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# Describe cardio-metabolic diseases and the associated cost in a district hospital in the North West Province

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# DESCRIBE CARDIO–METABOLIC DISEASES AND THE ASSOCIATED COST IN A DISTRICT HOSPITAL IN THE NORTH WEST PROVINCE

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Public Health in the field of Hospital Management

**OCTOBER 2014**

**DECLARATION**

I, Derrick Meriting Moalosi, declare that this research report is my own work. It is being submitted for the degree of Master Public Health in the field of Hospital Management at the University of the Witwatersrand, Johannesburg. It has not been submitted before any degree or for any examination at this or any other University.

_____

Derrick Meriting Moalosi

**DEDICATION**

This work is dedicated to my family, it is true that we do not fall from trees and thus would start with Boorra Moalosi, Boorra Rankapole and all the relatives where the origin of Moalosi's come from, Boorra Phuthi my in-laws for giving me their beautiful daughter, a woman of substance, my mother Ms JM Moalosi my sisters and brothers and lastly but not least to my beautiful wife, and my three sons (Kabelo and his wife Nthabiseng, Redumetse, and Outlwile).

Your support and understanding is highly appreciated.

To all of you I give thanks to you all for the role you played in my studies. Blessed is the hand that gives and thanking you all for having given so much for me, it is not in vain indeed.

**ACKNOWLEDGEMENT**

This work could not have been possible if it was not for the assistance, understanding, motivation and encouragement of the following:

1. North West Department of Health for giving me the opportunity to study, Ngaka Modiri Molema District Management Team under the leadership of Mr. G. Henning, Ms ME Mokhutshwane – Kaudi and Mr. PG Mogapi for your financial and moral support.
2. Gelukspan Hospital employees especially Ms GC Oseile who often acted as CEO in my absence, my office assistants (Ms T Balene, Ms MR Motswana, Mr. K. Masibi and others) for all the arrangements that they had to make sometimes at short notice. Information and admission offices for your understanding and support.
3. My lecturers broadened my horizon on different topics. This would not be complete if i did not mention Dr. D Basu for believing in our ability as hospital CEO's. Your support and dedication has not gone un noticed.
4. My fellow students the cohorts of 2009 for your friendship, openness and sharing common challenges that we experience at work. Thanks guys for sharing your stories.

To all of you I give thanks to you all for the role you played in my studies. May the good Lord bless you All.

**ABSTRACT**

BACKGROUND: Gelukspan District Hospital is situated in the Ngaka Modiri Molema District in the North West Province. The majority of patients admitted in the adult medical wards of this Hospital are due to two conditions namely (a) HIV/ AIDS and (b) Cardio-metabolic diseases. The Hospital regularly analyse data related to the HIV/ AIDS patients for HIV/ AIDS conditional grant. The information related to cardio-metabolic diseases are seldom analysed by the Hospital management, although there is a belief within the Hospital that more than one thirds of the patients admitted in these two wards are due to cardio–metabolic diseases. This study was planned against this background to systematically analyse the routinely collected data from the Hospital information system. The results of the study would hopefully provide the estimation of the prevalence of these diseases at a health facility level and the cost for managing these conditions.

AIM: To describe the profiles of patients admitted of cardio–metabolic diseases in the Gelukspan District Hospital in the North West Province during one year study period (from 01 April 2010 to 31 March 2011).

METHODOLOGY: This was a cross-sectional study based on retrospective review of routinely collected data from the Adult Medical Wards of the Gelukspan District Hospital during the one year study period (1 April 2010 to 31 March 2011). No primary data was collected for this study. The study variables included: the number of subjects with cardio-metabolic diseases among the subjects who were admitted in the Medical wards of the Hospital during one year study period; their profiles and the type and cost of laboratory tests performed for these patients at the time of admission. Permission to conduct the research at the Hospital was obtained from the North West Department of the Health and the University of the Witwatersrand 'Human Research Ethics Committee (Medical) before commencement of the study.

RESULTS: Number of admissions in male and female medical wards for non-communicable diseases was 558. There were almost same number of female (n= 287) and male (271) admissions. The result showed that both males and females suffer equally from cardio-metabolic diseases. The age – group

analysis showed almost a third of the subjects were below 50 years age and another third was above 65 years of age. More than 20% of the population were pensioners representing the age distribution of the study cohort. The majority of the subjects were black (97.8%) and unemployed (98%) representing the demographics of the catchment population. The majority of the women were single (55.4%). There was no significant difference between male and female patients in terms of primary clinical diagnoses. Thirty-nine percent of the males (n=108) and 56% (163) females stayed more than 3 days (the norms of average length of stay for District hospitals. The case fatality rate was 19.5% probably high in a district hospital setting, this implies that probably these patients were not managed properly at the PHC level and or at this The laboratory tests done at the time of admission included random and fasting blood glucose, and creatinine. No $HbA_1C$, lipogram and other renal function tests were done at the time of admission contrary to the norms and guidelines for management of cardio-metabolic diseases. The laboratory test result showed the possibility of significant comorbidity among the patients. Fourteen percent of the subject probably had nephropathy.

CONCLUSION: This was the first study conducted in this Hospital to systematically evaluate management of a particular group of patients. Hopefully, this study would assist the Hospital management to improve the management of patients admitted in this Hospital.

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**DEFINITION OF TERMS**

Cardio–metabolic disorders: Cardio-metabolic disorders represent a cluster of interrelated risk factors—primarily hypertension, elevated fasting glucose, dyslipidemia, abdominal obesity (waist circumference), and elevated triglycerides — that promote the development of atherosclerotic cardiovascular disease and type 2 diabetes.

District Hospital: A level one hospital offering primary health care services.

Rural hospital: A hospital situated within the rural communities, having no municipal infrastructure (waste removal and bulk water supply).

**LIST OF ABBREVIATIONS**

| | |
|---|---|
| CEO | Chief Executive Officer |
| CHC | Community Health Centre |
| CMD | Cardio Metabolic Disease |
| CVD | Cardio-vascular diseases |
| DHS | District Health System |
| DHIS | District Health Information System |
| GP | General Practitioner |
| HOD | Head of the Department |
| NCD | Non-Communicable diseases |
| WHO | World Health Organization |

# CHAPTER 1
# INTRODUCTION

The purpose of this study was to describe the prevalence of cardio–metabolic diseases and associated costs of laboratory tests in a district hospital in the North West Province. This introductory chapter will cover the background to the study, statement of the problem, aims and objectives as well as an outline of subsequent chapters.

## 1.1 BACKGROUND

The burden of non-communicable diseases (NCD) particularly cardio–metabolic diseases are on the increase and responsible for the majority of deaths in the world (WHO, 2008).

The real worldwide burden of these diseases is unknown due to various factors such as lack of reporting, diagnostic facilities, and quality of data. It is estimated that expenditure related to the patterns of patients admitted of these conditions have been escalating exponentially due to increasing cost of diagnosis and management of these conditions (WHO, 2010). The prevalence of cardio – metabolic diseases in Africa is low in comparison to other continents. This could be due to poor reporting, lack of diagnostic facilities and quality of data (WHO, 2008).

It is widely acknowledged that South Africa is faced with a quadruple burden of diseases namely HIV/ AIDS, other communicable diseases, trauma and non communicable diseases including diseases of lifestyle (such as cardio–metabolic diseases) (Bradshaw, Groenewald, Laubscher, et al, 2003). The actual burden of non-communicable diseases (such as cardio-metabolic diseases) at health facility and district level is unknown. There it is difficult to estimate the financial burden of these conditions on a health facility. The Department of Health has been allocating conditional grant for management of HIV/ AIDS patients but no such grant is allocated for management of patients with cardio-metabolic diseases.

## 1.2 JUSTIFICATION OF THIS STUDY

Gelukspan District Hospital is situated in Mafikeng Local Municipality of Ngaka Modiri Molema District in the North West Province. The Hospital has 184 beds (including 96 adult beds for male and female wards). The majority of patients admitted in these two wards are for two conditions (a) HIV/ AIDS and (b) Cardio-metabolic diseases. The Hospital regularly analyse data related to the HIV/ AIDS patients for HIV/ AIDS conditional grant. The information related to cardio-metabolic diseases are seldom analysed by the Hospital management, although there is a belief within the Hospital that more than one thirds of the patients admitted in these two wards are due to cardio–metabolic diseases.

This study is planned against this background to systematically analyse the routinely collected data from the Hospital information system. The results of the study will hopefully provide the estimation of the prevalence of these diseases at a health facility level and the associated cost for managing these conditions. This will further improve on the clinical management by medical officers, allied health professionals and nursing staff including the general management by provincial, district and hospital management of these diseases in a district hospital setting.

## 1.3 RESEARCH QUESTION

What is the prevalence of cardio–metabolic diseases in a district hospital in the North West Province? What are the type and cost of laboratory tests performed for these patients at the time of admission? .

## 1.4 STUDY OBJECTIVES

### 1.4.1 BROAD OBJECTIVE

To describe the prevalence of cardio–metabolic diseases among admitted adult patient in a district hospital in the North West Province during one year study period (from 01 April 2010 to 31 March 2011).

### 1.4.2 SPECIFIC OBJECTIVES

1. To describe the prevalence cardio-metabolic diseases among the patients who were admitted in the Medical wards of the Hospital during one year study period.
2. To determine the profile of these patients: (a) Socio-demographic profile (such as age, gender, ethnicity, and hospital classification), (b) Clinical profile (such as diagnosis, blood pressure).
3. To determine the type and cost of laboratory tests performed for these patients at the time of admission. .

## 1.5 SUBSEQUENT CHAPTERS

So far, the background to the research has been discussed. Then, research question and objectives were defined in this first chapter. A brief outline of following chapters is described below.

**Chapter Two: Literature Review**: The purpose of the literature review is to review pertinent literature and to describe the management of cardio-metabolic diseases in a district hospital setting.

**Chapter Three: Research Methodology:** The chapter describes the research methodology, study design, setting and scope and data management techniques used in this study.

**Chapter Four: Presentation of Results**: This chapter deals with an analysis of the data collected for this study relating to its aims and objectives.

**Chapter Five: Discussion**: The findings from the review of the literature are incorporated in this chapter with the results obtained from the analysis in order to address the aims and objectives of the study.

**Chapter Six: Conclusions and Recommendations:** This constitutes the last chapter of the report and derives conclusions from the research related to the objectives of this study, makes recommendations and advocates areas for future research in the field of management of cardio-metabolic diseases in a district hospital setting.

# CHAPTER 2
# LITERATURE REVIEW

In this chapter, relevant literatures into management of cardio-metabolic diseases in district hospitals are discussed. In addition to published literature, information from various unpublished sources is also reviewed.

## 2.1 CARDIO-METABOLIC DISEASES

Cardio-metabolic disease (CMD) is a disease collective that includes cardiovascular diseases (CVD) (ischaemic heart disease, cerebrovascular accident, congestive heart failure) and type 2 diabetes (Alberti, Zimmet, Shaw, 2006). They are associated with a defined cluster of risk factors that increase an individual's risk for cardiac arrest and diabetes. The International Diabetes Federation (IDF) published in a 2005 consensus statement for standardising the term worldwide with prescribed measurement values, for comparative and research purposes (IDF, 2006).

## 2.2 PREVALENCE OF CARDIOMETABOLIC DISEASES

Contrary to the popular belief, nearly 80% of NCD deaths occur in low-and middle-income countries and are the most frequent causes of death in most countries, except in Africa (Yach, Hawkes, Gould, et al., 2004; WHO, 2008). Even in African nations, NCDs have been rising rapidly and are projected to exceed communicable, maternal, perinatal, and nutritional diseases as the most common causes of death by 2030 (WHO, 2008). Globally, 58 million deaths of all causes occurred in 2005. Thirty percent of these deaths were attributed to cardiovascular diseases. Amongst these, 80% of these cardiovascular disease occurred in low- and middle-income countries and deaths occur equally across males and females (WHO, 2005). The burden of cardiovascular diseases is expected to increase. By 2030, the four leading causes of mortality are expected to be ischaemic heart disease, cerebrovascular disease, chronic obstructive pulmonary disease and respiratory disorders. There is an expected increase in mortality attributable to

tobacco use, from 5.4 million in 2004 to 8.3 million in 2030, this would therefore represent approximately 10% global mortality (WHO, 2008). With an increase in risk factors and a less than optimal access to health care and preventive interventions, cardiovascular disease is the number one cause of mortality in the developing world and expected to continue as such (Gazino, 2007). Barring Sub-Saharan Africa where is the second leading cause after HIV/AIDS (Jamison, Joel, Breman, Measham Ar, et al, 2006).

In South Africa, the burden of non-communicable diseases are increasing both in rural and urban areas most prominently in poor people living in urban settings (Mayosi, Flisher, Lalloo, et al., 2009). The North West Province a rural province in South Africa, identified cardiometabolic disease to be the cause of approximately 22% of all causes of death, according to the 2011 death notifications (Table 1.1).

**Table 1.1. The ten leading underlying natural causes of death in North West Province of death occurrence, 2011**

| Causes of death (based on ICD10) | North West | | |
|---|---|---|---|
| | Rank | Number | Percentage |
| Tuberculosis | 1 | 4 235 | 11% |
| Diabetes mellitus | 9 | 1 168 | 3% |
| Cerebrovascular disease | 4 | 1 740 | 5% |
| Ischaemic heart disease | - | - | 0% |
| Human immunodeficiency virus [HIV] disease | - | - | 0% |
| Chronic lower respiratory disease | 10 | 981 | 3% |
| respiratory | - | - | 0% |
| Malignant neoplasm of digestive organs | - | - | 0% |
| Malignant neoplasm of respiratory and intrathoracic organs | 5 | 1 706 | 5% |
| Hypertensive disease | 3 | 2 196 | 6% |
| Other forms of heart disease | 2 | 3 149 | 8% |
| Influenza and pneumonia | 6 | 1 549 | 4% |
| Intestinal infectiuos disease | 7 | 1 360 | 4% |
| Other viral diseases | 8 | 1 264 | 3% |
| Certain disorders involving the immune machanism | - | - | 0% |
| Other natural causes | - | 15 445 | 41% |
| Non natural causes | - | 2 762 | 7% |
| ALL CAUSES | | 37 555 | 100% |

Source: (Statistics South Africa, 2014, Mortality and causes of death in South Africa,2011: Findings from death notification).

## 2.3 RISK OF CARDIO-METABOLIC DISEASES

Apart from insulin resistance and central obesity, genetics, physical inactivity, ageing, pro-inflammatory states and hormonal fluctuations play a role in the causation of the metabolic syndrome (MS). Currently; there is scarcity of data describing the influence of ethnicity on the pathogenesis of cardio-metabolic diseases in the South African community (Yach, et al, 2004; IDF, 2006).

The WHO (2011) developed a 4 X 4 matrix based on the fact that people who die prematurely from non-communicable diseases die from preventable heart disease, strokes, diabetes, cancers and asthma as a result of increased levels of exposure to tobacco use, unhealthy diets, physical inactivity and the harmful use of alcohol; and ineffective and inequitable health care services for people with non-communicable diseases (Figure 2.1)

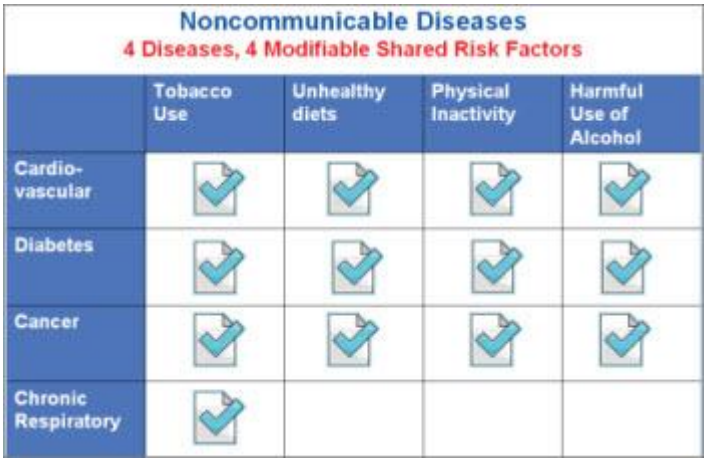



**Figure 2.1 NCD: 4 diseases, 4 modifiable risk factors**

## 2.4 MANAGING CARDIO-METABOLIC DISEASES

The management of these risk factors and diseases still focus largely on lifestyle changes, namely weight loss, increased physical activity, healthy diets, and smoking cessation (Independent Blue Cross, 2009). The prevention and management of CMD requires modifying dietary and lifestyle risk factors (Willet, 2002; Jamison, et al, 2006). These cost-effective interventions have been and can be adapted for each sphere of required prevention strategy.

In May 2009, a global alliance of non-governmental organizations (NCD-Alliance) was launched by the global Non-Communicable Diseases (NCD) focussed organizations. Their mandate is to represent population afflicted with a number of NCDs both in developing and developed countries. Preceding the United Nations Summit on Non-communicable Diseases in September 2011, the NCD Alliance's vision for the outcome of the summit include: NCD national

plans for all, a tobacco free world, improved lifestyles, strengthened health systems, global access to affordable and good quality medicines and technologies and finally human rights for people with NCDs (NCD Alliance, 2010).

The importance is therefore to ensure that NCDs are researched and quantified at relevant levels of care where action is sought and required. These data are beneficial in the identification of the population's specific health needs and therefore focus evidence towards strengthening health capacity as highlighted by both NCD Alliance and the Disease Control Priorities Project (Jamison, et al, 2006; NCD Alliance, 2011), which are essential in the decision making process of good quality medicines and technologies development and procurement and the overall management of cardio-metabolic disorders.

WHO (2010) suggested that the global epidemic of NCDs can be reversed through modest investments in interventions. These interventions include reduction in the major behavioural risk factors: tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity. However, they would require high levels of commitment, good planning, community mobilization and intense focus on a small range of critical actions. The population-wide approach should be complemented by health-care interventions for individuals who either already have NCDs or those who are at high risk (WHO, 2000). This was supported by Kraushaar and Krämer (2009) who suggested three strategies namely (a) the disbanding of screening in favour of population-wide enrolment into preventive interventions, (b) the substitution of the current cost utility analysis for a return-on-investment cantered appraisal of interventions, and (c) the replacement of standardized programs modelled around acute care by individualized and perpetual interventions.

## 2.5 COST OF MANAGING CARDIO-METABOLIC DISEASES

Cardiovascular disease cost the European Union €169 billion in 2003 (Leal, Luengo-Fernbndenz, Gray, et al, 2006). The data from the United States of

America estimates that CVD costs approximately double that, in direct and indirect annual costs. The high cost of cardio-metabolic diseases is also incurred in the treatment and management of diabetes and its complications, where globally the expenditure approximated US dollar (USD) 376 billion in 2010 and in 2030 the cost could exceed USD 490 billion (Thom, Haase, Rosamond, et al, 2006). There was an inequity of cardio-metabolic expenditure. Eighty percent of the world's diabetics live in low- and middle income countries, 80% of the global expenditure on health care for these diseases occurs in the worlds economically richest countries (Zhang, Zhang, Brown, et al., 2010). In South Africa, one quarter of the country's health care spending is devoted to cardiovascular disease (Leeder, Raymond, Greenberg, et al, 2004). The economic burden is not only felt at the country level, but so too by those afflicted with the disease, and as well as their caregivers (Gaziano, 2005). The Centre for Global Health and Economic Development estimate in countries like Brazil, India, China, South Africa, and Mexico, 21 million years of future productive life are lost each year because of cardiovascular disease (Leeder, et al, 2004).

The majority of these studies estimated the cost at macro level. However studies are necessary to estimate the financial burden placed on the health facilities for management of patients with these conditions.

# CHAPTER 3
# METHODOLOGY

The methodology for this study was selected on the basis of its aims and objectives. In this chapter the following were discussed: setting, scope, and study design and research tools and data management.

## 3.1 STUDY DESIGN

A cross-sectional study design was used for this study. Retrospective record review was done and information was extracted from Gelukspan District Hospital.

## 3.2 SETTING OF THE STUDY

The setting of the study was in the adult Medical wards at the Gelukspan District Hospital in the North West Province. The Hospital is situated in the Mafikeng Local Municipality in the Ngaka Modiri Molema District in the North West Province (Figure 3.1).

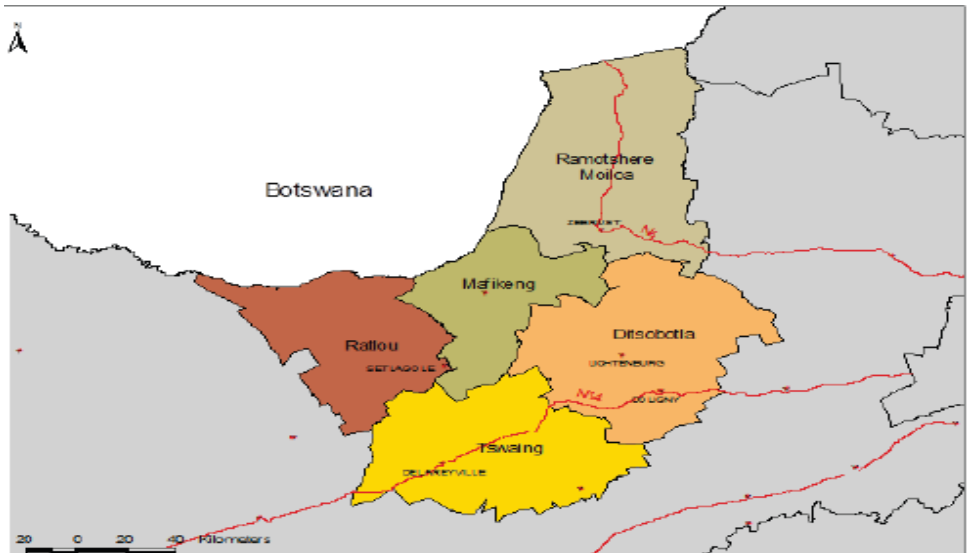



**Figure 3.1 Map of the Ngaka Modiri Molema District**

Gelukspan District Hospital is situated 55 kilometres from Mafikeng town, has 350 approved beds and 184 usable beds. The Hospital has two adult general wards with a bed capacity of 96. The Hospital serves the population of about 151, 444 from parts of Mafikeng, Ratlou, and Tswaing Local Municipalities which are largely rural and the unemployment rate of Ngaka Modiri Molema District is estimated at over 33,9% (Statistics South Africa, 2011).

The feeder clinics for the Hospital are most far removed from the Hospital, the nearest clinic is 22km away from the Hospital and the furthest is more than 130 km.

## 3.3 SCOPE OF THE STUDY

All records of patients who were admitted in the Adult Medical Wards of the Gelukspan District Hospital during the one year study period were reviewed. The information to be used for the study was the routinely collected by the Hospital. Therefore, no primary data collection was done. No intervention was done as a part of this study.

## 3.4 STUDY POPULATION AND SAMPLE

The study population included records of all patients with cardio-metabolic disorders (approximately 600) who were admitted in the Gelukspan District Hospital during the one year study period (from 01 April 2010 to 31 March 2011). A periodic sampling was used as the entire study population was included.

## 3.5 DATA MANAGEMENT

### 3.5.1 DATA COLLECTION

The data to be used for this study was extracted from different sources described below:

- For Objectives 1 and 2: The patient related data to be used for this study was routinely collected on monthly basis as a part of PAAB and District Health Information System (DHIS).
- For Objective 3: The laboratory data was extracted from the NHLS DISA data base.

Data from various sources was extracted to MS excel for further analysis.

### 3.5.2 STUDY INSTRUMENT

MS Excel-based data collection tools were designed for this study. (Appendix B).

### 3.5.3 STUDY VARIABLES

Data was collected on various variables that are relevant to this study (Table 3.1)

**Table 3.1 Relevant objectives and study variables**

| Objectives | Variables | |
|---|---|---|
| 1 | Prevalence of cardio-metabolic diseases | Number of patients admitted per diseases category |
| 2 | Demographic | Age<br>Gender<br>Ethnicity |
| | Socio-economic | Occupation (employed/ Unemployed) |
| | Clinical profile | Blood Pressure on admission<br>Diagnosis<br>Outcome (discharge/death/transfer)<br>Length of stay |
| 3 | Laboratory tests | Blood sugar (Random and Fasting/<br>Blood HbA1C<br>Blood cholesterol<br>Creatinine |
| | Costs | Cost of Laboratory tests |

The clinical parameters reported in the study (such as systolic blood pressure, diastolic blood pressure, random and fasting blood sugar) were measured at the time of admission.

### 3.5.4 DATA ANALYSIS

Data was captured on to the MS excel spreadsheet collected for the three objectives of study and were analysed with NCSS software (NCSS, 2007). The findings of the data were presented as Tables and graphs where appropriate.

Following descriptive data analysis were used for the study:

- Continuous variables (such as age): Mean or median and standard deviation or inter-quartile range based on the distribution of the data
- Categorical variables (such as ethnicity and gender): and proportions.

Following analytical statistics will be used to compare the variables between male and female patients:

- Continuous variable with normal distribution (such as age): t-test
- Continuous variable without normal distribution: Mann Whitney's U Test
- Categorical variables: Chi-square test

In addition, test of association was done between two variables (Pearson's or spearman's correlation based on the distribution of the data).

The statistical significance will be calculated at the 95% confidence level.

## 3.6 ETHICAL CONSIDERATIONS

All the information was collected anonymously from the Hospital Information System. No patient names or hospital numbers were used. Study numbers were allocated to different patients. The raw data from where the information was extracted was only available to the researcher.

Permission to conduct the research at the Hospital had been obtained from the North West Department of the Health. The research was also approved by the University of the Witwatersrand 'Human Research Ethics Committee (Medical) before commencement of the study (Appendix A).

# CHAPTER 4
# RESULTS OF THE STUDY

This chapter deals with the analysis of the data collected for this study relating to its aims and objectives. The results obtained from the analysis of data were described in this chapter.

## 4.1 NUMBER OF ADMISSIONS

Number of admissions in male and female medical wards for non-communicable diseases is listed in Table 4.1. The total number of subjects was 558.

**Table 4.1 Number of admissions per month**

| Month | Total | Female Ward GB3 | Male Ward GB4 |
|---|---|---|---|
| **April** | 80 | 24 | 56 |
| **May** | 41 | 23 | 18 |
| **June** | 47 | 30 | 17 |
| **July** | 59 | 32 | 27 |
| **August** | 12 | 11 | 1 |
| **September** | 27 | 15 | 12 |
| **October** | 62 | 32 | 30 |
| **November** | 45 | 16 | 29 |
| **December** | 49 | 27 | 22 |
| **January** | 36 | 21 | 15 |
| **February** | 40 | 26 | 14 |
| **March** | 60 | 30 | 30 |
| **Total** | **558** | **287** | **271** |

The total population of patients admitted to both male and female wards is 2, 494 patients. The admissions for cardio – metabolic disease is 22, 4% of the total patient population for the year of the study.

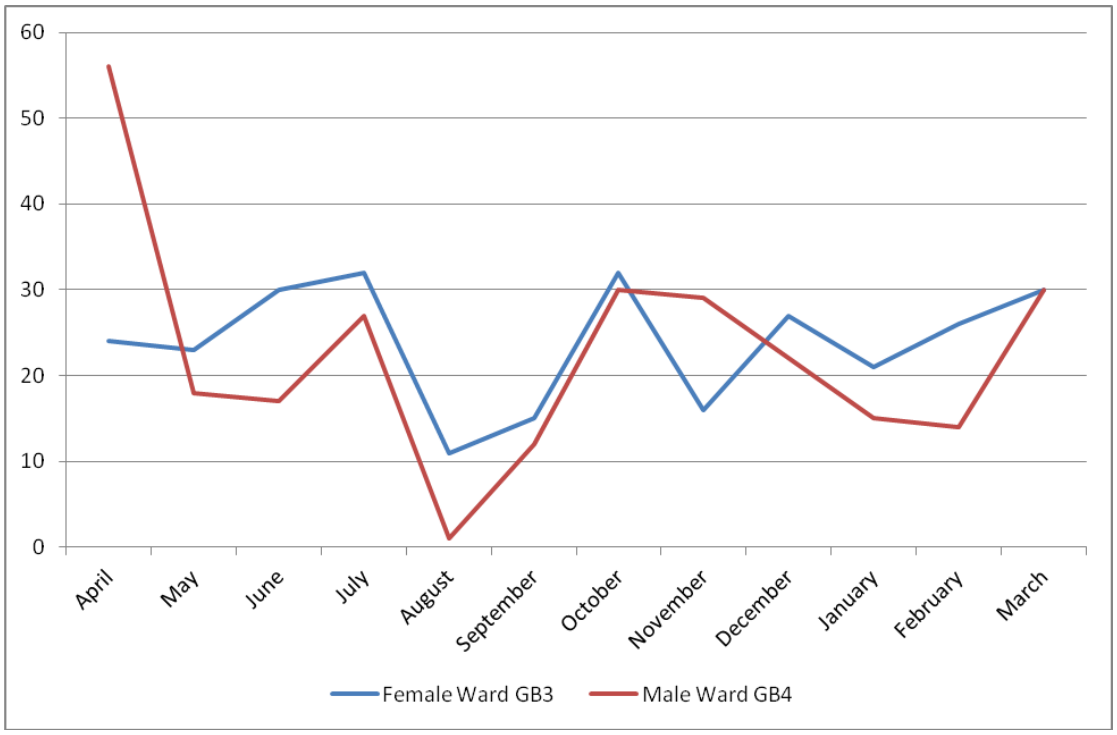



**Figure 4.1 Admissions per Month**

## 4.2 SOCIO-DEMOGRAPHIC PROFILES

### 4.2.1 AGE

Age frequency of subjects is listed in Table 4.2 (Figure 4.2).

**Table 4.2 Age Frequencies of subjects**

| | Total | Female | Male |
|---|---|---|---|
| **Median** | 56 | 58 | 56 |
| **IQR** | 41-68 | 44-70 | 38-67 |
| **Minimum** | 13 | 13 | 13 |
| **Maximum** | 97 | 97 | 95 |
| **AGE-GROUP** | | | |
| **Less than 50 years** | 201 (36.0%) | 96 (33.6%) | 105 (38.6%) |
| **50 – 64 years** | 165 (29.5%) | 83 (29.1%) | 81 (30.0%) |
| **65 years and more** | 192 (34.5%) | 107 (37.4%) | 85 (31.5%) |
| **Total** | **558 (100%)** | **287 (100%)** | **271 (100%)** |

There was no significant difference between male and female in terms of age (Mann Whitney's U test, p = 0.04). The majority of patients were aged above fifty years picking at 60 years before it drops. The age – group analysis showed almost a third of the subjects were below 50 years age and another third was above 65 years of age.

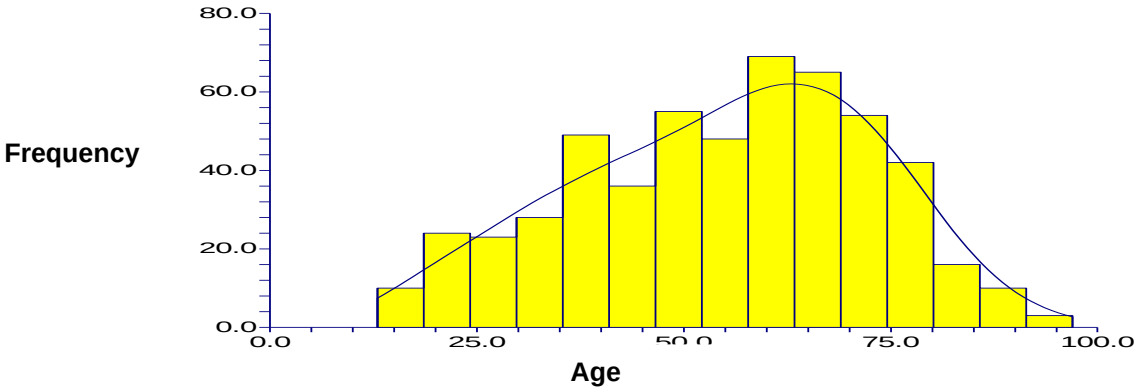



**Figure 4.2 Age Frequency**

### 4.2.2 ETHNICITY

The ethnicity frequency of subjects is listed below in Table 4.3.

**Table 4.3 Ethnic groups**

| Ethnicity | TOTAL | FEMALE | MALE |
|---|---|---|---|
| **BLACK** | 546 (97.8%) | 280 (97.6%) | 266 (98.2%) |
| **INDIAN** | 2 (0.4%) | 0 (0.0%) | 2 (0.7%) |
| **WHITE** | 10 (1.8%) | 7 (2.4%) | 3 (1.1%) |
| **Total** | 558 (100.0%) | 287 (100.0%) | 271 (100.0%) |

There was no significant difference between male and female in terms of ethnicity (Chi-square test, p = 0.17). Most of the patients in the hospital were black.

### 4.2.3 MARITAL STATUS

Marital status of subjects is listed below in Table 4.4

**Table 4.4 Marital status of subjects**

| MARITAL STATUS | TOTAL | FEMALE | MALE |
|---|---|---|---|
| **Divorced** | 2 (0.4%) | 0 (0.00%) | 2 (0.7%) |
| **Married** | 206 (36.9%) | 83 (28.9%) | 123 (45.4%) |
| **Single** | 309 (55.4%) | 182 (63.4%) | 127 (46.9%) |
| **Widow** | 41 (7.3%) | 22 (7.7%) | 19 (7%) |
| **Total** | **558 (100%)** | **287 (100.0%)** | **271 (100.0%)** |

There was significant difference between male and female in terms of marital status (Chi-square test, $p < 0.001$). There were more single women than men. Patients seen in the period were mostly single (55.4%) followed by married (36%).

### 4.2.4 EMPLOYMENT STATUS

The employment status of subjects is listed below in Table 4.5

**Table 4.5 Employment status**

| Occupation | Total | FEMALE | MALE |
|---|---|---|---|
| **EMPLOYED** | 4 (0.7%) | 2 (0.7%) | 2 (0.7%) |
| **PENSIONER** | 120 (21.5%) | 35 (12.2%) | 85 (31.4%) |
| **SCHOLAR** | 10 (1.8%) | 1 (0.3%) | 9 (3.3%) |
| **SELF EMPLOYED** | 4 (0.7%) | 0 (0.0%) | 4 (1.5%) |
| **UNEMPLOYED** | 420 (75.3%) | 249 (86.8%) | 171 (63.1%) |
| **Total** | **558 (100.0%)** | **287 (100.0%)** | **271 (100.0%)** |

There was a significant difference between male and female in terms of occupational status (Chi-square test, $p < 0.001$). There were more pensioner men than women.

## 4.3 CLINICAL PROFILES

### 4.3.1 PRIMARY CLINICAL DIAGNOSES

Clinical diagnoses of subjects are listed below in Table 4.6.

**Table 4.6 Clinical diagnoses**

| Diagnosis | Total | FEMALE | MALE |
|---|---|---|---|
| **ANGINA PECTORIS** | 2 (0.4%) | 2 (0.7%) | 0 (0.0%) |
| **CCF** | 122 (21.9%) | 47 (16.4%) | 75 (27.7%) |
| **ISCHAEMIA** | 10 (1.8%) | 5 (1.7%) | 5 (1.8%) |
| **HYPERTENSION** | 129 (23.1%) | 60 (20.9%) | 69 (25.5%) |
| **CEREBROVASCULAR** | 1 (0.2%) | 1 (0.3%) | 0 (0.0%) |
| **CVA** | 69 (12.4%) | 50 (17.4%) | 19 (7%) |
| **ENCEPHALOPATHY** | 6 (1.1%) | 3 (1.0%) | 3 (1.1%) |
| **DVT** | 7 (1.3%) | 4 (1.4%) | 3 (1.1%) |
| **CHOLESTEROL** | 1 (0.2%) | 0 (0.0%) | 1 (0.4%) |
| **DIABETES** | 211 (37.8%) | 115 (40.1%) | 96 (35.4%) |
| **Total** | **558 (100.0%)** | **287 (100.0%)** | **271 (100.0%)** |

Cardio-vascular problems were the main cause of admissions. However, Diabetes Mellitus was the single most common cause of admission among the study cohort. There was no significant difference between male and female patients in terms of primary clinical diagnoses.

### 4.3.2 SYSTOLIC BLOOD PRESSURE (SBP)

Systolic Blood Pressure of subjects at the time of admission is listed below in Table 4.7. The SBP was not normally distributed (Figure 4.3).

**Table 4.7 Systolic Blood Pressure**

| BP In mm | Total | Female | Male |
|---|---|---|---|
| **Median** | 118 | 118 | 117 |
| **IQR** | 100-132.5 | 100-135 | 108-131 |
| **Minimum** | 60 | 60 | 74 |
| **Maximum** | 216 | 216 | 194 |

There was no significant difference between male and female study cohorts in terms of Systolic Blood Pressure (SBP) (Mann Whitney's U test, p = 0.89).

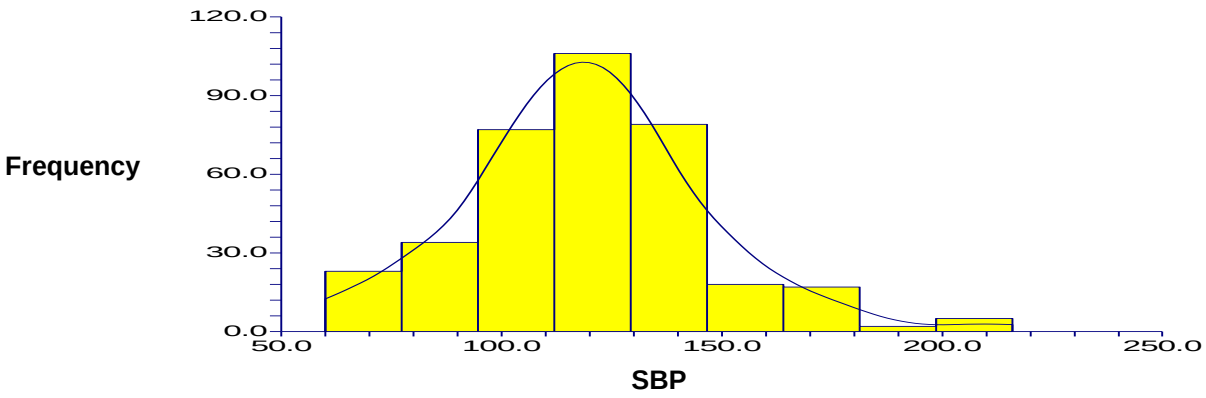



**Figure 4.3 Systolic Blood Pressure (SBP)**

### 4.3.3 Diastolic Blood Pressure (DBP)

| | Total | Male | Female |
|---|---|---|---|
| SBP no of Males + Females > 150 | **37 (7%)** | 10 (3, 69%) | 27 (9, 408%) |
| DBP no of Males + Females > 90 | **46 (8%)** | 9 (3, 321%) | 37 (12, 892%) |
| **Total** | **83 (15%)** | **19 (7%)** | **642 (22%)** |

Patients with abnormal BP are 15% of the total study cohorts. The study revealed that investigations did not comply to the protocol where BP for less than 1 patient in ten with these conditions was taken.

Diastolic Blood Pressure of subjects at the time of admission is listed below in Table 4.8. The DBP was not normally distributed (Figure 4.4). Thirteen percent of the subjects (n=73) had BP more than 140/90.

**Table 4.8 Diastolic Blood Pressure**

| BP in mm | Total | Female | Male |
|---|---|---|---|
| **Median** | 72 | 71 | 73 |
| **IQR** | 61.5 - 89 | 56- 90 | 65-84 |
| **Minimum** | 60 | 29 | 25 |
| **Maximum** | 216 | 131 | 128 |

There was no significant difference between male and female subjects in terms of Diastolic Blood Pressure (SBP) (Mann Whitney's U test, p = 0.38).

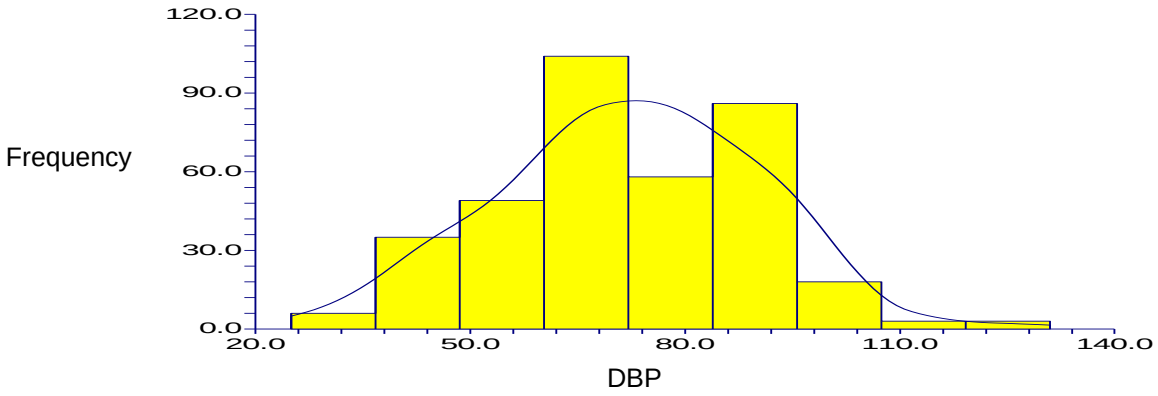



**Figure 4.4 Diastolic Blood Pressure (DBP)**

### 4.3.4 CLINICAL OUTCOME

Clinical outcome are of subjects is listed below in Table 4.9.

**Table 4.9 Clinical outcome of subjects**

| Clinical outcome | Total | FEMALE | MALE |
|---|---|---|---|
| **DECEASED** | 105 (19.5%) | 48 (17.9%) | 57 (21.0%) |
| **DISCHARGE** | 427 (79.2%) | 218 (81.3%) | 209 (77.1%) |
| **Referred to regional hospital** | 7 (1.3%) | 2 (0.7%) | 5 (1.8%) |
| **Total** | **539 (100.0%)** | **268 (100.0%)** | **271 (100.0%)** |

There was no significant difference between male and female in terms of clinical outcomes (Chi-square test, p = 0.32).

### 4.3.5 LENGTH OF STAY

The length of stay of subjects is listed below in Table 4.10. Length of stay was not normally distributed (Figure 4.5).

**Table 4.10 Length of Stay**

| In days | Total | Female | Male |
|---|---|---|---|
| **Median** | 4 | 4 | 3 |
| **IQR** | 2-6 | 3-6 | 1-6 |
| **Minimum** | 1 | 1 | 1 |
| **Maximum** | 41 | 26 | 41 |

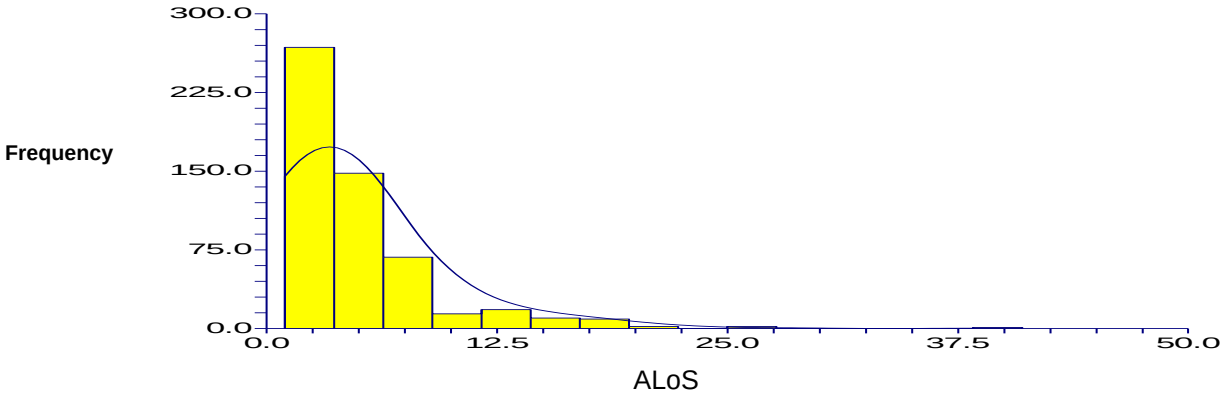



**Figure 4.5 Length of Stay**

There was significant difference between male and female in terms of length of stay (Mann Whitney's U test, p = 0.04). Female subjects were staying longer than male.

Nearly fifty percent (n=271, 48%) of the subjects stayed more than 3 days. Thirty-nine percent of the males (n=108) and 56% (163) females stayed more than 3 days (the norms of average length of stay for District hospitals) (National Department of Health, 2002).

## 4.4 LABORATORY TESTS

The laboratory tests done at the time of admission included random and fasting blood glucose, and creatinine. Interestingly no $HbA_1C$, lipogram and other renal function tests were done at the time of admission.

### 4.4.1 RANDOM BLOOD GLUCOSE

Random blood glucose of subjects at the time of admission is listed below in Table 4.11 and 4.12. The random blood glucose values are not normally distributed (Figure 4.6).

**Table 4.11 Fasting Glucose**

| | Total | Male | Female |
|---|---|---|---|
| Random Glucose no of Males + Females < 11,0 | 12 (2,150%) | 6 (2,214%) | 6 (2,090%) |
| Random Glucose no of Males + Females > 11,0 | 21 (4%) | 5 (1,845% ) | 16 (5,575%) |
| Random Glucose Total | 33 (6%) | 11 (4, 06%) | 22 (8, 67%) |

Patients with random Glucose investigation are 6% of Total study cohorts. The study revealed that investigations did not comply to the protocol where BP for less than 1 patient in ten with these conditions was taken.

**Table 4.12 Random Glucose**

| **In mmol/L** | **Total** | **Female** | **Male** |
|---|---|---|---|
| **Mean** | 12.1 | 13.3 | 9.7 |
| **SD** | 7.3 | 7.2 | 7.1 |
| **Minimum** | 3.1 | 3.2 | 4.1 |
| **Maximum** | 30 | 25.6 | 25.8 |

There was no significant difference between male and female in terms of Random Blood Glucose (t-test, $p = 0.09$).




**Figure 4.6 Random Glucose**

Fifty percent of the patients who were tested for random blood sugar at the time of admission had random blood sugar more than 11.1 mmol/l (SEMDSA, 2012).

### 4.4.2 FASTING GLUCOSE

Fasting glucose of subjects at the time of admission is listed below in Table 4.12. The fasting blood glucose values are not normally distributed (Figure 4.7).

**Table 4.12 Fasting Glucose**

| | Total | Male | Female |
|---|---|---|---|
| Fasting Glucose no of Males + Females < 6,0 | 39 (7%) | 13 (4,797%) | 26 (9,059%) |
| Fasting Glucose no of Males + Females > 6,0 (Pre- Diabetes) | 9 (2%) | 2 (0,738%) | 7 (2,439%) |
| Fasting Glucose no of Males + Females > 7,0 (Diabetes) | 58 (10%) | 7 (2,583%) | 51 (17,770%) |
| Fasting Glucose Total | 106 (19%) | 22 (3%) | 84 (29%) |
| Research Total | 558 | 271 | 287 |

Patients with random Glucose investigation are 6% and those with fasting Glucose investigations are 19% of Total study cohorts. The study revealed that investigations did not comply to the protocol where BP for less than 1

patient in ten with these conditions was taken.

**Table 4.12 Fasting Glucose**

| In mmol/L | Total | Female | Male |
|---|---|---|---|
| **Median** | 8.4 | 9.0 | 6.5 |
| **IQR** | 5.9- 16.5 | 5.9 – 19.6 | 5.4-9.9 |
| **Minimum** | 3.2 | 3.2 | 4.1 |
| **Maximum** | 44.0 | 44.0 | 29.1 |

There is significant difference between male and female in terms of Fasting Glucose (Mann Whitney's U test, p = 0.0006). More than 50% of subjects had Fasting plasma glucose (FPG) 7.0 mmol/L (SEMDSA, 2012).

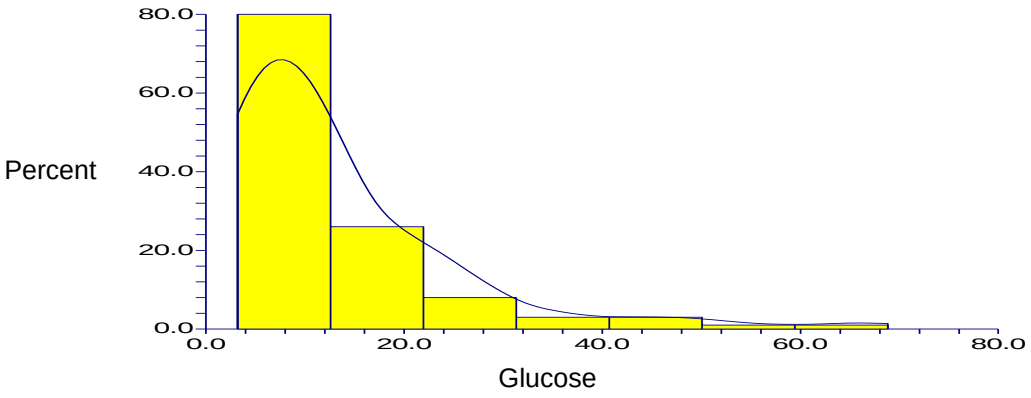



**Figure 4.7 Fasting Glucose**

### 4.4.3 CREATININE

Creatinine frequency of subjects is listed below in Table 4.13. The creatinine values were not normally distributed (Figure 4.8). Fourteen percent of the subject had creatinine more than 100 µmol/L [reference range 60 µmol/L to 100 µmol/L (NHLS, 2013)].

**Table 4.13 Creatinine**

| In mm | Total | Female | Male |
|---|---|---|---|
| **Median** | 66 | 63 | 76 |
| **IQR** | 50-89 | 45-89 | 57.5 - 89 |
| **Minimum** | 19 | 19 | 21 |
| **Maximum** | 383 | 383 | 205 |

There was significant difference between male and female in terms of Serum creatinine (Mann Whitney's U test, p = 0.0006). Male patients had higher serum creatinine than female.

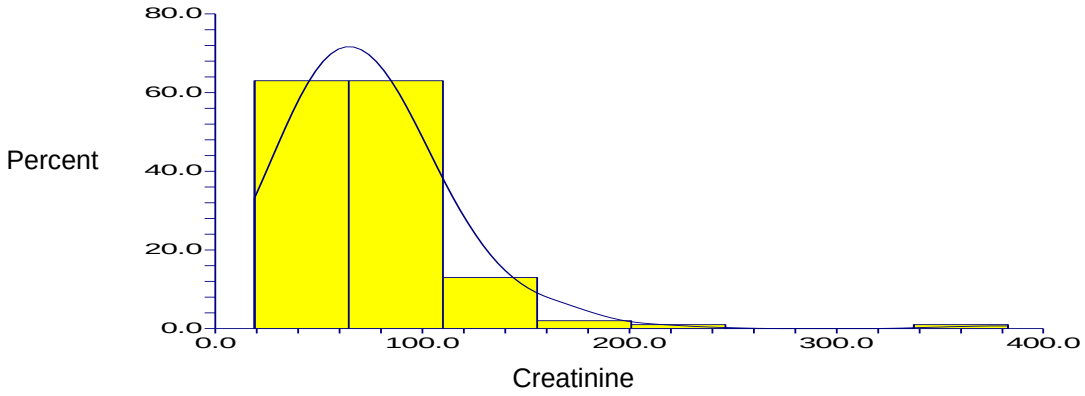



**Figure 4.8 Creatinine**

### 4.4.4 LABORATORY COSTS

The laboratory costs for these subjects are listed in Table 4.14. The total and average costs were R 90,697.94 and R162.54 respectively.

**Table 4.14 Laboratory cost for management of cardio-metabolic patients**

| Month | Total | NHLS |
|---|---|---|
| **April** | 80 | 4,745.40 |
| **May** | 41 | 6,609.62 |
| **June** | 47 | 8,166.10 |
| **July** | 59 | 7,155.46 |
| **August** | 12 | 7,777.51 |
| **September** | 27 | 8,691.15 |
| **October** | 62 | 8,878.63 |
| **November** | 45 | 4,661.48 |
| **December** | 49 | 5,069.71 |
| **January** | 36 | 10,213.11 |
| **February** | 40 | 9,368.17 |
| **March** | 60 | 9,361.60 |
| **Total** | **558** | **90,697.94** |

The laboratory costs were regressed against the number of monthly admissions (spearman's correlation was -0.32, p< 0.001) (Figure 4.9). It showed that there was a significant decrease in laboratory costs in relation to admission during the 12 months period.

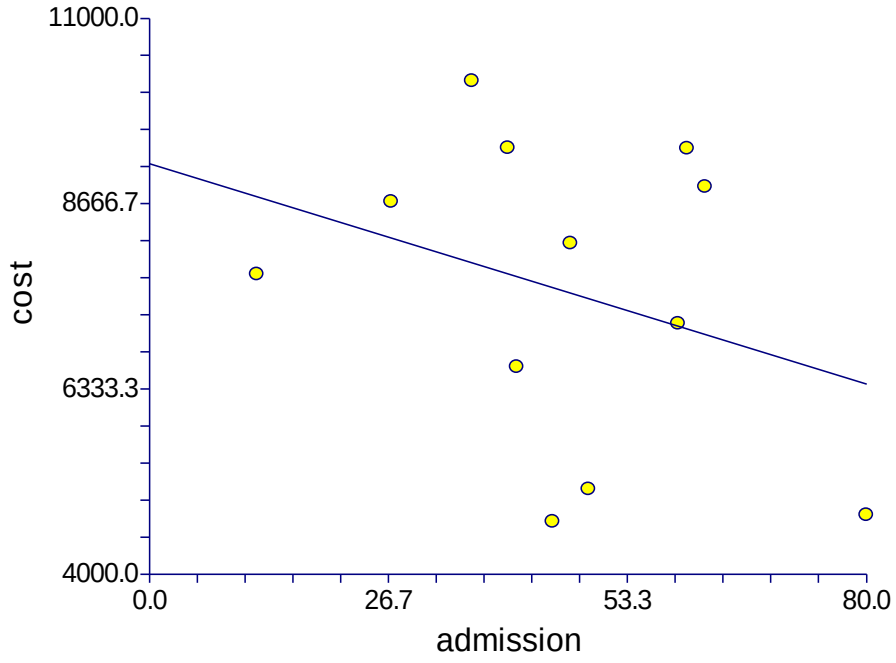



**Figure 4.9 Laboratory costs and monthly admissions**

# CHAPTER 5
# DISCUSSIONS

In this chapter, the results obtained from the analysis of the data were discussed and compared with those from other published studies.

## 5.1 STUDY POPULATION

The admission for both males and females decreased significantly during the month of August and September 2010 probably due to the public service strike.

## 5.2 SOCIO-DEMOGRAPHIC PROFILES

The result showed that both males and females suffered equally from cardio-metabolic diseases (Mann Whitney's U test, $p = 0.04$). The majority of patients were aged above fifty years. The age – group analysis showed almost a third of the subjects were below 50 years age and another third was above 65 years of age. Therefore, the target group for improvement of management of these categories of patients should include the younger population as well older patients (<50 years).

The majority of the subjects were black (97.8%) and unemployed (98%) representing the demographics of the catchment population. Most of them were single (55.4%) followed by married (36.9%). There were more single women than men. More than 20% of the population were pensioners representing the age distribution of the study cohort. There were more pensioner men than women.

## 5.3 CLINICAL PROFILES

There was no significant difference between male and female patients in terms of primary clinical diagnoses. Cardio-vascular problems were the main cause of admissions. However, diabetes mellitus was the single most

common cause of admission among the study cohort. In addition nearly a quarter of the patients were admitted for hypertension. This is probably due to the failure of the PHC facilities to manage the diabetic patients. There is a need to address this issue through outreach programme supported by this hospital.

Although 23% of the patients were admitted for hypertension, only thirteen percent of the subjects (n=73) had BP more than 140/90. Therefore it was not clear why additional 10% of patients were admitted with a primary diagnosis of hypertension.

Nearly fifty percent (n=271, 48%) of the subjects stayed more than 3 days. Thirty-nine percent of the males (n=108) and 56% (163) females stayed more than 3 days (the norms of average length of stay for District hospitals (National Department of Health, 2002). Subjects are admitted more days in hospital probably because of poor management of subjects or poor adherence to treatment and advice necessitating admission of patient in critical condition. This would require further study to understand the determinants of increasing length of stay in the female ward.

The case fatality rate was 19.5% probably high in a district hospital setting. This implies that probably these patients were not managed properly at the PHC level or at this Hospital. However this rate is lower than a study conducted by Gaziano, (2007). High discharge rate might be associated with readmission. Therefore, there is a need to conduct further research to calculate the rate of readmission

## 5.4 LABORATORY TESTS

The laboratory tests done at the time of admission included random and fasting blood glucose, and creatinine. Interestingly no $HbA_1C$, lipogram and other renal function tests were done at the time of admission contray to the norms and guidelines for management of cardio-metabolic diseases (National Department of Health, 2006; SEMDSA, 2012). This needs further exploration

with the medical management at the Hospital. The hospital management may need to explore the possibility of training the doctors on national guidelines for non-communicable diseases.

Fifty percent of the patients who were tested for random and fasting blood sugar at the time of admission had random blood sugar more than 11.1 mmol/l and 7 mmol/L respectively (SEMDSA, 2012). This figure was higher than the number of admission due to diabetes. It is probably due to comorbidity of diabetes among the patients admitted with cardio-vascular disorders. Fourteen percent of the subject had creatinine more than 100 µmol/L [reference range 60 µmol/L to 100 µmol/L (NHLS, 2013)], suggesting possible nephropathy among the subjects.

The total and average costs were R 90,697.94 and R162.54 respectively. There was a significant reduction in per capita laboratory costs during the period (spearman's correlation was -0.32, $p< 0.001$).

## 5.5 LIMITATIONS OF THE STUDY

The main limitation of the study was missing records. In these cases, ward registers and patients' records were used to extract missing data in the electronic record keeping system. Patient files were retrieved from the hospital filing system and gaps were filled using notes in the patient file.

In addition, it was difficult to reconcile data sourced from different units/ organisations. For example, the admission and clinical data were sourced from admission registers from the medical wards in the hospitals, laboratory data were sourced from NHLS and financial data were collected from Finance Departments.

# CHAPTER 6
# CONCLUSIONS AND RECOMMENDATIONS

In this chapter, the results obtained from this study were assessed in relation to the aims and objectives of the study, so that appropriate conclusions can be drawn. The limitations of the study are listed. Based on the findings of the study, appropriate recommendations and suggestions for future research are included.

## 6.1 CONCLUSIONS RELATED TO THE AIMS OF THE STUDY

This was a descriptive retrospective study that looked at broad issues pertaining to the management of cardio–metabolic diseases in a district hospital in the North West Province during one year study period (from April 2010 to March 2011).

### 6.1.1 THE NUMBER OF SUBJECTS WITH CARDIO-METABOLIC DISEASES

Number of admissions in male and female medical wards for non-communicable diseases was 558. There were almost same number of female (n= 287) and male (271) admissions.

### 6.1.2 DETERMINATION OF THE PROFILE OF THESE PATIENTS

The result showed that both males and females suffer equally from cardio-metabolic diseases. The age – group analysis showed almost a third of the subjects were below 50 years age and another third was above 65 years of age. More than 20% of the population were pensioners representing the age distribution of the study cohort. The majority of the subjects were black (97.8%) and unemployed (98%) representing the demographics of the catchment population. The majority of them were single (55.4%). There was no significant difference between male and female patients in terms of primary clinical diagnoses.

Thirty-nine percent of the males (n=108) and 56% (163) females stayed more than 3 days (the norms of average length of stay for District hospitals. The case fatality rate was 19.5% probably high in a district hospital setting.

### 6.1.3 DETERMINATIONATION OF THE TYPE AND COST OF LABORATORY TESTS

The laboratory tests done at the time of admission included random and fasting blood glucose, and creatinine. No $HbA_1C$, lipogram and other renal function tests were done at the time of admission contrary to the norms and guidelines for management of cardio-metabolic diseases (National Department of Health, 2006; SEMDSA, 2012). The laboratory test result showed the possibility of significant comorbidity among the patients. Fourteen percent of the subject probably had nephropathy. The total and average costs were R 90,697.94 and R162.54 respectively. There was a significant reduction in per capita laboratory costs during the period (spearman's correlation was -0.32, $p< 0.001$).

## 6.2 RECOMMENDATIONS

### 6.2.1 FOLLOW-UP

The researcher will present the findings of the study to the Hospital management and the health professionals involved with the management of these patients. Hopefully, the hospital management would use the findings of the study to improve management of these patients.

### 6.2.2 FURTHER STUDIES

Following studies are proposed as an extension of this project:

- To evaluate the high rate of mortality including readmission
- To evaluate the co morbidity among the patients admitted in the medical wards

- To evaluate the management of patients in the feeder clinics.
- To extend the study to other wards in the Hospital

## 6.3 SUMMARY AND CONCLUSIONS

This was the first study conducted in this Hospital to systematically evaluate management of a particular group of patients. Hopefully, this study would assist the Hospital management to improve the management of patients admitted in this Hospital.

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## APPENDICES

# APPENDIX A: LETTERS OF APPROVAL

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18-AUG-2011
Person No: 8805634J
TAA

Mr Derrick Meriting Moalosi
P O Box 180
Kwa-Thema
South Africa
1563

Dear Mr Moalosi

**Master of Public Health (Hospital Management): Approval of change of title**

We have pleasure in advising that your proposal entitled "Describe Cardio-metabolic diseases and associated cost in a district hospital in the North West Province". Please note that any changes to this title have to be endorsed by the Faculty's Higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

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Fax: 018 392 6710
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## POLICY, PLANNING, RESEARCH, MONITORING AND EVALUATION

**To** : **Academic Institutions, Research Institutions**

**From** : **North West Department of Health**

**Date** : **12 October 2011**

**Subject** : **Request for Permission to Conduct Study within the Department**

The subject matter above bears reference

### Purpose

Please note that the Department of Health can only grant an approval letter for Mr D.M Moalosi's research protocol upon received of ethical clearance which will enable the Provincial Health Research Committee to process the request.

Kindly obtain and furnish the Department with the ethical clearance certificate for the speedy processing of your request.

**Thank you**

**Mr B Redlinghys**
**Director: Policy Planning, Research, Monitoring & Evaluation**

12/10/11
**Date**

DIRECTOR:
POLICY & PLANNING
12 OCT 2011
DEPARTMENT OF HEALTH
PRIVATE BAG X2068 MMABATHO 2735



Healthy Living for All

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Derrick Meriting Moalosi

| | |
|---|---|
| CLEARANCE CERTIFICATE | M110806 |
| PROJECT | Cardio-Metabolic Diseases among Hospitalized Patients in a District Hospital in the North West Province |
| INVESTIGATORS | Derrick Meriting Moalosi. |
| DEPARTMENT | School of Public Health |
| DATE CONSIDERED | 26/08/2011 |
| M1108060DECISION OF THE COMMITTEE* | Approved unconditionally |

**Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.**

DATE 21/09/2011 CHAIRPERSON .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr Debs Basu

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

## APPENDIX B: DATA COLLECTION SHEET

| TOOL 1 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Study no | Date of admission | Hospital no | Ward | Age | Gender | Ethnicity | Hosp Classification | Marital status | Employment | Occupation | Referral unit | Length of staY |
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| TOOL 2 | ADMISSION | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Study no | Primary Diagnosis on admn | ICD-10 code | Other conditions | Smoking | Alcohol | Height | Weight | Waist circumference | Systolic BP | Diastolic BP | Lab results | Glucose | HBA1C | Total Cholesterol | HDL | LDL | Triglyceride | Creatinie | Hb |
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**TOOL 3: Direct Cost**

Ward

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Total |
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| Laboratory | | | | | | | | | | | | | |
| Blood and blood product | | | | | | | | | | | | | |
| Pharmacueticals | | | | | | | | | | | | | |
| General stores | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Human resources | | | | | | | | | | | | | |
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| TOTAL | | | | | | | | | | | | | |
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