activity (Kweneng West District Health Management Team 2010:2). Over 85% of the residents of the district live in rural areas, with over 20% of the population living in settlements with fewer than 100 inhabitants. The population of the district in 2001 was estimated at 40,562 (Botswana Central Statistics Office website 2011). Kweneng West was conveniently selected as the study setting, after the observation noted by the researcher that malnutrition was prevalent in the area.

1.3   RESEARCH PROBLEM

From 2005 to 2010, Kweneng West District reported high annual underweight prevalences among the children less than 5 years of age who attended child welfare clinics, as compared to the annual national averages reported during the same period.

However, no single study has been conducted so far at district level to investigate the impact of socio-economic, demographic and health-related determinants on high rates of underweight observed among under-five children. It is for this reason that this study sought to investigate the factors influencing the condition of underweight among children under 5 years of age in Kweneng West.
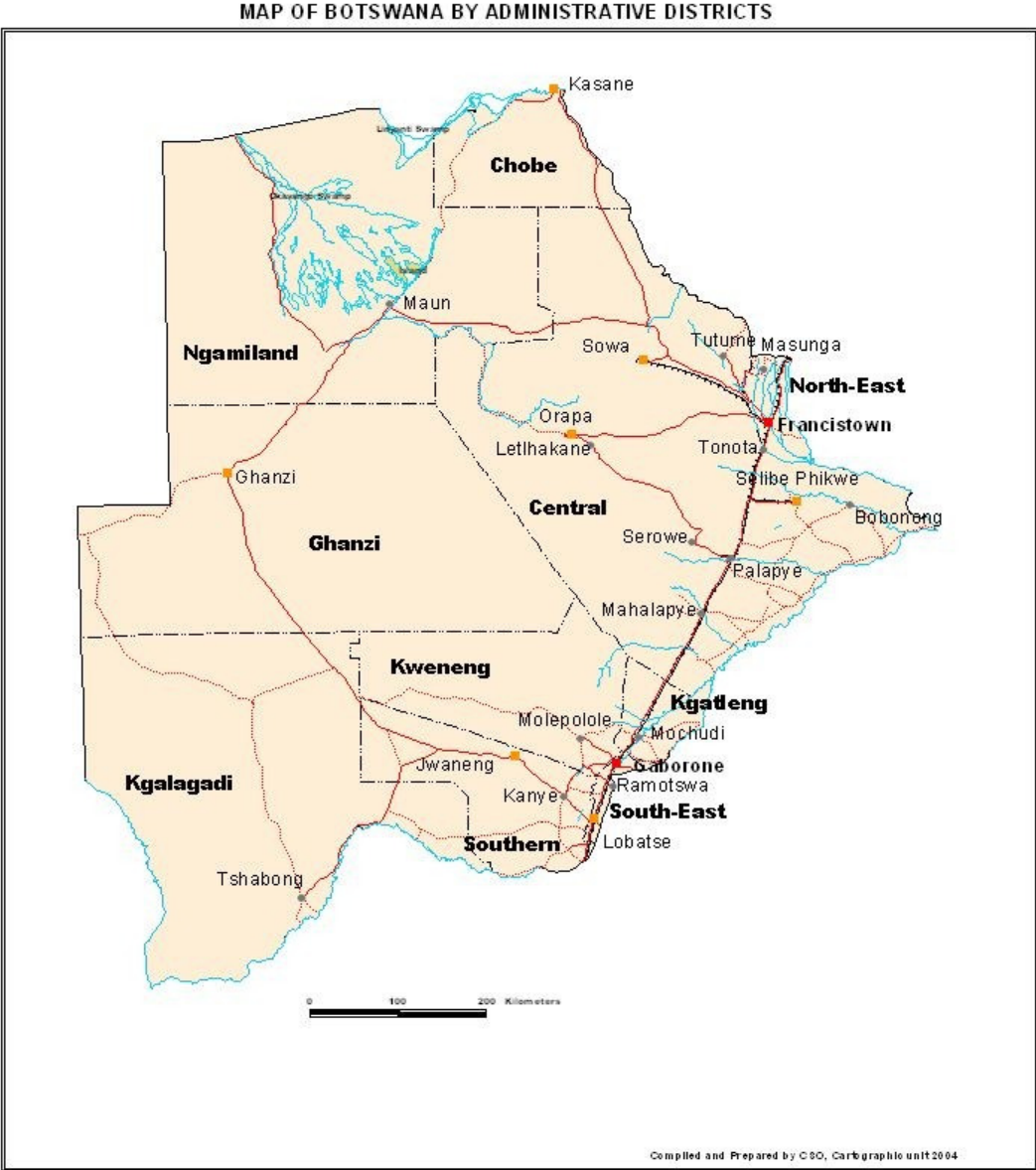
Figure 1.1   A map of Botswana by administrative districts
(Botswana Central Statistics Office 2009: xiii)

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1.4   AIM OF THE STUDY

1.4.1 Research purpose

The purpose of this study was to identify and determine the risk factors for the condition of underweight among children under the age of 5 years in Kweneng West District in the Republic of Botswana.

1.4.2 Research objective

The objective of this study was to ascertain to what extent the following factors were associated with the condition of underweight among under-five children in Kweneng West:

- **Demographic factors:** age of the parent at the time of diagnosis of underweight for the case, or the corresponding date for the control, and the gender of the study participant child.

- **Socio-economic factors:** level of education of parent, household size, parent's knowledge of causes of malnutrition, parent's knowledge of methods of prevention of malnutrition, number of meals taken by the child per 24 hours, breastfeeding practices, the parent's employment status , the parent's marital status, the number of under-five children in the household, alcohol abuse by the parent, and the parent's identity towards the child

- **Health-related factors:** antenatal care attendance, the HIV status of the mother during pregnancy, the child's birth weight, immunisation status, child illness, Vitamin A supplementation, and place where the child was delivered.

1.5   SIGNIFICANCE OF THE STUDY

By providing empirical evidence, the results of this study contribute to the growing of the body of knowledge about the factors influencing malnutrition in under-five children. They could also influence the formulation of appropriate policies aimed at addressing those factors. Relevant interventions could then be designed with the view to reduce the incidence of malnutrition in under-five children.

1.6   DEFINITION OF TERMS

1.6.1 Factors

1.6.1.1   Conceptual definition

Factors refer to any of the forces, conditions, or influences that act with other forces, conditions, or influences to bring about a result (Longman Active Study Dictionary of English 1987:214).

1.6.1.2   Operational definition

In this study, factors refer to socio-economic characteristics, demographic characteristics, and health-related conditions that could contribute to the occurrence of malnutrition in children under the age of 5 years.

1.6.2 Malnutrition

1.6.2.1   Conceptual definition

"Malnutrition" is a general term that indicates a lack of some or all nutritional elements necessary for human health (World Hunger Education Service website 2011).

1.6.2.2   Operational definition

In this study, malnutrition refers to the condition of moderate or severe underweight.

1.6.3 Child under 5 years of age

In this study, a child under the age of 5 years refers to a young human being whose age ranges from 6 to 59 months from his date of birth.

1.6.4 Child welfare clinics

Child welfare clinics are integrated services that are provided to all Batswana children from birth to 5 years of age, with the purpose of monitoring their nutritional status (Botswana Multi-Sectoral Committee for Poverty Reduction 2007:8).

1.6.5 Parent

1.6.5.1 Conceptual definition

A parent is the father or the mother of a person or animal (Longman Active Study Dictionary of English 1987:432).

1.6.5.2 Operational definition

In this study, the term "parent" refers to the biological mother or the guardian of the under-five participant child.

1.6.6 Guardian

1.6.6.1 Conceptual definition

A guardian is a person who has the responsibility of looking after a child who is not his or her own (Longman Active Study Dictionary of English 1987:272).

1.6.6.2 Operational definition

In this study, the term "guardian" refers to someone else besides the biological mother who had the responsibility of looking after the under-five child for a period of at least one month prior to the time the diagnosis of underweight was made for a case or for a period of at least one month prior to the corresponding date for the control.

1.6.7 Demographic factors

1.6.7.1 Conceptual definition

A demographic factor is a characteristic of a person.

1.6.7.2 Operational definition

In this study, demographic factors refer to the age of the parent and the gender of the study participant child.

1.6.8 Socio-economic factors

1.6.8.1 Conceptual definition

Socio-economic factors are the social and economic experiences and realities that help mould one's personality, attitudes, and lifestyle (EHow website 2011).

1.6.8.2 Operational definition

In this study, socio-economic factors refer to the following:

1.6.8.2.1 Level of education of the parent

- ***Conceptual definition***

Level of education refers to the number of years completed by an individual to learn or train his or her mind and character (Longman Active Study Dictionary of English 1987:192).

- ***Operational definition***

Level of education refers to the level of formal education that the parent has attained, which may range from none to tertiary education. The parent's level of education is classified as "none" if he or she has never attended a formal educational institution from

his or her birth up to the time of the diagnosis of the condition of underweight for the case or the corresponding date for the control. The level of education is classified as "primary" if the parent has completed at least one year of primary education. The level of education is classified as "secondary and above" if the parent has completed at least one year of secondary or tertiary education, as the case may be.

1.6.8.2.2 Household size

- ***Conceptual definition***

A household size is all the people living together in a house (Longman Active Study Dictionary of English 1987:296).

- ***Operational definition***

 Household size was classified as "large" if the total number of people living in the same house with the participant child at the time of the conduct of the study was more than 4, and as "adequate" if the total number of people living in the house was less than or equal to 4. The number 4 was used as a cut-off point based on the outcome of the Botswana Family Health Survey IV that was conducted in 2007. The above survey revealed that the average household size in Kweneng West District was 3.4, and the national average household size was found to be 3.5 (Botswana Central Statistics Office 2009).

1.6.8.2.3 Parent's knowledge of causes of malnutrition in children under 5 years of age

- ***Conceptual definition***

The parent's knowledge of causes of malnutrition in children under 5 years of age refers to the information that the parent has about the causes of malnutrition in children.

- ***Operational definition***

The parent was classified as knowledgeable or not knowledgeable depending on his or her ability or inability to cite at least one cause of malnutrition in children.

1.6.8.2.4 Parent's knowledge of the methods of prevention of child malnutrition

- ***Conceptual definition***

The parent's knowledge of the methods of prevention of child malnutrition refers to the information that the parent has about the methods of prevention of child malnutrition.

- ***Operational definition***

The parent was classified as knowledgeable or not knowledgeable depending on his or her ability or inability to cite at least one method of prevention of child malnutrition.

1.6.8.2.5 Number of meals taken by the child per day

- ***Conceptual definition***

The number of meals per day is the average number of meals taken by the participant child per 24 hours.

- ***Operational definition***

The adequacy of the number of meals taken by the participant child per 24 hours was judged based on the WHO feeding recommendations for the infant and young child. The number of meals per 24 hours was classified as "adequate" if the chid takes a minimum of five meals per day, and was classified as "small" if the child takes less than five meals per day. A meal refers to breastfeeding, milk formula feeding, or eating solid food, semi-solid food, or soft food, other than water.

1.6.8.2.6 Breastfeeding practices

- ***Conceptual definition***

"Breastfeeding practices" refers to the act of feeding an infant or child with his or her mother's breast milk.

- ***Operational definition***

The participating child was classified as "breastfed" if he or she was breastfed for a minimum period of six months from birth. The child was classified as "never breastfed" if he or she was never breastfed during his or her first six months of life or was breastfed for less than six months after birth.

1.6.8.2.7 Parent's employment status

- ***Conceptual definition***

Employment status refers to the state of being employed as a paid worker and the state of being unemployed (Longman Active Study Dictionary of English 1987:197).

- ***Operational definition***

The parent's employment status was classified as unemployed or employed (including having temporary jobs, having a regular job, or being self-employed).

1.6.8.2.8 Parent's marital status

- ***Conceptual definition***

Marital status is the civil status of each individual in relation to the marriage laws or customs of the country (Glossary of Statistical Terms website 2011).

- ***Operational definition***

The parent was classified as either of the following:

- <u>Living alone:</u> When he or she does not live in the same house with his or her partner.

  This includes a single parent, a married parent who lives separated from his or her partner, a divorced parent, and a widowed parent.

- <u>Living together:</u> When he or she lives in the same house with his or her partner.

  This includes a married parent who lives in the same house as his or her partner, and a parent who is not officially married but lives in the same house with his or her partner.

1.6.8.2.9   Alcohol abuse by the parent

- ***Conceptual definition***

Alcohol abuse refers to alcohol consumption associated with social, psychological and physical problems (Boon, Colledge & Walker 2006:244).

- ***Operational definition***

Alcohol abuse was classified as present if:
- A male guardian consumes five or more drinks per occasion or in a single day, or 15 or more drinks per week.
- The mother or a female guardian consumes four or more drinks per occasion or in a single day or eight or more drinks per week. The above numbers of drinks are considered risky drinking limits by the World Health Organization (Botswana Ministry of Health [S.a.]:31).

1.6.8.2.10   Number of under-five children in the household

- **Conceptual definition**

The number of under-five children in the household refers to the number of people whose ages vary between 0 and 59 months who live in the same house as the study participant child

- **Operational definition**

The number of under-five children in the household was classified as "large" if the number of children was more than three, and as "adequate" if the number of children was less than or equal to three.

1.6.8.2.11   Parent's identity towards the child

- **Operational definition**

The parent's identity towards the child was classified as "mother" if by the time the study was conducted; the child was being raised by his or her biological mother and as "guardian" if the child was being raised by someone else besides the biological mother.

1.6.9   Health-related factors

1.6.9.1   Conceptual definition

The WHO defines health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity (WHO website 2011a).

1.6.9.2   Operational definition

In this study, health-related factors refer to those medical conditions or situations affecting the biological mother or the child and which could have an impact on the health status of the child. These include:

1.6.9.2.1 Antenatal care (ANC) clinic attendance by the biological mother during the pregnancy

- **Conceptual definition**

ANC clinics offer scheduled medical consultations to pregnant women, with the purpose of maintaining the mother and the baby in the best possible state of health by identifying actual and potential problems at an early stage and instituting appropriate management (Miller & Callander 1989:81).

- **Operational definition**

ANC clinic attendance refers to the fact that the biological mother attended at least three ANC clinic sessions when she was pregnant with the study participant child.

1.6.9.2.2 HIV infection status of the mother during pregnancy

- **Conceptual definition**

"HIV" is short for "human immunodeficiency virus". HIV is a retrovirus that causes AIDS by infecting the CD4 T lymphocytes of the immune system (Farlex 2011). HIV infection status refers to the presence or absence of the HIV in a human organism.

- **Operational definition**

HIV infection status was classified as follows:

Positive: if the mother was HIV-infected while she was pregnant with the study participant child.

Negative: if the mother was not HIV-infected while she was pregnant with the study participant child.

Unknown: if the mother did not know her HIV status while she was pregnant with the study participant child.

Note: The HIV infection status must have been confirmed by at least one laboratory HIV-testing technique which is approved by the HIV-testing policy in the country.

1.6.9.2.3 Child's birth weight

- ***Conceptual definition***

The child's birth weight refers to the heaviness of the child, as measured by a weight scale at birth.

- ***Operational definition***

A child born with a weight below 2,500 grams was classified as "low birth weight". A child born with a weight equal to or more than 2,500 grams was classified as "normal birth weight".

1.6.9.2.4 Child's immunisation status

- ***Conceptual definition***

"Immunization" is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine" (WHO 2011c).

- ***Operational definition***

In this study, a child's immunisation status was classified as "up to date" if the child had received all the correct doses of vaccines that he or she was supposed to have received by his age at the time that he was diagnosed with underweight (for cases) or by the corresponding date, as per Botswana's immunisation schedule (for controls). The child's immunisation status was classified as "not up to date" if the child had missed at least one dose of vaccine or was behind with regard to Botswana's immunisation schedule at the time that he was diagnosed with underweight (for cases) or on the corresponding date (for controls).

1.6.9.2.5   Child illness

- **Conceptual definition**

Child illness refers to any illness, impairment, or abnormal condition that affects primarily infants and children (Encyclopaedia Britannica website 2011).

- **Operational definition**

For the sake of this study, child illness was classified as present or absent if at least two weeks prior to the date when the child was diagnosed with underweight (for a case) or prior to the corresponding date (for a control) the study participant child had or had not presented with one or more of the following conditions: a cough, diarrhoea, vomiting, fever, ear problems, or disability.

1.6.9.2.6   Vitamin A supplementation

- **Conceptual definition**

Vitamin A supplementation refers to the administration of Vitamin A to children under the age of 5 and lactating mothers as both a preventive and a therapeutic measure.

 Operational definition

A child was classified as "up to date" or "not up to date" in terms of Vitamin A supplementation if he or she had received or had not received (as the case may be) all the due Vitamin A supplementation doses at the time that he was diagnosed with underweight (for a case) or by the corresponding date (for a control), according to the universal schedule of Vitamin A supplementation.

1.6.9.2.7 Child's place of delivery

- ***Operational definition***

The child's place of delivery was classified as "institutional" if the child was born in an official health facility. This includes private and government health facilities. The child's place of delivery was classified as "non-institutional" if the child was born outside an official health facility. This includes home delivery or having been born before reaching a health facility.

1.7 FOUNDATIONS OF THE STUDY

This study was guided by the UNICEF conceptual framework for causes of malnutrition in society.

1.8 RESEARCH DESIGN AND METHODS

This study is a quantitative case control study. Data were collected using two approaches, namely a review of records and a survey.

1.9 VALIDITY AND RELIABILITY

To enhance the internal validity and reliability of this study, the following measures were taken:

- Similar conditions for data collection were ensured for each participant.
- The nature and purpose of the research were regularly communicated.
- Cases and controls were selected that were similar with regard to extraneous factors.
- Two weeks prior to the fieldwork, the study methodology was piloted at Khudumelapye Child Welfare Clinic in Kweneng West. Khudumelapye Child Welfare Clinic has similar characteristics to Letlhakeng Child Welfare Clinic. Elements of the research proposal that were pre-tested included the study variables, the availability of the respondents, the acceptance of the study by the participants, the time factor, the adequacy of resources, the relevance of the

questions, the sequence and comprehensibility of the questions, and the accuracy of the respondents' interpretation of the questions. Pilot data have not been used in the main study.

1.10   ETHICAL CONSIDERATIONS

1.10.1 Protecting the rights of the participants

The risks for human beings were minimal with the methodology used in this study. Nevertheless, the following was done to protect the rights of the participants:

- Parents of selected cases and controls were informed of the purpose of the study and were allowed to voluntarily choose to participate or not.
- Parents had the right to withdraw from the study at any time without incurring any penalty.
- The right of the participants to anonymity was protected, and the data that were collected were kept confidential.
- The researcher obtained informed consent from parents before their enrolment in the study (see appendix C).

1.10.2 Protecting the rights of the institution

Before collecting data from the study participants, permission was sought from the following institutions and individuals:

- The Higher Degrees Committee of the Department of Health Studies at the University of South Africa (see appendix B).
- The Health Research Unit in the Ministry of Health of Botswana (see appendix A).
- The Kweneng West District Health Management Team (see appendix A).
- Health workers in charge of Letlhakeng Child Welfare Clinic.

In addition:

- The researcher took all the necessary precautions so that the daily activities of the institution where the study was conducted were not disturbed.
- All the information collected during the course of the study and involving the institution where the study was conducted has been kept confidential and will not be divulged under any circumstances without prior permission from the institution concerned.

1.10.3 Scientific integrity of the research

The following measures were taken to ensure the scientific integrity of the research:

- The research protocol was submitted for institutional review to the Higher Degrees Committee of the Department of Health Studies at the University of South Africa and to the Health Research Unit in the Ministry of Health of Botswana.
- Plagiarism was not committed.
- All the sources that have been used have been acknowledged accordingly.
- All contributors to the study have been acknowledged.
- No fabrication or distortion of data or results has been applied.

1.11 SIGNIFICANCE OF THE STUDY

The identification of the factors that may contribute to the occurrence of the condition of underweight among under-five children in Kweneng West District may help in the formulation of appropriate policies and the creation of intervention strategies aimed at addressing those factors and in improving the nutritional status of the under-five population.

1.12 STRUCTURE OF THE DISSERTATION

Chapter 1: Orientation to the study

The first chapter provides the background information about the research problem which motivated the researcher to conduct the study. It highlights the aim of the study and its significance, provides definitions of key terms used, and explains the

foundations of the research. This chapter also announces the research design and methods and discusses the validity, reliability and ethical considerations related to the study. A short conclusion ends the chapter.

Chapter 2: Literature review

This chapter focuses on a review of specific literature studied on malnutrition.

Chapter 3: Research design and method

The third chapter reports about the research design and method followed. It specifies the research population, the data-collection approach and method that was used, the development and testing of the data-collection instrument, and the data process and analysis.

Chapter 4: Presentation, analysis and description of the research findings

This chapter specifies the procedures that were followed in analysing the data and the computer programs that were used. It focuses on the major findings of the study. The research results are discussed in relation to the findings of other studies.

Chapter 5: Conclusions and recommendations

The final chapter reports on the conclusions that were drawn in relation to the research problem, purpose and objective, and whether the objective of the study was achieved. It indicates the limitations of the research and presents recommendations for future action and research.

1.13   CONCLUSION

Child malnutrition is a persistent problem in the Republic of Botswana. Kweneng West, which is the focus of this study, is one of the districts that consistently reported high annual prevalences of underweight among under-five children who attended a child welfare clinic from 2005 to 2010, as compared to the annual national prevalences reported during the same period. This case-control study intends to grow the body of

knowledge concerning the factors influencing malnutrition among children under 5 years of age in Kweneng West District. The following chapter presents a review of the literature that was studied regarding the research topic.

CHAPTER 2

LITERATURE REVIEW

2.1   INTRODUCTION

This chapter presents a review of literature that was studied and which includes classifications of malnutrition, the pathophysiology of malnutrition, a review of similar studies conducted in Botswana, Africa, and the world, the causes of malnutrition in children, according to the UNICEF conceptual framework for causes of malnutrition in society, and the situation with regard to malnutrition in Botswana, Africa and the World. A brief conclusion ends the chapter.

2.2   CLASSIFICATIONS OF MALNUTRITION

Malnutrition in children can take the form of stunting, wasting, or underweight (Mahgoub, Nnyepi & Bandeke 2006:2). Children whose weight-for-age indicator is more than two or three standard deviations below the median for the international reference population (ages 0-59 months) are considered moderately or severely underweight (WHO website 2011b). Children whose height/length-for-age indicator is more than two or three standard deviations below the median for the international reference population (ages 0-59 months) are considered moderately or severely stunted (World Bank website 2011). Children whose weight-for-height/length indicator is more than two or three standard deviations below the median for the international reference population (ages 0-59 months) are considered moderately or severely wasted (Botswana Ministry of Health & UNICEF 2008:2).

2.3   PATHOPHYSIOLOGY OF MALNUTRITION

According to Porter and Kaplan (2011:15), the initial metabolic response of malnutrition is decreased metabolic rate. To supply energy, the body first breaks down adipose tissue. Later, when these tissues are depleted, the body may use protein for energy, resulting in a negative nitrogen balance. Visceral organs and muscle are broken down,

and a decrease in weight occurs. Loss of organ weight is greatest in the liver and intestines, intermediate in the heart and kidneys, and least in the nervous system.

Children who are malnourished are at far greater risk of contracting pneumonia, measles, diarrhoea, malaria, and HIV/AIDS, and of dying from these conditions (Save the children website 2011). Malnutrition affects a child's growth, morbidity, mortality, cognitive development, and physical work capacity. It also impacts on human performance, health, and survival (Mahgoub et al 2006:2).

2.4   A REVIEW OF SIMILAR STUDIES ON CHILD MALNUTRITION

Nzala, Siziya, Babaniyi, Songolo, Muula and Rudatsikira (2011) conducted a cross-sectional study with the objective to determine associations of demographic, cultural and environmental factors with frequency and severity of malnutrition among children less than 5 years of age in Zambia. The researchers used data from the Zambia Multiple Indicator Cluster Survey of 1999-2000 and included 6,142 children in the survey. Their study discovered that child malnutrition was associated with the male gender, a low education level on the part of the householder and mother, poverty, incomplete vaccination status, and the type of toilet used by the child.

A population-based multicentre nested case-control study conducted by Shargi, Kamran and Faridan (2011), which included 76 underweight children and 76 controls in the city of Namin in Iran, showed that the female gender, poverty, short maternal height, and the use of unhygienic latrines in the home were significantly associated with childhood malnutrition. In an age-matched case-control study including 102 severely malnourished under-five children and 102 well-nourished children, Amsalu and Tigabu (2006) found that severe acute malnutrition in Ethiopia was independently associated with a lack of exclusive breastfeeding for the first six months of life and late initiation of complementary diet.

To assess the nutritional status and to determine potential risk factors of malnutrition in children under 3 years of age in Nghean (Vietnam), Hien and Hoa (2009) conducted a cross-sectional descriptive survey using a structured questionnaire and measurements of weight and height of children aged 6-36 months. The research found that region of residence (urban or rural), ethnicity, mother's occupation, household size, mother's

body mass index, number of children in family, weight at birth, time of initiation of breastfeeding, and duration of breastfeeding were significantly correlated with child malnutrition.

Turyashemererwa, Kikafunda and Agabe (2009) assessed by means of a cross-sectional descriptive study using both qualitative and quantitative methods of data collection the prevalence of malnutrition and the factors influencing the nutritional status of children under 5 years of age in a peri-urban environment in Kabarole District in western Uganda. They administered a questionnaire to 93 caretakers of children aged 6-59 months in randomly selected households and held focus group discussions with a few selected participants. The findings from their study revealed that education level of the mother/caretaker, age of the child, receipt of information on child feeding, and time of introduction of other foods were significantly correlated with child stunting.

In 2006, Mahgoub et al conducted a cross-sectional descriptive survey using a structured questionnaire and measurements of weight and height of under-three children. Four hundred households and mothers of children under 3 participated in the study, whose objective it was to evaluate the level of malnutrition and the impact of some socio-economic and demographic factors of households on the nutritional status of children less than 3 years of age in Botswana. The study revealed that malnutrition was significantly higher among boys than among girls, underweight was less prevalent among children whose parents were involved in informal business, children brought up by single parents suffered from underweight to a significantly higher level than children living with both parents, the prevalence of underweight decreased significantly as family income increased, the higher the level of the mother's education, the lower the level of child underweight observed, and breastfeeding was found to reduce the occurrence of underweight among children.

Previous studies on child malnutrition have had the strength of including representative samples and using structured questionnaires and a collection of anthropometric data through measurements of the length/height and weight of participant children by the researchers. For example, Nzala et al (2011) included 6,142 children less than 5 years in their study; Nnyepi et al (2010) included 742 households and 1,003 children; Hien and Hoa (2009) selected 383 child/mother pairs for their study; Mahgoub et al (2006) included 400 households and mothers of children under 3, representing the 23 health

regions of Botswana; Rayhan and Khan (2006) had a sample of 5,419 children; Amsalu and Tigabu (2006) included 102 cases and 102 age-matched controls and Shargi et al (2011) had a sample of 76 children with malnutrition (the cases) and 76 children without malnutrition (the controls) to identify risk factors for protein-energy malnutrition in children under 6 years of age in the city of Namin in Iran.

The researcher has noticed the following limitations from the above mentioned studies. In some of the studies, participants were restricted to children under 3 years of age. (Hien and Hoa 2009; Mahgoub et al 2006). Nnyepi et al (2010), Nzala et al (2011), Hien and Hoa (2009), Mahgoub et al (2006), Turyashemererwa et al (2009), and Rayhan and Khan (2006) applied a cross-sectional study design to investigate the factors associated with child malnutrition in their respective investigations. However, Joubert and Ehrlich (2007: 87) report that although cross-sectional studies are relatively easy and economical to conduct, and are useful for evaluating the relationships between exposures that are relatively fixed characteristics of individuals, they also have some limitations. Cross-sectional studies are not able to distinguish between factors that cause the disease and factors that prolong the period with the disease. Compared to cohort studies and case-control studies, cross-sectional studies provide weaker evidence about disease causation and do not assess and compare the occurrence of new cases of disease (incidence) in the group of people with the disease and the group of people without the disease.

In the current study, the researcher extended the age of participant children up to 59 months and applied a case-control study design because of budget and time constraints (a cohort study is costly and time-consuming). Another reason in the choice of this study design is that the researcher wanted to provide stronger evidence about the causation of malnutrition than has been the case in previous cross-sectional studies. He also wanted to assess and compare the occurrence of new cases of underweight (incidence) in two groups.

2.5   THE SITUATION WITH REGARD TO MALNUTRITION IN BOTSWANA

Several population-based surveys in Botswana show that child malnutrition is a persistent problem and that there are significant disparities in its prevalence both across and within districts (Nnyepi et al 2010:6). The Botswana Family Health Survey conducted in 2007 revealed that about 13% of children under 5 years were underweight or too thin for their age, 26% were estimated to be stunted or too short for their age, and 7.2% were estimated to be wasted or thin for their age (Botswana Central Statistics Office 2009:2). A cross-sectional descriptive survey using a structured questionnaire and measurements of weight and height of children under 3 years conducted in 2006 came up with prevalence of 5.5%, 38.7%, and 15.6%, respectively, for wasting, stunting, and underweight among children under 3 years of age in Botswana. The same study showed higher levels of undernutrition in under-three children from single-parent households, households with low earnings, households with low parental education, and households in rural areas (Mahgoub et al 2006:9).

2.6   GLOBAL VIEW OF MALNUTRITION

According to the World Health Organization (WHO), cited in Nzala et al (2011), 60% of all deaths occurring among children aged less than 5 years in developing countries can be attributed to malnutrition. Based on recent estimates, 115 million children under 5 years of age worldwide are underweight, and about 178 million others are too short for their age or stunted (WHO website 2011). Benson and Shekar, cited in Nzala et al (2011), estimate that 50% of children aged 12 to 15 months are underweight, and more than one-third of children less than 5 years are stunted.

2.7   CAUSES OF MALNUTRITION

Figure 2.1 illustrates the causes of malnutrition according to the UNICEF conceptual framework for causes of malnutrition in the society.
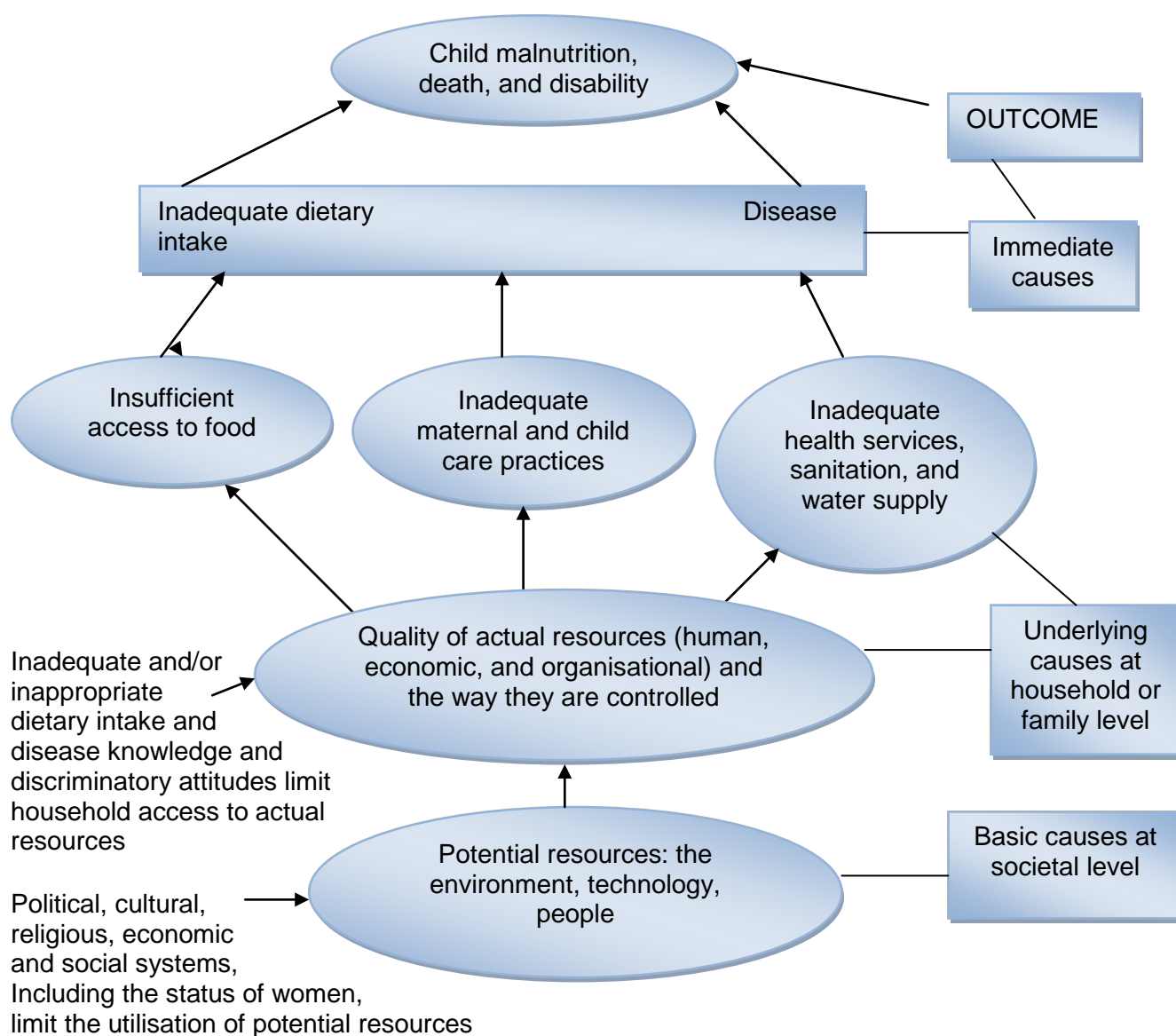
Figure 2.1   UNICEF conceptual framework for causes of malnutrition in society

(Botswana Ministry of Health & UNICEF 2008: 1)

According to the UNICEF conceptual framework for causes of malnutrition in society, there are immediate, underlying, or intermediate, and basic, or root, causes of malnutrition (Botswana Ministry of Health 2005:4). Malnutrition is multifaceted and requires multi-sectoral, multidisciplinary and multi-level action to alleviate it.

The basic causes of malnutrition act at societal level. They include political, cultural, religious, economic and social systems, including the status of women, which limit the utilisation of potential environmental, technological and human resources by women (Botswana Ministry of Health & UNICEF 2008:1).

The underlying causes of malnutrition act at household and family level. They include inadequate or inappropriate dietary intake, inadequate disease knowledge, and discriminatory attitudes, which limit household access to quality and quantity economic and organisational resources (Botswana Ministry of Health & UNICEF 2008:1).

The immediate causes of malnutrition act at individual level. They include inadequate dietary intake and diseases, which lead to child malnutrition, disability, and death (Botswana Ministry of Health & UNICEF 2008:1).

2.8   CONCLUSION

Malnutrition in children, which can take the form of stunting, wasting, or underweight, affects a child's growth, morbidity, mortality, cognitive development, physical work capacity, human performance, health, and survival. According to the UNICEF conceptual framework, there are immediate, intermediate and basic causes which interact at various levels of life to lead to child malnutrition. The literature review has revealed that many studies investigating risk factors for child malnutrition have so far been conducted in Botswana, Africa, and the world. However, the current study is the first to investigate the impact of a broad range of demographic, socio-economic and health-related factors on the nutritional status of children less than 5 years of age in the rural district of Kweneng West in Botswana. Chapter 3 discusses the research design and method used in the study.

CHAPTER 3

RESEARCH DESIGN AND METHOD

3.1   INTRODUCTION

This chapter explains the research design that was followed, the population and the sample selection, the data-collection approach and method of data analysis used.

3.2   RESEACH PARADIGM

This study is a quantitative research study. Quantitative research is a formal, objective, systematic process in which numerical data are used to obtain information about the world (Burns & Grove 2005:23). The choice of this research paradigm was justified by the fact that the purpose of the study was an examination of the relationships between different variables. Quantitative research is thought to produce a hard science that involves rigour, objectivity, and control (Burns & Grove 2005:23).

3.3   RESEARCH DESIGN

This research is a case-control study. A case-control study is a retrospective epidemiological study used to identify factors that may contribute to a medical condition by comparing people who have the disease or condition of interest (the cases) with those who do not have the disease or condition of interest (the controls) (Biology Online 2011). In a case-control study, the researcher begins with cases, that is, individuals from an identified population (called the source population) who have developed the outcome of interest, for example, having been diagnosed with a particular disease. The researcher then selects a suitable population that does not have the outcome of interest. Once cases and controls have been identified, the researcher collects exposure measurements and compares them between the two groups (Joubert & Ehrlich 2007:82). This study design assisted in attaining the set objective of the study by comparing the odds of exposure (risk factors) among malnourished children and the odds of exposure (risk factors) among well-nourished children. The calculation of the

odds ratio and confidence intervals for the two groups helped to identify and determine the risk factors associated with malnutrition among under-five children.

3.4   RESEARCH METHOD

3.4.1 Population and sample selection

The study population included children under the age of 5 years attending child welfare clinics in Kweneng West District, as well as their parents. The study had a case-control study design. Cases and controls were conveniently selected from the child welfare clinic registers and nutrition surveillance logbook monthly reports obtained from Letlhakeng Child Welfare Clinic. No sampling was done but this was a population survey of all available records during the data collection period.

The inclusion criteria for the cases were:

- The child had to have been residing in Kweneng West District for at least three consecutive months prior to the time that the study was conducted.
- Children had to be under the age of 5 years and had to have had a first-time diagnosis of moderate or severe underweight made at Letlhakeng Child Welfare Clinic between 1 October 2011 and 1 April 2012.

The inclusion criteria for the controls were:

- The child had to have been residing in Kweneng West District for at least three consecutive months prior to the time that the study was conducted
- Children had to be under the age of 5 years and had to have never been diagnosed as suffering from moderate or severe underweight from their birth up to the time that the study was conducted.
- A control had to have attended all the required monthly child welfare clinic visits from the time of his or her birth up to the time that the study was conducted.
- A control had to be of the same age or not more than two weeks older or younger than the case.

- A control had to have been residing in the same village as the case and had to have attended the same child welfare clinic as the case for at least three consecutive months prior to the time that the study was conducted.

- All eligible controls identified from the child welfare clinic registers and logbook monthly reports were selected to participate in the study.

3.4.2 Data collection

3.4.2.1 *Data-collection approach and method*

Data sources included:

- Nutrition surveillance logbook monthly reports, which were available from the child welfare clinics.

- The child welfare clinic registers, which were available from the child welfare clinics.

- Child welfare clinic cards, with which all children attending the child welfare clinics are provided; and

- Face-to-face structured interviews conducted with the parents of the children selected to participate in the study.

3.4.2.2 *Development and testing of the data-collection instrument*

Data were collected using two approaches, namely a review of records and a survey.

- **Review of records**

The documentary sources consulted included the child welfare clinic registers, the nutrition surveillance logbook monthly reports, and the child welfare clinic cards.

- **Survey**

The data-collection instrument was a self-developed standardised questionnaire including closed questions and consisting of three sections. Two weeks prior to the fieldwork; the study methodology was piloted at Khudumelapye Child Welfare Clinic in

Kweneng West. Khudumelapye Child Welfare Clinic has similar characteristics to Letlhakeng Child Welfare Clinic. Elements of the research proposal that were pre-tested included the study variables, the availability of the respondents, the acceptance of the study by the participants, the time factor, the adequacy of resources, the relevance of the questions, the sequence and comprehensibility of the questions, and the accuracy of the respondents' interpretation of the questions. Pilot data have not been used in the main study. The pilot study helped in assessing the acceptance of the study by the participants, the time factor, the adequacy of resources, the relevance of the questions, the sequence and comprehensibility of the questions, and the accuracy of the respondents' interpretation of the questions.

3.4.2.3 *Characteristics of the data-collection instrument*

The variables used in the development of the instrument were mainly obtained from the review of the literature of previous studies on child malnutrition. Those are the factors that have been investigated by others researchers in others settings.

The data-collection instrument included only closed questions and consisted of the following three sections:

- The first section included questions with regard to the child's health history (place of delivery, gender, diagnosis, date of diagnosis, birth weight, breastfeeding history, number of meals taken per 24 hours, immunisation status, child illness history, and Vitamin A supplementation status).
- The second section included questions with regard to the parent's social, economic and health characteristics (the parent's identity towards the child , the parent's age, the parent's education level, the parent's knowledge of causes of malnutrition, the parent's knowledge of methods of prevention of malnutrition, the parent's employment status, the parent's marital status, questions investigating possible alcohol abuse, the mother's antenatal care attendance history, and the mother's HIV status during pregnancy).
- The third section included questions with regard to characteristics of the household (the number of under-five children in the household, and the size of the household).

3.4.2.4 Data-collection process

Once cases and controls had been identified from the nutrition surveillance logbook monthly reports, their names, the names of their parents, and their home addresses were retrieved from the child welfare clinic registers. After that, the researcher conducted home visits to meet the parents for face-to-face interviews. Before the interview, the researcher introduced himself, explained the purpose of the study, and sought informed consent from the participants. The interview was conducted only after consent had been obtained from the parent. During the home visits, the child welfare clinic cards were consulted for both cases and controls, for the purpose of collecting more information about the health status of the mothers and the children. However, no anthropometric measurements were taken from the participant children. If a parent was absent from his or her home during the first survey visit, a second home visit was scheduled for a face-to-face interview, to maximise the number of participants. During the interviews, the researcher used one interpreter who was fluent in English and the local languages spoken by the residents of Kweneng West District, namely Setswana and Sekgalakgadi. Out of 39 eligible cases and 77 eligible controls originally identified to participate in the study, 1 case declined to be enrolled, another one had relocated to another district at the time of data collection. One control as well had already left the district at the time of data collection.

3.4.2.5 Data handling

Questionnaires were numbered using a coding method, that is, the name of the health facility and the number on the child's child welfare clinic card. The data were filed and kept in a lockable trunk under supervision of the researcher.

3.4.2.6 Sorting and quality-control measures

After interviewing the parents, the researcher performed a manual sorting of data and the following basic procedures:

- Data were coded.
- Inconsistencies in data in the questionnaire were checked for, and if found, were queried with the parents.

- Any missing data were documented.

Summary tables and frequency tables, as well as a visual representation of the appropriate variables, were used.

3.4.2.7 *Ethical considerations related to the data collection*

The researcher obtained informed consent from the parents by explaining the purpose of the study. There were parents that required special attention, namely elderly parents. Confidentiality was assured to all informants, and their anonymity was guaranteed as no name or identification of the parent or study participant child was collected during the interview. All the collected data were anonymous, and investigators made a firm undertaking not to identify participants in any published work that might emanate from the study.

3.4.3 Data analysis

In this study, a statistician used the SPSS (Version 13) and STATA (Version 11) for data analysis. P-values of ≤ 0.05 were considered significant. Descriptive and inferential statistics were used to achieve the study objectives. Summary tables, frequency tables, cross-tabulations, and visual representations of the appropriate variables were used. Summary statistics appropriate for case-control studies (crude and adjusted odds ratios with 95% confidence intervals) were used to summarise the principal study findings. Univariate and multivariate conditional (fixed-effect) logistic regression were used to investigate the predictors or risk factors for underweight.

3.5 CONCLUSION

Chapter 3 discussed the research paradigm, design and methodology that guided the study. The following chapter presents the main research findings.

CHAPTER 4

PRESENTATION, ANALYSIS AND DESCRIPTION OF THE RESEARCH FINDINGS

4.1   INTRODUCTION

The focus of this chapter is the presentation and description of the findings of the study.

4.2   DATA MANAGEMENT AND ANALYSIS

Data were collected using a combination of a review of records (child welfare clinic registers and under-five child welfare clinic cards) and structured interviews conducted with the parents. The following basic procedures were carried out before the data were analysed:

- Data were coded.
- Inconsistencies in the data in the questionnaire were checked for, and if found, were queried with the interviewer.
- Any missing data were documented.

A statistician analysed the data that were captured from the 37 cases and the 76 controls using the SPSS (Version 13) and STATA (Version 11) computer software.

4.3   RESEARCH RESULTS

This section presents a summary of the findings of the study. The results are presented both in descriptive and analytical form, in frequencies, percentages, graphs, figures, tables, and the requisite statistics. The purpose of this study was to identify and determine the risk factors for the condition of underweight among children under the age of 5 years in Kweneng West District in the Republic of Botswana. The objective was to ascertain to what extent the following factors were associated with the condition of underweight among under-five children in Kweneng West:

- **Demographic factors:** the age of the parent at the time of the diagnosis of underweight for the case or the corresponding date for the control, and the gender of the study participant child.
- **Socio-economic factors:** the level of education of the parent, the size of the household, the parent's knowledge of causes of malnutrition, the parent's knowledge of methods of prevention of malnutrition, the number of meals taken by the child per day, breastfeeding practices, the parent's employment status , the parent's marital status, the number of under-five children in the household, alcohol abuse by the parent, the parent's identity towards the child
- **Health-related factors:** antenatal care attendance, the HIV status of the mother during pregnancy, the child's birth weight, immunisation status, child illness, Vitamin A supplementation, and the child's place of delivery.

4.3.1 Demographic characteristics of the cases and the controls

A total of 113 respondents (N=113) were recruited in the study, with a total of 33% cases with underweight (n=37) and 67% controls with no underweight (n=76). There were a total of 54 (48%) females in the study, of which 61% were among the cases and 39% were among the controls. The subjects were of similar age distribution, approximately normal, with a mean of 30 (Standard Deviation 14). (See Figure 4.1.)

Table 4.1   Demographic characteristics of the cases and controls

Variable	All	Cases	Controls
N	113	37 (33%)	76 (67%)
Female (N, %)	54 (48%)	33 (61%)	21 (39%)
Age (months)			
Mean (SD)	30 (14)	30 (13)	30 (14)
Median (IQR)	30 (19-42)	30 (19-42)	30 (18-42)
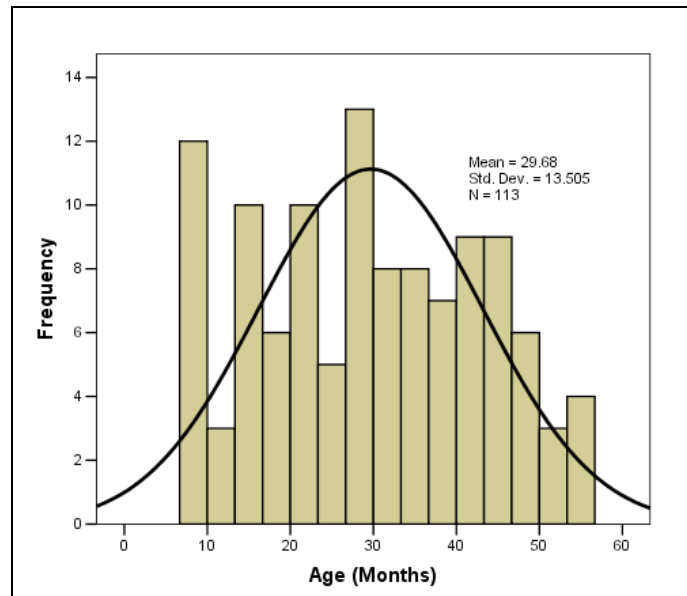
Figure 4.1   Distribution of the age of the cases and controls

4.3.2 Child characteristics and risk factors for underweight

Several child characteristics were analysed using univariate analysis and multivariate conditional (fixed-effect) logistic regression analysis. Table 4.2 shows the characteristics of the cases and controls participants. At univariate analysis, low birth weight [odds ratio (OR) =13.16, 95% confidence interval (CI) 2.96-58.45)], small number of daily meals taken by the child (OR=13.38, 95% CI 3.07-58.38), child illness (OR=20.95, 95% CI 7.55-58.10), and inadequate Vitamin A supplementation (OR=7.42, 95% CI 1.49-37.10) were significantly associated with underweight (p<0.05). After adjusting for low birth weight and gender, only inadequate Vitamin A supplementation (Adjusted OR=13.27, 95% CI 1.94-90.46), small number of daily meals taken by the child (Adjusted OR=19.04, 95% CI 3.24-112.13), and low birth weight (Adjusted OR=12.34, 95% CI 2.76-55.02) remained significantly associated with being underweight (p<0.05). The adjustment was not done for child illness because of inconsistent constraints. Figure 4.2 shows a comparison of the child characteristics for selected predictors of underweight.

Table 4.2 Child characteristics, with crude and adjusted odds ratios and 95%confidence intervals (n=37 cases, n=76 controls)

Variable	Cases	Controls	Crude OR (95% CI)	Adjusted OR (95% CI) [a]
Gender				
Female	21	33	0.57 (0.25-1.29)	0.68 (0.27-1.76)
Male	16	43	1	1
Born outside institution				
Yes	1	3	1.37 (0.14-13.21)	0.68 (0.06-1.75)
No	36	73	1	1
Low birth weight				
Yes	14	3	13.16 (2.96-58.45)*	12.34 (2.76-55.02)*
No	23	73	1	1
Not breastfed in the first six months				
Yes	8	15	1.05 (0.37-2.96)	1.48 (0.39-5.64)
No	29	61	1	1
Small number of daily meals taken				
Yes	34	40	13.38 (3.07-58.38)*	19.04 (3.24-112.13)*
No	3	36	1	1
Immunisation status not up to date				
Yes	6	6	6.75 (0.77-59.18)	8.13 (0.75-87.82)
No	31	70	1	1
Child illness				
Yes	30	13	20.95 (7.55-58.10)*	- [k]
No	7	63	1	
Inadequate Vitamin A supplementation				
Yes	6	2	7.42 (1.49-37.10)*	13.27 (1.94-90.46)*
No	31	74	1	1
Child raised by a guardian				
Yes	12	18	1.78 (0.67-4.74)	5.67 (1.30-24.73)*
No	25	58	1	1

* = a significant association

[a] = Adjusted for low birth weight and gender, unless otherwise specified

[k] = No adjustment done because of inconsistent constraints

Figure 4.2   A comparison of child characteristics for selected significant predictors of underweight

4.3.3 Parent characteristics and risk factors for underweight

Table 4.3 shows the characteristics of the parents of the cases and controls, with odds ratios from univariate analysis and multivariate conditional (fixed-effect) logistic regression analysis. There were more cases that had guardians as parents (32%), as compared to the controls (24%). Having a guardian who is not the child's mother was associated with higher odds of being underweight, after adjusting for low birth weight and gender (Adjusted OR=5.67, 95% CI 1.30-24.73). The age of the parent, the parent's education level, parent's marital status, alcohol abuse by the parent, and the mother's HIV status during pregnancy were not significant predictors of underweight (p>0.05). Lack of knowledge of causes of malnutrition by the parent (Crude OR=3.56, 95% 1.27-9.95) and lack of knowledge of methods of prevention of child malnutrition (Crude OR=5.80, 95% CI 1.95-17.19) were significant predictors of underweight at univariate analysis. After adjusting for parent's level of education, lack of knowledge of methods of prevention of child malnutrition was still a significant predictor of underweight (Adjusted OR=4.71 95% CI 1.41-15.82). After adjustment was made for low birth weight and gender, it was found that the children of unemployed parents were 50.3 times more likely to be underweight. Figure 4.3 shows a comparison of parent characteristics for selected significant predictors of underweight.
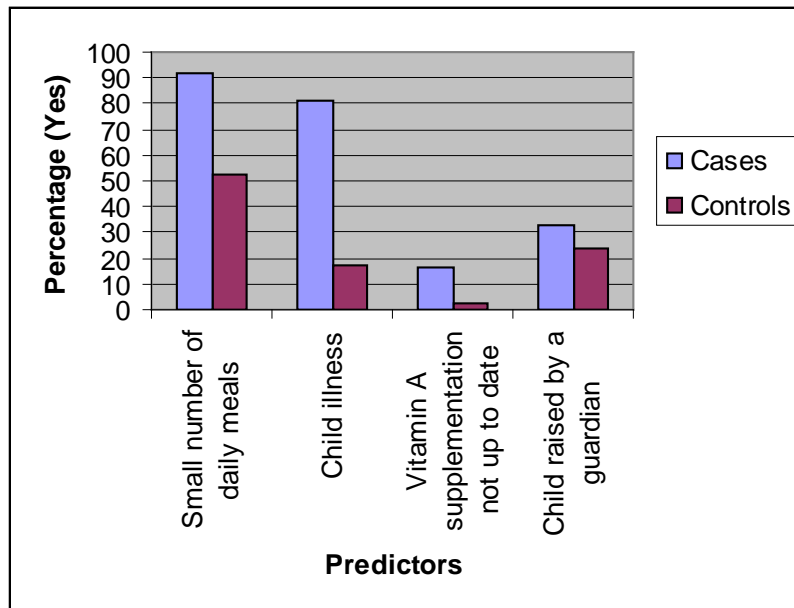
Table 4.3   Parent characteristics, with crude and adjusted odds ratios and 95% confidence intervals (n=37 cases, n=76 controls)

Variable	Cases	Controls	Crude OR (95% CI)	Adjusted OR (95% CI)[a]
Younger age of the parent				
Yes	5	4	2.62 (0.70-9.77)	2.63 (0.55-12.53)
No	32	72	1	1
Parent's level of education				
None	7	9	1.61 (0.55-4.67)	2.47 (0.64-9.52)
Primary	10	22	0.99 (0.42-2.35)	1.58 (0.56-4.50)
Secondary and above	20	45	1	1
Lack of knowledge of causes of malnutrition				
Yes	23	31	3.56 (1.27-9.95)*	2.49 (0.76-8.07) [b]
No	14	45	1	1
Lack of knowledge of methods of prevention of malnutrition				
Yes	29	33	5.80 (1.95-17.19)*	4.71 (1.41-15.82)* [b]
No	8	43	1	1
Employment status of the parent				
Unemployed	24	6	38.68 (5.20-38.7)*	50.3 (4.86-52.1)*[b]
Employed	13	70	1	
Marital status of the parent (Living alone)				
Yes	21	46	1.24 (0.54-2.80)	1.49 (0.54-4.04)
No	16	30	1	1
Alcohol abuse by the parent				
Yes	2	4	1.22 (0.22-6.69)	1.76 (0.28-11.17)
No	35	72	1	1
Lack of ANC attendance by the mother				
Yes	0	0	- [c]	- [c]
No	37	76	-	-
Mother HIV-positive during pregnancy				
Yes	8	16	0.96 (0.34-2.64)	1.27 (0.35-4.52)
No	29	60	1	1

* = a significant association

[a] = Adjusted for low birth weight and gender, unless otherwise specified

[b] = Knowledge questions adjusted for education level, gender, and low birth weight

[c] = No adjustment done because of inconsistent constraints
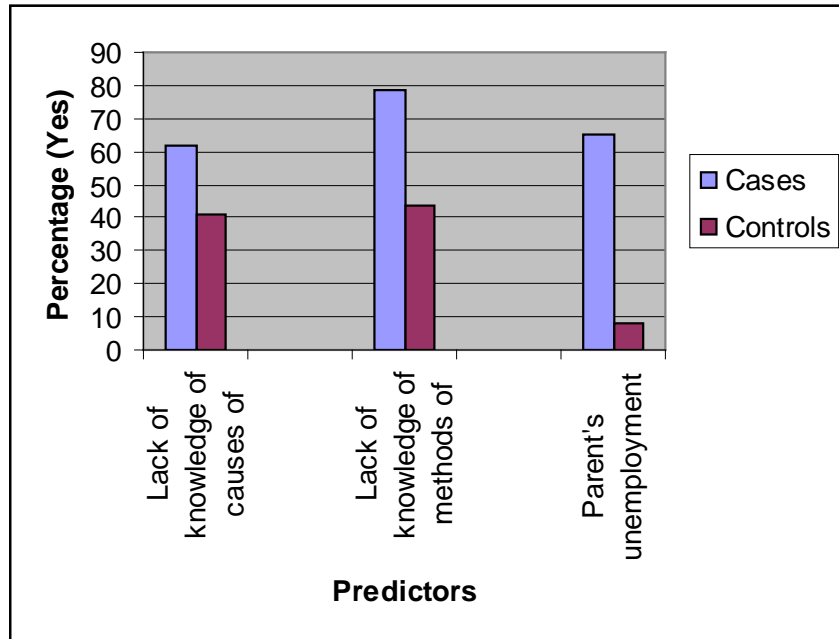
Figure 4.3   A comparison of parent characteristics for selected predictors of underweight

4.3.4 Household characteristics and risk factors for underweight

Table 4.4 shows the characteristics of the households among cases and controls. Having more than three under-five children and having a household of more than four members were not associated with any increased risk of being underweight.

Table 4.4   Household characteristics, with crude and adjusted odds ratios and 95% confidence intervals (n=37 cases, n=76 controls)

Variable	Cases	Controls	Crude OR (95%CI)	Adjusted OR (95%CI) [a]
Large number of under-fives in the house (>3)				
Yes	2	6	0.76 (0.12-4.65)	1.05 (0.11-9.68)
No	35	70	1	1
Large household size (>4)				
Yes	34	66	1.73 (0.44-6.76)	1.28 (0.31-5.31)
No	3	10	1	1

[a] = Adjusted for low birth weight and gender, unless otherwise specified

4.3.5 Demographic risk factors

The child's gender (Crude OR=0.57, 95% CI 0.25-1.29; Adjusted OR=0.68, 95% CI 0.27-1.76) and the age of the parent (Crude OR=2.62, 95% CI 0.70-9.77; Adjusted OR=2.63, 95% CI 0.70-9.77) did not have a significant influence on underweight.

4.3.6 Socio-economic risk factors

Several socio-economic factors were analysed using univariate and multivariate analysis. At univariate analysis, small number of daily meals (Crude OR=13.38, 95% CI 3.07-58.38), lack of knowledge of causes of malnutrition (Crude OR=3.56, 95% CI 1.27-9.95), lack of knowledge of methods of prevention of malnutrition (Crude OR=5.86, 95% CI 1.95-17.19), and parent's unemployment (Crude OR=38.68, 95% CI 5.20-287) were significantly associated with underweight (p<0.05). After adjusting for low birth weight, gender, and level of education for the lack of knowledge of causes of and methods of prevention of malnutrition, only small number of daily meals (Adjusted OR=19.04, 95% CI 3.24-112.13), lack of knowledge of methods of prevention of malnutrition (Adjusted OR=4.71, 95% CI 1.41-15.82), parent's unemployment (Adjusted OR=50.3, 95% CI 4.86-52.1), and child raised by a guardian (Adjusted OR=5.67, 95% CI 1.30-24.73) remained significantly associated with being underweight (p<0.05).

4.3.7 Health-related risk factors

Health-related factors were analysed using univariate and multivariate analysis. At univariate analysis, low birth weight (Crude OR=13.16, 95% CI 2.96-58.45), child illness (Crude OR=20.95, 95% CI 7.55-58.10), and Vitamin A supplementation not up to date (Crude OR=7.42, 95% CI 1.49-37.10) were significantly associated with underweight (p<0.05). After adjusting for low birth weight and gender, low birth weight (Adjusted OR=12.34, 95% CI 2.76-55.02) and Vitamin A supplementation not up to date (Adjusted OR=13.27, 95% CI 1.94-90.46) remained significantly associated with underweight (p<0.05). The adjustment was not done for child illness because of inconsistent constraints.

4.4　DISCUSSION

Following placement of the data in regression models, the factors that were found to be significantly associated with underweight were small number of daily meals taken by the child, lack of knowledge of methods of prevention of malnutrition by the parent, parent's unemployment, low birth weight, Vitamin A supplementation not up to date, child illness, and child raised by a guardian. Contrary to the findings of a study conducted by Mahgoub et al in 2006 to evaluate and report on the factors influencing malnutrition among children under 3 years of age in Botswana, which showed that underweight was significantly associated with the male gender, single-parent status, lower parent's level of education, and lack of breastfeeding, the current study did not reveal a significant association between the condition of underweight and these factors.

A case-control study conducted by Shargi et al (2011) to determine the risk factors for protein-energy malnutrition in children under the age of 6 years in Iran showed that malnutrition was significantly associated with the female gender. This observation is not confirmed by the findings of this study. The differences observed across studies in regard to the relationship between gender and the child's nutritional status may indicate that gender is not a biological factor in malnutrition, but that there may be other gender-related social or cultural factors that affect a child's growth.

Consistent with the results from a study conducted by Nnyepi et al (2010), whose purpose it was to assess child nutrition and the household economic situation in the context of rising food prices in Mabutsane and Bobirwa (Botswana), this study showed that the risk of malnutrition in children was lower in children with a birth weight greater than 2,500 grams and that breastfeeding exposure did not influence the risk of malnutrition. However, the findings of the current study contradict those from Nnyepi et al's study, which revealed that the risk of malnutrition was lower in children cared for by a grandmother (a guardian) and children from smaller households and that the number of meals the child took in a day did not influence the risk of malnutrition. The difference between the current study and Nnyepi et al's study, which could explain the discrepancies in the results, resides in the fact that Nnyepi et al applied a cross-sectional study design including a large sample size of 742 households and 1,003 children. Multivariate analysis in this study showed that children who are raised by guardians (father, stepparent, grandparent, brother, sister, uncle, aunt, cousin, or other

relative besides the biological mother) had a greater risk of developing the condition of underweight than children raised by their biological mothers. It also showed that a small number of meals taken by the child in a day was significantly associated with the occurrence of underweight, but that the size of the household did not influence the risk of child malnutrition.

Contrary to the results yielded by a case-control study conducted by Amsalu and Tigabu (2006) to identify and determine the risk factors for severe acute malnutrition in children under the age of 5 in Ethiopia, this study did not reveal a significant association between the parent's level of education, the size of the household, and breastfeeding practices with underweight. However, this study is consistent with the above-mentioned study in the finding that the parent's lack of knowledge of the recommended infant and child feeding practices was significantly associated with the occurrence of child malnutrition.

The results from this study are consistent with those from the study by Rayhan and Khan (2006) on factors causing malnutrition among under-five children in Bangladesh that showed that low birth weight was positively associated with child underweight. However, the relationship between the parent's level of education and child underweight could not be established by our study, as it was in the case of Rayhan and Khan's study.

This study revealed a significant association between child illness and child underweight, consistent with the findings of a study by Turyashemererwa et al (2009), who assessed the prevalence of malnutrition and the factors influencing the nutritional status of children below 5 years of age in a peri-urban environment in Kabarole District in western Uganda. The current study did not detect a relationship between the size of the household and the condition of child underweight.

One difference in a study conducted by Hien and Hoa (2009) on the nutritional status and determinants of malnutrition in children less than 3 years of age in Ngheam, Vietnam is that their study revealed a significant association between the number of under-five children in the family and large household size and the condition of child underweight. In contrast with the researcher's expectations, this study did not reveal a significant association between the mother's HIV status during pregnancy and the

child's nutritional status after birth. This could be explained by the improvement in the management of HIV-positive mothers through a successful prevention of mother-to-child transmission of HIV (PMTCT) programme, which is preventing children from acquiring HIV infection during pregnancy, labour, delivery, and the postpartum period.

Alcohol abuse which was assessed by asking the parent to describe his or her typical occasional, daily and weekly alcohol drinking pattern, quantified in terms of number of drinks per occasion, per day, or per week (the following are counted as a drink: 360 ml of regular beer, 150 ml of wine, 45 ml ounces of 80-proof distilled spirits) was not found to be associated with child underweight. The explanation could be that due to social desirability, some of the respondents might have not truthfully reported their alcohol consumption patterns, therefore providing wrong information to the researcher. This study did not show a significant association between the child's immunisation status and nutritional status. This could be explained by the high immunisation coverage observed among cases (84%) as well as controls (92%). However, a study conducted by Nzala et al (2011) to determine the association of demographic, cultural and environmental factors with frequency and severity of malnutrition among children less than 5 years of age in Zambia showed that a child immunisation status that was not up to date was associated with underweight.

4.5   CONCLUSION

This chapter presented the research results and discussed the research findings in relation to the literature review and research objective. Among the factors that were investigated, socio-economic factors (namely parent's unemployment, small number of daily meals taken by the child, lack of knowledge of methods of prevention of child malnutrition by the parent, and child raised by a guardian) and health-related factors (namely low birth weight, Vitamin A supplementation not up to date, and child illness) were found to be significantly associated with underweight. The following chapter provides possible explanations about the relationship between the identified risk factors and the condition of underweight. It concludes the research in relation to the problem statement, indicates limitations of the research, and makes recommendations for the relevant decision makers and further studies.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1   INTRODUCTION

This chapter concludes the study, discusses its limitations, and provides recommendations for decision makers and further studies.

5.2   RESEARCH DESIGN AND METHOD

This research was a case-control study. The cases were 37 underweight children under the age of 5 and the controls were 76 children of good nutritional status recruited among under-five children attending Letlhakeng Child Welfare Clinic.

5.3   SUMMARY AND INTERPRETATION OF THE RESEARCH FINDINGS

The purpose of this study was to identify and determine the risk factors for underweight among children less than 5 years of age in Kweneng West District of Botswana. Following placement of the data in regression models, the relevant factors significantly associated with underweight were small number of daily meals taken by the child, lack of knowledge of methods of prevention of malnutrition by the parent, parent's unemployment, low birth weight, Vitamin A supplementation not up to date, child illness, and child raised by a guardian. The findings from this study indicate that child malnutrition in Kweneng West is multifaceted and requires multi-sectoral, multidisciplinary and multi-level action to alleviate it. The factors influencing malnutrition among children under 5 years of age in Kweneng West District can be classified as follows:

- Basic causes: parent's unemployment.
- Underlying causes: lack of knowledge of infant and child feeding practices by the parent, inadequate childcare practices, inadequate Vitamin A supplementation, and low birth weight.

- Immediate causes: inadequate dietary intake, and child illness.

5.3.1 Parent's unemployment

Underweight children were found to be 50.3 (Adjusted 0R=50.3, 95% CI 4.83-52.1) times more likely to have unemployed parents as compared to well-nourished children. Kweneng West District has one of the highest unemployment rates in the country (Botswana Multi-Sectoral Committee for Poverty Reduction 2007:6). It was estimated in 2007 that 39% of the working-age population was unemployed (Botswana Multi-Sectoral Committee for Poverty Reduction 2007:6). The relationship between unemployment and malnutrition could be explained by the fact that unemployment (a basic cause of malnutrition) can lead to poverty, which can, in turn, lead to household food insecurity and insufficient access to food (underlying causes of malnutrition). Insufficient access to food can lead to inadequate dietary intake by the child (an immediate cause of malnutrition), which can finally lead to child malnutrition. The high unemployment rate could also explain the high prevalence rate of underweight among children below the age of 5 observed for many years in the district.

5.3.2 Low birth weight

Underweight children were found to be 12.34 (Adjusted OR=12.34, 95% CI 2.76-55.02) times more likely to have a birth weight of less than 2,500 grams as compared to well nourished children. This could be due to the fact that children born with a low birth weight might from the time of their birth lack certain nutrients that are essential for their future normal growth and development. But it could also suggest that children born with low birth weight might take a longer period of time to reach the normal weight for their age.

5.3.3 Inadequate dietary intake (small number of daily meals taken by the child)

Underweight children were found to be 19.04 (Adjusted OR=19.04, 95% CI 3.24-112.13) times more likely to have a small number of daily meals as compared to well-nourished children. Turyashemererwa et al (2009: 983) report that the number of meals a child takes has an effect on his or her nutritional status, since it is related to nutrient intake. The greater the frequency of feeding, the higher the chances of meeting the

recommended daily nutrient intake. The daily nutrient intake of the current study participant children could not be assessed because of logistical constraints such as the lack of laboratory equipment able to quantitatively and qualitatively measure nutrient intake. The researcher relied on figures for the number of daily meals taken by the child to make inferences about the adequacy of nutrient intake.

5.3.4 Child illness

Underweight children were found to be 20.95 (Crude OR=20.95, 95% CI 7.55-58.10) times more likely to have presented with at least one episode of child illness two weeks prior to the time of the diagnosis of underweight as compared to well-nourished children. Turyashemererwa et al (2009: 982) found in their study that child illnesses (diarrhoea, vomiting, pneumonia, ear diseases, disability, and febrile diseases) were significantly associated with child stunting (p=0.004). They explain that the relationship between malnutrition and child illness is twofold. Malnutrition makes a child vulnerable to disease, and, in turn, the child loses appetite because of illness, which can lead to insufficient dietary intake and malnutrition.

5.3.5 Inadequate Vitamin A supplementation (Vitamin A supplementation not up to date)

Underweight children were found to be 13.27 (Adjusted OR=13.27, 95% CI 1.94-90.46) times more likely to have their Vitamin A supplementation not up to date as compared to well-nourished children. According to the Department of Public Health of Botswana's Ministry of Health and UNICEF (2008:16), Vitamin A is given to children under the age of 5 and lactating mothers in all health facilities. It is given as both a preventive and a therapeutic measure. Vitamin A is important for good vision, protecting the body against infection, and ensuring adequate growth and development. There are two schedules of Vitamin A supplementation, namely the universal schedule, and the schedule for the sick child.

Table 5.1   Universal Vitamin A supplementation schedule

Age (months/ Timing)	0-6 months (if not breast-fed)	9	18	24	30	36	42	48	54	60	Mothers at time of delivery or within 6 to 8 weeks after delivery
Dose (IU)	50,000	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000

Fuchs, Ausayakhun, Ruckphaopunt, Tansuhaj and Suskind (1994: 295) report that the role of Vitamin A deficiency in a child's growth is difficult to define because of the usual co-existence of macronutrient and/or micronutrient deficiencies, which themselves are established causes of growth failure. Malnutrition is postulated to be the consequence of recurrent infection.

5.3.6 Child raised by a guardian

Underweight children were found to be 5.67 (Adjusted OR=5.67, 95% CI 1.30-24.73) times more likely to have a guardian as a parent as compared to well-nourished children. Guardians include fathers, stepparents, grandparents, brothers, sisters, uncles, aunts, cousins, or other relatives besides the biological mother. Some of the study participant children were found to be being raised by elderly grandparents who did not have a regular source of income and did not have sufficient knowledge of recommended infant and young child feeding practices. Such children might be at risk of inadequate dietary intake, child illnesses, and malnutrition.

5.3.7 Lack of knowledge of methods of prevention of child malnutrition by parents

Underweight children were found to be 4.71 (Adjusted OR=4.71, 95% CI 1.41-15.82) times more likely to have parents who do not have knowledge of methods of prevention of child malnutrition as compared to well-nourished children. The lack of knowledge of the recommended infant and child feeding practices by some of the parents could

suggest that there are limitations in the quality of health education and promotion activities conducted at child welfare clinics.

5.4   CONTRIBUTION OF THE STUDY

The identification and determination of the risk factors for the condition of underweight among under-five children in Kweneng West District may help with the formulation of appropriate policies and intervention strategies aimed at addressing these factors and improving the nutritional status of the under-five population in the district.

5.5   LIMITATIONS OF THE STUDY

Although it has provided important information on the factors that could influence malnutrition among children less than 5 years of age in the Kweneng West District of Botswana, this study has a number of limitations. Firstly, being a case-control study, it cannot establish the correct temporal relationship between exposure and disease. The study did not assess all the potential factors that could explain the differences between the findings of this study and those of other studies conducted on the same topic but in different settings. The study relied on participants' self-reported data, which is prone to recall bias and social desirability bias. In a case-control study, recall bias is a common form of information bias, and social desirability bias occurs when the participants respond to particular questions by providing answers that they consider to be the most socially desirable or least stigmatising, rather than answering with complete honesty (Joubert & Ehrlich 2007:163). Some eligible participants were not available to participate in the study. This was the case with eligible participants who had relocated to other districts or had emigrated at the time that the study was conducted and whose new contact particulars were unknown to the researcher. A large sample of participants could not be obtained because of time constraints. This could explain the wide confidence intervals observed for some of the variables, such as "small number of daily meals taken" (Adjusted OR=19.04, 95% CI 3.24-112.13). The research method did not include a qualitative component because of time constraints and the language barrier. The researcher was not fluent in the local languages spoken by the residents of Kweneng West and had to rely on interpreters. The inclusion of a qualitative component could have strengthened the study by providing reasons why some things are not done the way they should be done.

5.6   RECOMMENDATIONS

In light of the findings of this study, the following recommendations are offered:

- Similar research should be conducted on a large sample of under-five children to detect the effects of some of the factors that could not be observed by the current study.
- The government of Botswana and Kweneng West local authorities should provide more job opportunities in the district to reduce the working-age population unemployment rate, which is driving child malnutrition in the district.
- Health education should be reinforced at child welfare clinics, health facilities and, at community level to improve parents' knowledge of the recommended infant and child feeding practices.
- The Kweneng West District Health Management Team should strengthen the implementation of the Accelerated Child Survival and Development (ACSD) strategy at all levels of health service delivery in the district. One of the recommendations of the above-mentioned strategy is the introduction of integrated and accelerated Vitamin A supplementation by all health facilities and in outreach services twice a year for an entire month, at the beginning of the year and six months later (Botswana Ministry of Health 2009:45). This should be accompanied by sensitisation of mothers, fathers, and other caregivers to the benefits of Vitamin A supplementation (Botswana Ministry of Health 2009:45).
- The Botswana government should ensure continuous provision of supplementary feeding to all children under 5 years of age, as decided by the Vulnerable Group Feeding Programme (VGFP) in 1988 (Botswana Ministry of Health & UNICEF 2009:12). The VGFP was introduced by the government of Botswana in 1988 to assist nutritionally at-risk members of the population and to improve declining household food security during drought. The food commodities given to under-five children attending child welfare clinics every month consist of fortified blended food, oil, beans, and dried skimmed milk (Botswana Ministry of Health & UNICEF 2009:12). However, in the course of this study, investigators were informed that interruptions in the provision of those commodities were observed from time to time. Such a situation places particularly children from low-income families at risk of inadequate dietary intake during the months where they are not supplied with supplementary food at child welfare clinics.

5.7   CONCLUSIONS

The results of this study indicate that child malnutrition in Kweneng West District is multifaceted and requires multi-sectoral, multidisciplinary and multi-level action to alleviate it. This study has discovered that there are basic, underlying and immediate causes that act at various levels of society and which contribute to the occurrence of child malnutrition in Kweneng West District. There is a need for urgent interventions to prevent and mitigate child malnutrition in the district by addressing all the identified risk factors.

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Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE

HSHDC 53/2011

Date of meeting: 1 December 2011   Student No: 4512-774-3

Project Title: Factors influencing malnutrition among children under five years of age in Kweneng West District, Botswana.

Researcher: Kadima Yankinda Etienne

Degree: Masters in Public Health   Code: DIS4986

Supervisor: Dr ES Seloilwe
Qualification: D Litt et Phil
Joint Supervisor:

DECISION OF COMMITTEE

Approved √   **Conditionally Approved** ☐

Potgieter
Prof E Potgieter
CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE

Bezuidenhout
Prof MC Bezuidenhout
ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

CONSENT FORM

I fully understand the explanation given by the researcher to me on the area of his/her investigation. I also understand that the aim of his/her research is to investigate the factors influencing malnutrition among children under five years of age in Kweneng West district. The findings from this study could contribute to the development of policies targeting the prevention of malnutrition in under five children. The researcher regards the proposed study as no risks to the participants and describes the level of risk low. There will be no incentives for the participants and the participation is voluntary. I am fully aware that the information I will provide will remain confidential and that my personal details will not be made known. If I agree to respond to the questions contained in the questionnaire, I should do it as fully and objectively as I can by ticking the appropriate box. I am free to withdraw from this study at any time I so wish.

I therefore:

A) Agree to take part in the study

Signature…………………………………   Date:…………………………

B) Disagree to take part in the study

Signature……………………………….   Date:………………………….

FACTORS INFLUENCING MALNUTRITION AMONG CHILDREN UNDER THE AGE OF FIVE YEARS IN KWENENG WEST DISTRICT
(REPUBLIC OF BOTSWANA)

QUESTIONNAIRE

I. HEALTH FACILITY NAME…………….…………………….…………

II. CHILD INFORMATION

1. Birth registration number……………….…………

2. Child welfare clinic card number…………………….

3. Date of birth…………………………………………

4. Age (in months)…………………………………..

5. Place of birth…………………………………….

6. Sex ………………………………………………………………………………………………………..........
   - Male = 1
   - Female = 2

7. Birth weight………………………………………………………………………………………………………
   - Low birth weight (< 2500 grams) = 1
   - Normal birth weight (>or = 2500 grams) = 2

8. Diagnosis …………………………………………………………………………………………………..
   Moderate underweight = 1   Severe underweight = 2
   Control = 3

9. Date of diagnosis……………………………………….

10. Has the child ever been breastfed during the first 6 months after birth?...
    Yes (ever breastfed) = 1   No (never breastfed) = 2   Not sure = 3

11. How many times does the child breastfeed, Milk formula feed, eat solid, semi solid or soft food other than water per 24 hours?..
    Adequate = 1 (at least 8 times for infants 0-6 months old; at least 5 times for infants and children 7-59 months old)
    Small = 2 (<8times for infants 0-6 months old; < 5 times for infants and children 7-59 months old)

12. How was the immunization status by the time of the diagnosis of underweight for case or corresponding date for control?..
    Up to date = 1   Not up to date = 2   Not sure = 3

13. Did the child have one of the following conditions (cough, diarrhoea, vomiting, fever, ear problems or disability) 2 weeks prior to the time of the diagnosis of underweight for the case or the corresponding date for the control?..
    Yes = 1   No=2   Not sure = 3

14. How was the vitamin A supplementation at the time of the diagnosis of underweight for the case or for the corresponding date for the control?..
    Up to date = 1   Not up to date = 2   Not sure = 3

III. MOTHER OR CARETAKER INFORMATION

15. The respondent is the…………………………………………………………………………… ☐
Mother = 1   Caretaker = 2

16. If the caretaker, for how long have you been in charge of the child?……………………………. ☐
(in months)

17. If the caretaker, the mother is…………………………………………………………………… ☐
Alive = 1   Dead = 2   Unknown = 3

18. If the mother is dead, what did she die of?.. ☐
Disease = 1   Accident = 2   Unknown = 3   Not applicable = 4

19. If the caretaker, what is your relationship to the child?... ☐
Father = 1   Stepparent = 2   Grandparent = 3   Brother/sister = 4
Uncle/aunt = 5   Cousin = 6   Other relative = 7   Not related = 8

20. What is your age (in years) at last birthday?.. ☐
Younger age (< 21 years) = 1   old age (> 21 years) = 2   Unknown = 3

21. What is your education level?... ☐
None (never been at school) = 1   Secondary (at least 1 year) = 3
Primary (at least 1 year) = 2   Tertiary (at least 1 year) = 4

22. What causes malnutrition in children?... ☐
Knowledgeable (gives at least one cause) = 1
Not knowledgeable (fails to give at least one cause) = 2

23. How can you prevent malnutrition in children?.. ☐
Knowledgeable (gives at least one preventive measure) = 1
Not knowledgeable (fails to give at least one preventive measure) = 2

24. About the current employment status of the head of your household, which is most appropriate?......... ☐
Unemployed = 1 Sometimes gets temporary jobs = 2   Regular job = 3 Self-employed = 4 Refused
employment = 5

25. What is your current marital status?………………………………………………………… ☐
Living alone (Single + married, living separated + divorced + widowed) = 1
Living together (Married, living together + cohabiting) = 2

26. Do you ever drink alcohol?... ☐
Yes = 1   No = 2

27. If yes to item 26, how often do you have a drink containing alcohol?…………………… ☐
    Once a month or less = 1
    2 to 4 times a month = 2
    2 to 3 times a week = 3
    4 or more times a week = 4
    Daily or almost daily = 5

28. If yes to item 26, how many drinks do you have on a typical day or occasion when you are ☐
drinking?..
    1 or 2 = 1
    3 or 4 = 2
    5 or more = 3

2

29. Did the mother attend at least 3 antenatal care consultations while she was pregnant with the study participant child? ………………………………………………………………………………… ☐
Yes (attended 3 or more antenatal care consultations) = 1
No (did not attend, or attended less than 3 antenatal care consultations) = 2
Not sure = 3

30. Did the mother test for HIV while she was pregnant with the study participant child?................. ☐
Yes = 1   No = 2   Not sure = 3

31. If yes to the previous question, what was the HIV status of the mother while she was pregnant with the study participant child?.. ☐
Positive = 1   Negative = 2   Unknown = 3

IV. HOUSEHOLD INFORMATION

32. How many children under 5 years of age currently live in your household?...................... ☐

33. How many people currently live in your household?... ☐

DATE OF INTERVIEW………………………………………

TIME OF INTERVIEW………………………………………….

INTERVIEWER'S FIRST NAME AND SURNAME………………………….