AN EVALUATION OF MEDICINE PRESCRIBING PRACTICES IN OUT-PATIENT DEPARTMENTS IN PUBLIC HEALTH FACILITIES IN KHOMAS REGION, NAMIBIA

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BY

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ABSTRACT

It is estimated by the World Health Organisation (WHO, 2004) that globally, over 50% medicines are prescribed inappropriately. In Namibia, suboptimal prescribing practices have been reported in previous medicine use surveys. Prescribing patterns in the out-patient settings have however not been evaluated in the Khomas Region.

The aim of this study was to evaluate the medicine prescribing patterns in out-patient departments of public health facilities in the Khomas Region, Namibia.

The study adopted the WHO descriptive cross-sectional observational design for a medicine use survey using both quantitative and qualitative methods of data collection. The study was conducted at three levels of health care: Hospital, Health Centre and Clinic. Data on prescribing indicators were collected from patient prescriptions and data on prescribers' use of treatment guidelines was also collected. The main outcome variables were the use of STGs in prescribing of medicines at OPD units and five prescribing indicators recommended by WHO.

A total of 1,243 prescription records were reviewed and 37 prescribers participated in the study. Four out of the five prescribing indicators were below acceptable prescribing thresholds clearly showing that rational prescribing in Khomas Regions is suboptimal. The very high level of antibiotic prescribing (69%) is very worrying and will directly lead to increase in Anti-microbial resistance. The average of over three medicines per prescription shows that there is a degree of polypharmacy and the low level of generic prescribing only (64%) is also worrying. Adherence to STGs was found to be 73%, which is better than found in some other studies but still below the acceptable level. The main factors driving the use of STGs were access to STGs and/or training; access to STG recommended medicines at the health facility and the simplicity in indexing of the STG. The study recommends implementation of a prescribing performance management system

to standardize, continuously monitor and improve on the prescribing of medicines at OPD units in Khomas Region.

Key works: Prescribing patterns, medicines, standard treatment guidelines, Namibia

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DEDICATION

This work is dedicated to the Almighty God, who gave me courage and strength to carry on with my studies, my father Niaz Ahmad who guided and encouraged me throughout my career, my late mother Saeeda Bibi who always consoled me when my spirits were low, my wife Shaista Kanwal who had been understanding and supportive throughout my study by taking extra burden of raising our kids in addition to work as I couldn't spare much time for them and my three children Salihah Niaz, Saad Niaz and Huzaifah Niaz for stealing some of their time during my studies.

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DECLARATION

I, Qamar Qayyum Niaz, declare that the study "An Evaluation of Medicine Prescribing Practices in out-Patient Departments in Public Health Facilities in Khomas Region, Namibia" is a true reflection of my own research and that this work or part thereof has not been submitted for a degree in any other institution of higher education.

....

Qamar Qayyum Niaz Date

CERTIFICATION

The undersigned certify that she has read and thus hereby recommending for acceptance of research thesis entitled "An Evaluation of Medicine Prescribing Practices in out-patient Departments in Public Health Facilities in Khomas Region, Namibia" in partial fulfilment of the requirements for the award of the degree of MASTER OF PUBLIC HEALTH (MPH) at the University of Namibia

Signature…… **Date……/……/……**

Dr. L Pretorius, University of Namibia

Supervisor

ABBREVIATIONS AND ACRONYMS

ACTs Artemisinin-based combination therapies

ADR Adverse Drug Reaction

AMR Antimicrobial Resistance

ART Antiretroviral Treatment

BNF British National Formulary

CMS Central Medical Stores

CNS Central Nervous System

CVS Cardiovascular System

EML Essential Medicine List

EN Enrolled Nurse

ENT Ear, Nose Throat

GIT Gastrointestinal System

IHK Intermediate Hospital Katutura

INN International Non-proprietary Name

KHC Katutura Health center

KMDC Khomasdal clinic

LRTI Lower Respiratory Tract Infection

MO Medical Officer

MoHSS Ministry of Health and Social Services

MRMD Multi Regional Medical Depot

Nemlist Namibia Essential Medicines List

NMPC National Medicines Policy Coordination

OPD Out-patient Department

PEP Post exposure prophylaxis

PHC Primary Health Care

PMIS Pharmaceutical Management Information System

RN Registered Nurse

RTI Respiratory Tract Infection

RUM Rational use of medicines

SAMF South African Medical Formulary

STGs Standard Treatment Guidelines

STI Sexually Transmitted Infections

TB Tuberculosis

TC Therapeutics Committee

URTI Upper Respiratory Tract Infection

WHO World Health Organization

XDR Extensively Drug Resistant

CHAPTER ONE : INTRODUCTION

1.1. Background to the medicine prescribing problem

The World Health Organisation's World Medicines Situation report estimates that half of all medicines are inappropriately prescribed, dispensed or sold worldwide, and that half of all patients fail to take their medicine properly (WHO, 2004). This report also estimates that two-thirds of global antibiotic sales occur without any prescription, particularly in developing countries such as Indonesia, Pakistan and India. The majority (90%) of injection prescriptions are estimated to be unnecessary (WHO, 2004).

An audit of antibiotic prescribing in two governmental teaching hospitals in Indonesia found that only 21% of prescriptions were considered appropriate, 15% were inappropriate regarding choice of medicine, dosage or duration, and 42% of prescriptions were deemed to be unnecessary (Hadi *et al*., 2008). An assessment of antibiotic prescribing practices in primary and secondary health care facilities in Uttar Pradesh, India found an overall antibiotic prescription rate of 81· 8%, which is very high (Kumar, Indira, Rizvi, Rizvi, & Jeyaseelan, 2008). Research done in Uganda showed that prescribing practices by both private and public practitioners were highly irrational and did not conform to treatment guidelines and recommended educational interventions (Obua, Ogwal-Okeng, Waako, Auopont, & Ross-Degnan, 2004).

In Namibia, various medicine use surveys provide evidence of wide spread inappropriate use of medicines across all levels of health care. Some examples of such surveys include medicine use mini survey in Kunene region (Kabel, 2008) and the third national survey on the use of medicines in Namibia's public health institutions, including monitoring the implementation of the National Drug Policy (Lates & Shiyandja, 2001). The Pharmacy Management Information System (PMIS) report of July to September 2015 of Division: Pharmaceutical Services of MoHSS shows that prescribing practices in Namibia public health facilities are below recommended standards (Niaz, Phulu, & Nghishekwa, 2015). The average number of medicines per prescription has been on the rise nationally from 1.6 in 2012 to 2.9 in 2015, giving an indication of increasing Polypharmacy. The percentage of medicines prescribed by generic name declined nationally from 83% in 2012 to 77% in 2015, while antibiotic prescribing fluctuated between 44% and 50% during 2012 to 2015 which is way above the MoHSS set target of 25% and acceptable limit of 35% (Niaz et al., 2015).

The inappropriate use of medicines is not only widespread, it is also costly and has the potential to be extremely harmful both to the individual and the population as a whole. Adverse drug events rank among the top 10 causes of death in the USA and are estimated to cost that country between US$ 30 and US$ 130 billion each year (Holloway & van Dijk, 2011). Growing resistance to antimicrobial medicines is a particularly serious challenge in countries at all economic levels, and results largely from inappropriate prescribing and use. For the treatment of malaria, chloroquine resistance is now

established in 81 of the 92 countries in which the disease is endemic (Holloway & van Dijk, 2011). Non standardization in prescribing practices can lead to poor health care outcomes for patients, poor inventory control, as well as loss of valuable resources. Irrational use of medicines may cause significant harm to patients leading to poor patient outcome and significant adverse drug reactions (ADRs), development of antimicrobial resistance (AMR) and waste of resources leading to an increased economic burden (WHO, 2002).

Much greater use of evidence-based diagnostic and treatment guidelines by health professionals is needed. More effective monitoring and regulation of medicines, and public education and information are important components of a strategy for increased rational use (Holloway & van Dijk, 2011). In order to promote Rational Use of Medicines (RUM) in Namibia, the MoHSS adopted the Essential Medicine concept at the time of Independence and the first National Medicine Policy was launched in 1998 (MoHSS, 1998). Namibia's first Standard Treatment Guidelines (STGs) addressed conditions managed at clinics and health centres were launched in 1994. Unfortunately health workers in Hospitals did not feel that the guidelines applied to them – even though they were treating some of the same conditions. Further guidelines for individual conditions were developed – especially for Tuberculosis, Malaria and HIV/AIDS, but there was still a lack of comprehensive STGs in Namibia, covering the majority of conditions seen in health facilities (chronic as well as acute) until 2011 (MoHSS, 2011). STGs are important interventions as part of improving medicine use in countries (Management Sciences for

Health, 2012). The impact of the launch and implementation of Namibia's first comprehensive STGs was checked by MoHSS by conducting a post implementation assessment in 2014. The findings of Namibia STGs post assessment show that the overall compliance to the STGs was between 26.2 – 44.6 % nationally. This is quite low, as compliance to guidelines of 90% and above is considered ideal while 80% and above compliance is considered acceptable. Compliance to the STGs varied across the regions in Namibia; Erongo region had highest compliance at 44.6%; Karas region had lowest compliance at 15.4%; Khomas region had a compliance of 20.7% according to this assessment (Akpabio *et al*., 2014). Considering the worsening prescribing indicators and low compliance of prescribers to STGs, a need was identified to conduct a study on prescribing indicators and compliance to STGs in the Khomas region, one of the most populous regions of the Namibia.

1.2. Problem statement

Irrational prescribing remains a major public health challenge globally and in Namibia (WHO, 2004, Hadi *et al*., 2008, Obua *et al*., 2004, Kumar *et al*., 2008, Kabel, 2008, Lates & Shiyandja, 2001, MoHSS-Namibia, 2015) . The compliance to STGs in Namibia has been shown to be very unsatisfactory (Akpabio *et al*., 2014). Prescribing indicators such as average number of medicines per prescription, level of generic prescribing, percentage of prescriptions with antibiotics remains suboptimal (Niaz et al., 2015). These irrational prescribing practices may lead to wastage of resources, development of antimicrobial resistance and increase in poor treatment outcomes and adverse drug reactions (WHO,

2002) . Despite the fact that the MoHSS has taken steps to improve rational use of medicines across the country, including but not limited to a National system of tracking the Rational Use of Medicines (PMIS), implementation of Comprehensive STGs, training courses for prescribers and pharmacy staff, the problem of poor prescribing patterns and poor compliance to STGs still exists. Furthermore the causes and impact of irrational use of medicines has not been widely studied in Khomas region (Akpabio *et al*., 2014, MoHSS-Namibia, 2015). This study investigated the current trends in prescribing practices and compliance with STGs in different level health care facilities such as Hospitals, Health Centres and Clinics in Khomas Region of Namibia.

1.3. Significance and justification of the study

Although there were a few medicine use evaluation studies conducted in Namibia in the remote past (Lates & Shiyandja, 2001, Kabel, 2008), none of the studies were conducted on the prescribing patterns in Khomas region of Namibia. This study will fill the gap of knowledge about the current trends in prescribing and compliance to STGs in Khomas Region in order to design interventions to improve the use of medicines, with the aim of improving the health outcome at the population level as well as effective and efficient use of the resources available

The results of this study will inform the development and revision of medicine use policy at hospital, regional and national levels. Findings on prescribing patterns will help pinpoint specific problems associated with prescribing practices and compliance to STGs.

This study will help establish a baseline regarding prescribing indicators such as average number of medicine per prescription to check level of polypharmacy, prescribing by generic name, percentage of antibiotic and injection prescribing within the Khomas Region. The study will also identify factors that may influence prescribing indicators and STG compliance. Based on the findings, key stakeholders will be able to plan targeted and informed interventions to overcome the identified medicine use problems. This study will also inform the implementation of different level key interventions targeting prescribers that can be educational such as pre-service and in-service trainings, regulatory such as basic registration and continuous professional development for registration maintenance and administrative and policy level such as development and maintenance of STGs, EMLs and strict adherence protocols.

Ultimately, the implementation of the recommendations of the study hope to improve the current sub-optimal trends in prescribing practices and guidelines compliance. The study results will help identify, if there are any, specific cadres that should be prioritized when designing interventions. This will also help prioritize management of conditions in special population groups, in order to target interventions. The study will also help prioritize some disease conditions that might need urgent intervention to improve prescribing indicators and STG adherence.

1.4. Study Objectives

1.4.1. Main Objective

The main objective of the study is to evaluate the medicine prescribing practices in out-patient departments in public health facilities in Khomas Region, Namibia.

1.4.2. Specific objectives

The specific objectives of the study are to;

i. Determine selected prescribing indicators at out-patient departments (OPD) in the public health facilities in Khomas Region, Namibia.

ii. Determine the level of compliance to Namibia STGs among prescribers at OPD in the public health facilities in Khomas Region, Namibia.

1.5. Scope of study

The scope of this study will focus on prescribing practices of medicines used in public health facilities as indicated in STGs. The study will look at different public health facilities in Khomas including PHC facilities such as clinics and health centres as well as hospitals. Only prescriptions and prescribers at out-patient departments will be evaluated for prescribing patterns and adherence to STGs.

1.6. Conceptual framework

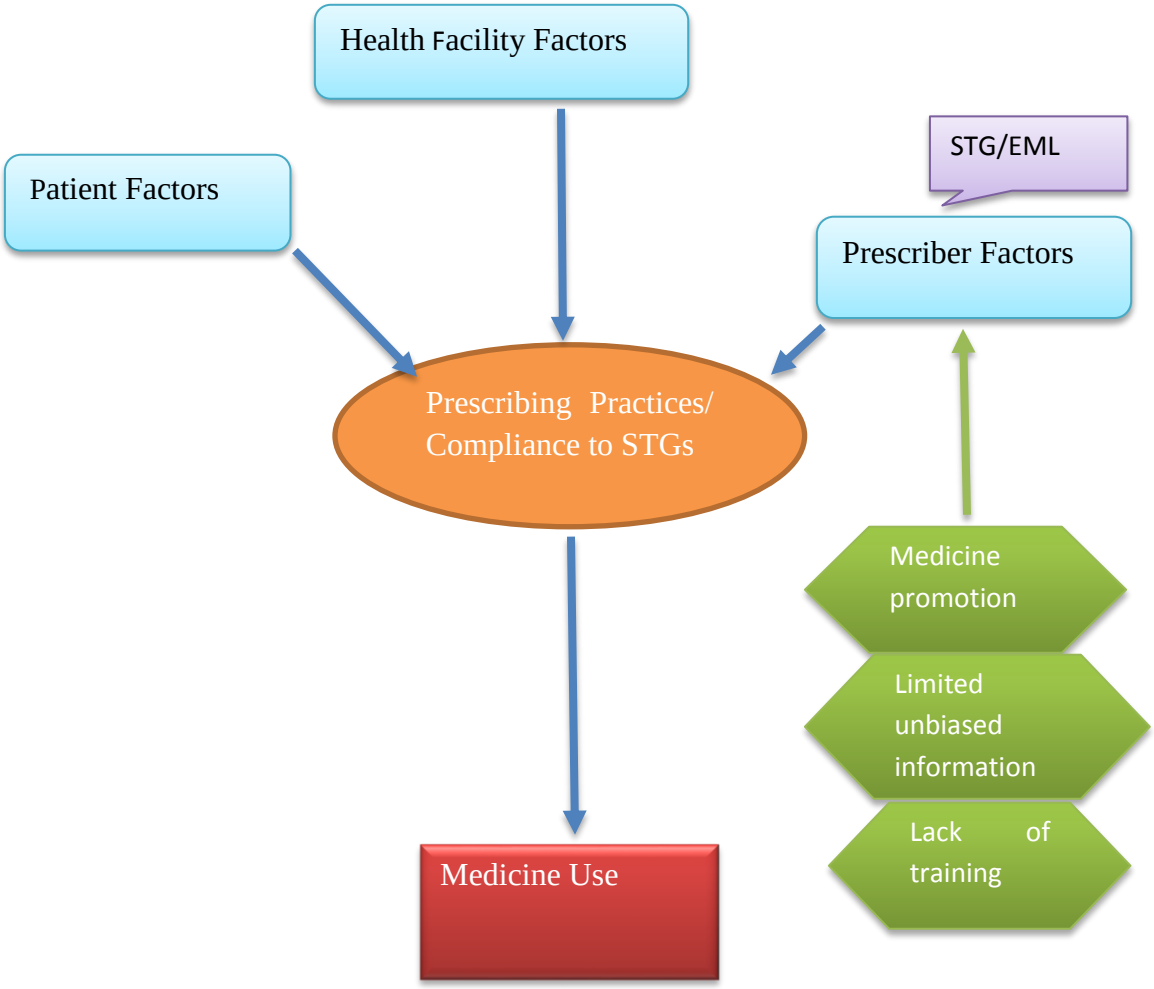

Figure 1: Conceptual Framework of the study

The model of conceptual framework for this study (**Figure 1)** illustrates the potential determinants of prescribing practices with special focus on prescriber related factors. Several factors affect prescribing practices including patient related factors, health facility related factors and prescriber related factors.

1.7. Summary

This chapter provided the introduction and background of the problem associated with the irrational prescribing worldwide and in Namibia that led the researcher to conduct this study. The researcher has provided justification, significance and conceptual framework of the study and stated the problem and study objectives of this study. The next chapter discusses the literature review related to the study topic.

CHAPTER TWO : LITERATURE REVIEW

2.1. Introduction to literature review

A literature review involves finding, reading, understanding and forming conclusions about the published research and theory as well as presenting it in an organized manner (Burns & Grove, 2005). For the purpose of this study, an intensive review of the literature related to prescribing patterns and compliance to STGs was done and summarized. The literature review has been divided and presented according to the objectives. In the beginning of this chapter **(2.2)**, an overview is given of Namibia and its health care profile. The following sections provide an overview of RUM **(2.3)**, prescribing patterns at health facilities **(2.4)**, the burden of irrational prescribing **(2.5)** and compliance to STGs **(2.6)** by prescribers. Gaps in current literature **(2.7)** and summary of the chapter **(2.8)** is provided in the end.

2.2. Namibia Health Care Profile

Namibia is classified as an upper middle income country (International Monetary Fund, 2015) and is situated in the Southern African Region of the African continent (Namibia Statistics Agency, 2013b). According to the Namibia 2011 Population and Housing Census main report, the total population of Namibia was estimated at 2,113,077; Khomas Region where study is conducted had population of 342, 141 (Namibia Statistics Agency, 2013a). Life expectancy at birth was estimated at 66 years for males and 70 years for females. The probability of dying between 15 and 60 years per 1 000 population was 255

for males and 177 for females. The total expenditure on health per capita was US$ 749 while total expenditure on health as percentage of GDP was 7.7 % (WHO, 2016).

The Namibian Constitution Article 95 calls for maintenance of the welfare of the people by putting in place legislation in order to provide health care services for the people and also to ensure social welfare for the people including the weak and vulnerable members of the society (Government of Republic of Namibia, 1996). This legislation provides for MoHSS to develop essential health care programmes based on a Primary Health Care (PHC) approach which is scientifically sound and socially acceptable, based on standards and latest technology, universally accessible to individuals and families in the communities with their full participation and at a cost that the country can afford to maintain at every stage of the development in the spirit of self-reliance and self-determination (Government of Republic of Namibia, 1996). The MoHSS is also mandated to provide information, advice and training so that communities understand the PHC approach and its contribution to the health promotion and prevention of diseases and rehabilitation of those who are in need (Government of Republic of Namibia, 1996)

The vision of MOHSS is to be the leading provider of quality health care and social services' while the mission of MoHSS is "to provide integrated affordable, accessible quality health care and social services responsive to the needs of the population" (MoHSS & ICF International, 2014). Health care services are provided by private and public sector. The majority of the population (85%) utilise the public health care facilities while only 15% of the population are serviced by the private health care sector (Brockmeyer, 2012).

The Namibia Public Health Care system is divided into 14 regional health directorates; Public Health Care facilities are divided into different levels. The highest level of health care facility is the National Referral Hospital followed by Intermediate Hospitals, District Hospitals, Health Centres and Clinics. The health services are also provided at outreach health posts in the community. In addition to the 14 regional health directorates, National Directorates include Primary Health Care Services, Developmental Social Welfare Service, Special Programs, Finance and Logistics, Internal Audit, Quality Assurance, Tertiary Health Care and Clinical Support Services, Policy Planning and Human Resource Development, Human Resource Management and General Services (MoHSS, 2016). Prescribing cadres for humans, according to legislation, include medical doctors, dentists and nurses (Government of Republic of Namibia, 2003).

The pharmaceutical services rendered in Namibia (both public and private sectors) are guided by a National Medicine Policy (NMP). In the public sector Pharmaceuticals are procured centrally by the Central Medical Store (CMS) and are distributed via CMS and two Multiregional Medical Depots (MRMD) to all public health facilities (MoHSS, 1998). The Subdivision National Medicine Policy Coordination (NMPC) of the Division Pharmaceutical Services monitors pharmaceutical service delivery via Pharmaceutical Management Information System (PMIS) using a set of indicators that cover RUM and quality of care indicators; stock management and item availability indicators; human resource development and work load indicators; and medicine financing indicators (MoHSS, 2012b).

The National Medicine Policy of Namibia has a component on RUM and promotes all WHO proposed strategies in this regard (MoHSS, 1998). Namibia adopted an Essential Medicine Concept in 1995 and launched their first Essential Medicine List (EML) in the same year (MoHSS Nemlist, 2011). Treatment guidelines for some conditions existed in the form of Treatment Manual for Clinics and Health Centres and a Pocket Manual for Health care workers, published in 1992 and 1996 respectively. Some specific disease guidelines also existed for Malaria, Tuberculosis (TB), and Antiretroviral Therapy (ART), however the first comprehensive STGs for Namibia were published in 2011 (MoHSS, 2011).

2.3. Overview of rational use of medicines

At the start of the 20th Century the only medicine widely available was Aspirin. In the 1940's the first antibiotic, anti-malarial, and anti-tubercular medicines were introduced. By the 1970's there were medicines available to treat nearly every major illness – but half the world's population had no access to these medicines at all (Quick, Hogerzeil, Velasquez, & Rago, 2002). Realising that this situation was not acceptable the World Health Organisation (WHO) introduced the concept of essential medicines in 1977 (WHO, 2002). Essential medicines' provision was one of the eight essential components of primary health care provision according to Alma Ata declaration (WHO, 1978). Essential medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and

comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford (WHO, 2002). The implementation of the concept of essential medicines is intended to be flexible and adaptable to many different situations; exactly which medicines are regarded as essential remains a national responsibility. Experience has shown that careful selection of a limited range of essential medicines results in a higher quality of care, better management of medicines (including improved quality of prescribed medicines), and a more cost-effective use of available health resources. In line with the essential medicine concept the Rational Use of Medicines (RUM) requires that patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community (WHO, 1985).

Improved access to pharmaceuticals as well as their appropriate use is important to achieve maximum benefits from them. Realizing the importance of appropriate use of medicines, the WHO (1985) brought all the countries together to sensitize and harmonize the RUM concept. The WHO has since developed a standard methodology to investigate medicine use problems including prescribing practices, implement and evaluate interventions to promote their rational use (WHO, 1993).

2.3.1. Factors causing irrational use of medicines

The WHO (2002) has provided a tried and tested method of analysing prescribing factors through prescribing indicators. Analysis of these indicators can be used to provide first-hand knowledge of prescribing practice trends at individual or groups of health facilities or even across a whole country. Several factors may affect the prescribing behaviour; some important influencing factors could be medicine promotion by company sales representatives, limited training of prescribers and availability of limited unbiased information. According to policy perspective on medicines by WHO (2002), factors that contribute to irrational use of medicines can be classified into three groups, namely health professionals' related, health infrastructure related and patient related factors. Examples of health professional related factors include inaccurate diagnosis, lack of training, etc. Health care system related factors include a poor pharmaceutical supply system, poor legislation regarding pharmaceutical registration and use and shortage of skilled workforce. Patient factors include misleading information and beliefs regarding medicines and treatment, cultural and religious influences, etc. Irrational use of medicines may lead to poor clinical outcome and adverse medicines reaction causing significant patient harm, antimicrobial resistance and waste of resources (WHO, 2002).

2.3.2. Consequences of irrational use of medicines

Irrational prescribing can lead to unfavourable health care outcomes. A few examples of the problems associated with irrational prescribing include but not limited to polypharmacy (use of too many medicines) which can result in increased adverse effects

for the patient, prescribing without using generic name of medicines, over prescribing of antibiotics, overprescribing of injections and non-compliance to treatment guidelines (Holloway & van Dijk, 2011).

2.3.3. Indicators used to measure prescribing patterns

Medicine use in health facilities can be assessed through objectively measuring their use using core medicine use indicators. The publication "How to Investigate Drug Use in Health Facilities" provides a set of indicators that can be used to identify problems in general prescribing and quality of care in health facilities and to compare different areas at different times (WHO, 1993). These indicators can be classified into prescribing, patient care, and facility-specific indicators. These indicators measure medicine use patterns and prescribing behavior (WHO, 1993) using WHO tested techniques. These indicators can be efficiently used to assess potential problems in medicine use and to prioritize and focus subsequent efforts to correct these problems. This study is focussing on prescribing indicators.

The prescribing indicators include the average number of medicines per out-patient prescription, whose purpose is to measure the degree of Polypharmacy (prescribing too many medicines per prescription), percentage of medicines prescribed by their generic names, percentage of prescriptions that include an antibiotic and percentage of prescriptions that include an injection, in order to measure the overall level of use of two important, but commonly overused and costly forms of medicine therapy (WHO, 1993).

2.3.4. Strategies to improve medicine use

There are four different types of interventions that have been developed and implemented successfully in order to improve medicine use throughout the world to address irrational medicine use including irrational prescribing (LeGrand, Hogerzeil, Haaijer-Ruskamp, & Le Grand, 1999).

Educational interventions include formal training of health care professionals, in-service training of health care professionals through workshops or seminars, on the job training and supportive supervision, provision of unbiased health information through printed and electronic materials (LeGrand *et al*., 1999). In a public hospital in South Africa antibiotic prescribing decreased from 46% to 26% after implementing educational intervention of prescriber training (Danysz, 2010).

Managerial strategies include adopting WHO essential medicine concept through the development and implementation of EMLs and STGs, appropriate procedures for procurement of pharmaceuticals, clinical supervision and implementation of good prescribing and dispensing practices (LeGrand *et al*., 1999).

Regulatory strategies include strict adherence to quality medicine registration to avail quality and safe medicines, regulating health care service facilities, prescribing and dispensing as well as pharmaceutical promotion (LeGrand *et al*., 1999).

Economic strategies include discouragement of financial incentives from pharmaceutical business and separation of the dispensing process from the prescribing process (LeGrand *et al*., 1999).

Core interventions that can improve medicine use include a mandated multi-disciplinary national medicine use policy coordinating body, development, implementation and review of STGs, development, implementation and review of essential medicine list, establishing Therapeutics Committees (TCs) in order to discuss therapeutic matters and promote RUM, inclusion of pharmacotherapy in undergraduate formal health education, continuous professional development as a requirement for professional registration renewal, supportive supervision, monitoring and evaluation, access to unbiased information, community targeted RUM promotion, discouragement of financial incentives, appropriate regulatory framework and governments financial commitment to ensure availability of pharmaceuticals and health care providers (WHO, 2002). One important strategy to improve rational prescribing is through formulating evidence-based clinical guidelines for training, supervision and supporting decision-making about medicines as indicated in Chapter 8 of The Worlds Medicine Situation (K. Holloway & van Dijk, 2011).

Implementing the above mentioned recommendations has been shown to improve medicine use in several health systems. After establishment of National medicine policy coordinating body in Oman, the average number of medicine per prescriptions reduced from 4.5 medicines in 1996 to 2.8 in 2006 and antibiotic prescribing reduced from 60%

to 38% (Jaffer, 2007). Antibiotic use for acute respiratory infection in children reduced after implementation of antibiotic guidelines in France whereas in US, the use of formulary in hospitals, improved the quality of prescribing, availability of medicines and reduced cost (Schiff *et al*., 2012).

2.4. Prescribing patterns at health facilities

The following section looks at literature specific to the indicators that will be studied in this paper.

2.4.1. Average number of medicine per out-patient prescription

The acceptable limit for average number of medicines per out-patient prescription according to MoHSS Namibia PMIS manual is 2.5 (MoHSS, 2012b). The average number of medicine per prescription in Namibia was 2.9 (Niaz et al., 2015). This average was found in the range of 1.9 in Ethiopia (Desalegn, 2013) to 3.4 in Iran (Cheraghali *et al*., 2004). Polypharmacy was found to be the norm in India with 52.7% prescriptions containing at least 3 medicines (Patel, Vaidya, Naik, & Borker, 2005). Another assessment in India found that the average number of medicine per prescription was 2.9 (Karande, Sankhe, & Kulkarni, 2015). A review study by Holloway *et al* shows an average number of medicine per prescription between 2.1 and 2.8 (K. A. Holloway, Ivanovska, & Wagner, 2013). When compared with MoHSS Namibia standards, most of the studies except the one conducted in Ethiopia revealed existence of polypharmacy.

2.4.2. Prescribing using generic names of medicines

MoHSS Namibia considers 80% or above medicines prescribed using generic name as acceptable (MoHSS, 2012b). In Namibia prescribing with generic name was 77% (Niaz et al., 2015). The literature review revealed that prescribing using generic names of medicines ranged between 0% medicines prescribed using generic names, as a study in the United States (Steinman, Chren, & Landefeld, 2007), to 98.7% as found by an assessment of drug use pattern using WHO prescribing indicators in Ethiopia (Desalegn, 2013). In India generic prescribing was found to be in the range of 48.5% (Bhartiy, Shinde, Nandeshwar, & Tiwari, 2008) to 73.4% (Karande *et al*., 2015) which is unacceptable according to MoHSS Namibia standards. Another study in India found that only 10% of prescriptions contained generic medicines (Patel *et al*., 2005). A study in Lao found that 78% medicines were prescribed by generic name (Keohavong, Syhakhang, Sengaloundeth, Nishimura, & Ito, 2006) which is quite close to MoHSS Namibia standards (MoHSS, 2012b). In neighbouring South Africa, a study found that only 21% of the medicine were prescribed using their generic name (Karim, Pillai, Ziqubu-Page, Cassimjee, & Morar, 1996) which is far below the standards set by MoHSS Namibia (MoHSS, 2012b).

2.4.3. Antibiotic Prescribing

Antibiotics have been vital in healthcare since their introduction in the 1940s (Penesyan, Gillings, & Paulsen, 2015). They play an important role in treating serious infections, preventing infections in surgical patients, protecting cancer patients and people with

compromised immune systems, and promoting growth and preventing disease in livestock (Gelband *et al*., 2015). Rational antibiotic prescribing and use is important to prevent development of resistance (Penesyan *et al*., 2015). MoHSS Namibia aims to achieve the threshold of less than 25% prescriptions containing antibiotics while less than 35% prescriptions containing antibiotic is considered acceptable (MoHSS, 2012b). A brief summary of several studies done on antibiotic prescribing and use are presented below.

2.4.3.1. Percentage prescriptions with an antibiotic

Antibiotic prescribing in Namibia was found to be 44% (Niaz et al., 2015). A study done in Jordanian hospital and emergency clinics found antibiotic prescribing at 35.6% (Al-Niemat, Bloukh, Al-Harasis, Al-Fanek, & Salah, 2008). Three different studies in India found antibiotic prescribing at 39.6% (Karande *et al*., 2015), 60.9% (Bhartiy *et al*., 2008) and 75% (Patel *et al*., 2005). A Lao study found antibiotics prescribing at 47% (Keohavong *et al*., 2006). In Iran the antibiotic prescribing was 58% (Cheraghali *et al*., 2004). A study in Ethiopia found antibiotic prescribing at 58.1% (Desalegn, 2013). A review study found that in developing countries, antibiotic prescribing was in the range of 45% to 54% (K. A. Holloway *et al*., 2013). When comparing with standards (MoHSS, 2012b), antibiotic prescribing was above 35% and hence unacceptable in all the above studies.

2.4.3.2. Factors contributing to irrational antibiotic prescribing

A study in Korea suggests that antibiotic prescribing does not relate to level of education in the healthcare setting (Choi, Park, Lee, & Kwon, 2012). A study in Canada found that physicians who see more patients and, presumably, spend less time with each patient prescribe more antibiotics than those who see fewer patients (Hutchinson & Foley, 1999). Physicians in the UK who has been in practice for a longer duration of time, or are not involved in medical teaching appear to misuse antibiotics more frequently (Steinke, Bain, MacDonald, & Davey, 2000). It was also found that in addition to using antibiotics for inappropriate indications, physicians were using more broad-spectrum antimicrobials, considered as second- or third-line agents to treat common infections (Linder & Page, 2001).

2.4.3.3. Antibiotic prescribing in Upper Respiratory Tract Infections

Antibiotics are frequently prescribed for respiratory infections, even though most of these infections are viral (Robert, Ronald, & Debra, 1996). Two studies in US showed that the rates of prescribing antibiotics for upper respiratory infections were in the range of 40% - 75% (Nyquist, Gonzales, Steiner, & Sande, 1998) and 16% to 80% (Mainous, Hueston, & Love, 1998) respectively. With regards to treatment of adults with sore throat in US, antibiotic prescribing was between 68% and 73% (Linder & Page, 2001). Antibiotic prescribing for URTIs at Katutura Health Centre (KHC) in Namibia was found to be 78% (Kunda, 2014).

2.4.3.4. Antibiotic prescribing in children

In Canada, prescribing of antibiotics in respiratory infections in preschool children under 5 years of age range from 24% to 80% (Wang, Einarson, Kellner, & Conly, 1999). Adherence to management guidelines in acute respiratory infections and diarrhoea in children under 5 years old in PHC facilities in Botswana found antibiotic prescribing at 30% (Boonstra, Lindbæk, & Ngome, 2005).

2.4.4. Injection Prescribing

Literature review on injection prescribing has been presented under three sub-sections; % prescriptions with an injection (2.4.4.1), consequences of irrational injection prescribing (2.4.4.2) and strategies to improve injection use.

2.4.4.1. Percentage prescriptions that include an injection

The overall range of injection prescribing as per reviewed literature was between 0.2% as reported in an Indian study (Karande *et al*., 2015) and 78% as reported by a study in Bangladesh (Chowdhury *et al*., 2011). A different study in India found injection prescribing at 13.6% (Bhartiy *et al*., 2008). Injection prescribing was found to be 18% in Lao (Keohavong *et al*., 2006), 36.9% in China (Tang *et al*., 2013), 38.1% in Ethiopia (Desalegn, 2013) and 41% in Iran (Cheraghali *et al*., 2004). An assessment in Nepal established that during the 3 month study period one or more members per household received an injection (Gyawali *et al*., 2015). Although MoHSS does not monitor use of

injections as per regular PMIS, injection prescribing of 15% and above is considered irrational (Eldin & Ali, 2013). Keeping in view this standard, injection prescribing was within standards in two Indian studies (Karande *et al*., 2015, Bhartiy *et al*., 2008). Injection prescribing in rest of the studies reviewed was way above acceptable standards of 15% (Eldin & Ali, 2013)

2.4.4.2. Consequences of irrational injection prescribing

21 million hepatitis B, 2 million hepatitis C and 260 000 HIV/AIDS cases may be caused by re-use of syringes and needles without sterilization (Hauri, Armstrong, & Hutin, 2004). 5% of new HIV infections in developing countries may be attributable to unsafe health care injections (Guilbert, 2003). About 16 billion preventive and curative injections are given each year in developing countries. Over 95% of all injections given are curative (therapeutic). For every vaccination given, 20 therapeutic injections are administered. The more injections are given, the more people are exposed to needles and syringes thus increasing the risk of exposure (WHO, 2000).

2.4.4.3. Strategies to improve injection use

In order to ensure the safe and appropriate use of injections, WHO (2000) recommends following strategies;

- Increased awareness regarding the risk of infections associated with unsafe and unnecessary injections.
- Building the concept of safe and appropriate use of injections within national medicine policy.
- Ensuring availability of sufficient quantities of single-use injection devices and safety boxes in every health care facility.
- Avoiding unnecessary injections.
- Safe and appropriate waste management of dirty syringes and needles.

Publicly reporting performance data on injections portrayed injection prescribing reduction from 73.4% to 69.32% (Wang *et al*., 2014).

2.5. Burden of irrational prescribing

A summary of literature on burden of irrational prescribing has been summarized below in two subsection; unsatisfactory medicine use patterns **(2.5.1)** and antimicrobial resistance **(2.5.2)**

2.5.1. Unsatisfactory medicine use patterns

According to the WHO action programme on essential medicines, irrational prescribing is a global concern because more than 50 % of all medicines are prescribed, dispensed or sold inappropriately (Hogerzeil, 1995). A study showed that prescribing and dispensing practices were not satisfactory in the public sector health facilities of Pakistan like many other developing countries (Hafeez *et al.,* 2004). Another study in Pakistan revealed that

irrational medicine use was a major problem in medical practice and its consequences could lead to resistance to antibiotics, ineffective treatment, adverse effects and an economic burden on the patient and society (Siddiqi *et al*., 2002). In Mexico, it was determined that irrational use of medicines is a frequent problem in all therapeutic fields examined, mostly documented in antibiotics and drugs for the symptomatic treatment of diarrhoea (Wirtz, Reich, Flores, & Dreser, 2008). A Nigerian study showed that the pattern of prescription medicine use in their army hospitals was unsatisfactory and was characterized by a high number of medicines per prescription, high rate of antibiotic use and unscientific prescriptions by prescribers (Adebayo & Hussain, 2010). A Ugandan research showed that prescribing practices by both private and public practitioners were highly irrational and did not conform to treatment guidelines and recommended educational interventions as recommended in their country (Obua *et al*., 2004).

2.5.2. Antimicrobial resistance

Antimicrobial resistance (AMR) is defined as the resistance of a microorganism (bacteria, fungi, viruses and some parasites) to an antimicrobial agent to which it was originally sensitive (WHO, 2014). In recent years, once-treatable infections are becoming difficult to cure (Cars *et al*., 2007). Many pathogens are resistant to more than one antibiotic (Penesyan *et al*., 2015). Antibiotic prescribing is of great concern because overprescribing of antibiotics leads to antimicrobial resistance rendering them unusable in future, thus limiting the treatment options (Gelband *et al*., 2015). Among others, over- prescribing of antibiotics is one of the factors leading to antimicrobial resistance. The WHO report on

global surveillance of antimicrobial resistance (2014) revealed resistance to third-generation Cephalosporins in several countries and the wide spread resistance to Flouroquinolones and Carbapenems considered last resort for life-threatening infections caused by common intestinal bacteria (WHO, 2014). AMR threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi (WHO, 2014). A study by Metcalfe *et al* in 2010 shows that individuals prescribed an antibiotic in primary care, for a respiratory or urinary infection, develop bacterial resistance to that antibiotic (Metcalfe, Lovering, Mant, & Hay, 2010).

A review study revealed that globally, the increase in antibiotic resistance has been driven by the unrestrained use of antibiotics in human health, agriculture and animal husbandry (Prasad & Smith, 2013). An antimicrobial resistance research in Eastern Africa by Omulo *et al*. (2015) showed that the emergence and persistence of antimicrobial resistance is driven by varied factors including the indiscriminate use of antibiotics and variable drug efficacy and presents a major threat to the control of infectious diseases (Omulo, Thumbi, Njenga, & Call, 2015). A study in Pakistan revealed that *K. pneumoniaea* showed very high resistance of 60% to gentamicin. *S. aurus* showed lowest sensitivity for Ampicillin and moderate sensitivity for erythromycin, methicillin and cefotaxime (Bano *et al*., 2012). Resistance of *K. pneumoniaea* against carbapenem emerged in 18 European countries from 2005 to 2010 (Magiorakos, Suetens, Monnet, Gagliotti, & Heuer, 2013).

Antimicrobial resistance is not only a concern for treatment of routine infections – it is also a serious concern for the ongoing treatment of the three major infectious diseases in Namibia – HIV, TB and Malaria. In 2013, there were an estimated 480 000 new cases of MDR-TB in the world. Extensively drug-resistant TB (XDR-TB, defined as MDR-TB plus resistance to any flouroquinolones and any second-line injectable drug) has been identified in 100 countries, in all regions of the world, including in Namibia (WHO, 2014). Namibia was ranked fourth in the world by the World Health Organisation (WHO) in terms of the per capita incidence of TB with 174 MDR TB cases reported in 2014 (MoHSS, 2015).

The emergence of *P. falciparum* multidrug resistance, including resistance to Artemisinin-based combination therapies (ACTs) is an urgent public health concern that is threatening the ongoing global effort to reduce the burden of malaria. This is of particular concern for Namibia which is taking steps to eliminate malaria totally.

As of 2010, levels of HIV drug resistance among adults were found to be about 5% globally (WHO, 2014).

According to the above literature overprescribing of antibiotics and other drugs should be halted if we want to restore our medicines for future. Should overprescribing continue, more antimicrobial resistance may be identified in future.

2.6. Compliance to STGs by prescribers

The STGs are designed to ensure that medications are administered in a safe, effective and economic manner, and can be very powerful tools in promoting the RUM. STGs helps prescribers make decisions about appropriate treatments for specific clinical conditions based on the signs and symptoms the patient is displaying. When medicines are not prescribed in accordance with STGs, it constitutes irrational use of medicines. A study of prescribers' compliance to STGs can provide an indication of whether interventions adopted by a country in the form of policies and guidelines to promote RUM, have been successful or not. STG compliance of more than 90% is desired whereas more than 85% compliance to guidelines is considered acceptable (Management Sciences for Health, 2012).

Compliance to STGs varies from country to country and also between different conditions. Suboptimal prescribing seems to exist in primary health care in developing countries with an STG compliance in the range of 30% to 40% (K. A. Holloway *et al*., 2013). STG compliance has shown to be different in different patient age groups as evident by a study in Bangladesh where adherence to STGs was 29.5% in paediatric and 52.7% in adult patients (Afreen & Rahman, 2014) which shows that paediatric prescribing is prone to irrational prescribing as compared to adult prescribing. The STG post implementation study in selected regions of Namibia showed STG compliance in the range of 26.2% to 55.1%. STG compliance in Khomas Region was 24.4% according to this study (Akpabio *et al*., 2014).

2.6.1. Compliance to STGs in respiratory infections

The literature review revealed compliance to guidelines in different respiratory infections in different parts of the world in range of 3.3% in Bangladesh (Afreen & Rahman, 2014) to 89.5% in Canada (Arnold, Allen, Al-zahrani, Tan, & Wang, 1997). In Canada compliance to antibiotic prescribing guidelines in paediatrics for respiratory infections was 89.5% (Arnold *et al*., 1997). In Iran only 23% of prescriptions on average followed national guidelines for acute upper respiratory tract infection, and 66% for mild to moderate pneumonia (Cheraghali *et al*., 2004). In a rural paediatric hospital in Sierra Leone adherence to STG's for lower respiratory tract infections was 14% (Bruycker *et al*., 2013). In Bangladesh, treatment guideline adherence in bronchial asthma and pneumonia in children was found to be 3.3% while in adult patients it was 13.3% in bronchial asthma (Afreen & Rahman, 2014). Adherence to management guidelines in acute respiratory infections in children under 5 years old in PHC facilities in Botswana was 26% (Boonstra *et al*., 2005). Compliance to STGs for URTI in KHC in Khomas Region was 47% (Kunda, 2014). Except in the Canadian study, compliance to STGs in different respiratory infections was below 80% which is unacceptable as per standards set for this study. MoHSS Namibia does not have any set targets for STG compliance at this moment.

2.6.2. Compliance to STGs in Gastrointestinal Tract infections

Another group of infections that are commonly mis-treated are Gastrointestinal Tract (GIT) infections. In India compliance to STGs for treatment of acute diarrhoea in children up to 12 years of age was found to be 0.7% (Pathak, Pathak, Marrone, Diwan, & Lundborg, 2011). In Iran, only 12% prescriptions, on average, followed national guidelines for treating uncomplicated diarrhoea (Cheraghali *et al*., 2004). Compliance to guidelines in managing childhood diarrhoea was 15% in Thailand (Howteerakul, Higginbotham, Freeman, & Dibley, 2003). Adherence to management guidelines in diarrhoea in children under 5 years old in PHC facilities in Botswana revealed compliance in 26% prescriptions (Boonstra *et al*., 2005). Thus compliance to STGs for various diarrhoeal diseases ranged between 0.7% (Pathak *et al*., 2011) and 26% (Boonstra *et al*., 2005) which is way below expectable threshold of 80% compliance.

2.6.3. Compliance to STGs in non-communicable diseases

In Scotland, guideline adherence in patients with diabetes mellitus was found to be at 74.0% (Ernst, Kinnear, & Hudson, 2005) whereas in India 83.6% of prescription in diabetes complied with STG's (Khushali, Kartik, Nilay, & Devang, 2013). These studies revealed reasonable compliance to STGs when treating diabetes mellitus. A study in France, Germany, Italy, The Netherlands, Spain, and UK on adherence to European guidelines for the treatment of chronic heart failure was in the range of 60% to 63% (Komajda *et al*., 2005). A study in USA found non-compliance to Joint National Committee recommendations for hypertension to be in the range of 47.7% to 67.5%

(Clause & Hamilton, 2002) whereas in Malaysia, adherence to hypertension treatment guidelines was 75.92% (Abdulameer *et al*., 2012). A comparison of two methods for measuring anti-hypertensive drug use and concordance with South African STG's showed substantial non-compliance to STG's (Pillay, Smith, & Hill, 2009).

2.6.4. STG Compliance in antibiotic prescribing

Compliance with antibiotic prophylaxis guidelines to prevent infective endocarditis in dental Settings showed good compliance of 87% and 75% in UK and Iran respectively (Soheilipour, Dunne, Newton, & Jabbarifar, 2009). In US, compliance to treatment guidelines for non-tuberculous mycobacterial lung disease was very poor at 13% across all levels of physicians (Adjemian *et al*., 2014). In Nigeria, with respect to compliance to antibiotic prescribing standards in the country, 52% of the total prescriptions were appropriate whereas 30% were inappropriate (E Obaseiki-Ebor, Akerele, & Ebea, 1987).

2.6.5. Compliance to STGs in vector borne diseases

A study in a rural paediatric hospital in Sierra Leone showed a good compliance of 88% with malaria guidelines (Bruycker *et al*., 2013) whereas uncomplicated malaria treatment at government health facilities in Kenya found that 56.9% children received recommended treatment, 30.4% had minor errors, and 12.7% received inappropriate treatment (Zurovac *et al*., 2004). In Kenya; a further study showed that the reference guidelines for malaria prescribing were available in very few health facilities and health workers did not

prescribe an appropriate regimen for anti-malarial to more than half of the patients and care giver of the patients with uncomplicated malaria (Tetteh, Njoroge, & Wambua, 2006).

2.7. Gaps in current literature

The literature review shows that the irrational use of medicines is a major problem worldwide particularly in developing and transitional countries. These problems include, but are not limited to, polypharmacy, antibiotics and injections overuse, non compliance to STGs and limited use of generic names when prescribing. The literature review also revealed a gap in the study in terms of published studies on irrational use of medicines in Namibia. To date the National PMIS reports have been used as a local baseline of prescribing practices and to monitor the impact of interventions implemented by MoHSS, Namibia inline with WHO recommendations.

A few surveys were conducted in the past that looked at prescribing patterns but that was long before Namibia's comprehensive STGs were developed and implemented. Also, no study to analyze prescribing patterns in Khomas Region of Namibia was conducted. Compliance to treatment guideline studies have been undertaken in different parts of the world including Africa but most of the studies were undertaken for specific conditions or group of conditions, including STG post assessment conducted in Namibia. No study of compliance to STGs in general in Namibia has been published to date. This literature gap prompted the researcher to conduct this study.

2.8. Summary

This chapter provided a literature review of studies conducted world wide keeping in view the objectives of this study. It provided an overview of rational use of medicines and the burden of irrational prescribing. It further included a summary of different studies conducted globally on prescribing indicators such as the average number of medicines per prescription, antibiotic prescribing, injection prescribing and compliance to STGs. A literature review on antimicrobial resistance, which is one of the consequences of antibiotic overuse, has also been provided.The researcher has also provided a summary of literature review on different strategies that can be employed to improve irrational use of medicines. At the end of the chapter, a discussion on identified gaps in literature is provided. The following chapter will outline the research methodology and study design that was used to achieve the study objectives.

CHAPTER THREE : RESEARCH METHODOLOGY

3.1. Chapter overview

The study design and settings are explained at the start of this chapter **(3.2)** .Following sections provide an overview of study population **(3.3)**; sample size and sampling methods **(3.4)**; selection criteria **(3.5)**; data collection instruments **(3.6)**; reliability and validity of instrument **(3.7)**; data collection procedure **(3.8)**, study variables **(3.9)**, thresholds for prescribing indicators **(3.10)** and data management and analysis **(3.11)**. Ethical considerations **(3.12)** and Summary of the chapter **(3.13)** is provided at the end.

3.2. Study design and setting

A descriptive observational cross-section study design was adopted in this study to observe the prescribing patterns at the out-patient departments. The design adopted a mixed approach for data collection that included quantitative methods to collect indicators on prescribing of medicines as described by World Health Organisation indicator based medicine use survey tools on how to investigate medicine use at health facilities (WHO, 1993) and qualitative methods to evaluate factors and practices associated with prescribing of medicines at out-patient departments in the Khomas Region. Patient prescription records in patients' health passports (prescriptions booklets) were analysed to determine patterns of medication prescribing. An interviewer administered questionnaire (Annex 2) was administered to prescribers at the selected health facilities to evaluate the factors driving medication prescribing. The advantage of this cross sectional

observational design is that both the predictors (factors) and the outcomes (prescribing patterns) in this study will be determined at the same time – thus maximizing the use of time. However the disadvantage of this design is the possibility of excluding certain patients and prescribers in the study population who are not accessible during the time of the study. To overcome this limitation we conducted the study over several months from 1st February 2015 and 31st July 2015 to minimize the chance of excluding any patient groups or prescribers.

The study setting for this study was two different level of public health care facilities namely hospital and PHC facilities in Khomas Region of Namibia. The hospital selected was Intermediate Hospital Katutura (IHK) whereas PHC facilities included Katutura Health Centre (KHC) and Khomasdal Clinic (KMDC). All these facilities are located in Khomas Region. The Khomas Region hosts the capital city, Windhoek, of Namibia.

3.3. Study population

The study population consisted of – all public health facilities in Khomas Region of Namibia providing out-patient health care services; all out-patient prescriptions and all prescribers at the out-patient departments of the three health care facilities in the Khomas Region of Namibia during the study period 1st February 2015 and 31st July 2015. According to the Namibia 2011 Population and Housing Census the total population of Khomas Region where study was conducted had population of 342, 141 (Namibia Statistics Agency, 2013a).

Health facilities in the Khomas Region were selected due to the diverse cosmopolitan patient and prescriber populations. These populations thus provide an opportunity to evaluate variations in medicine prescribing in diverse populations and design appropriate interventions for specific study populations.

We stratified the prescribers and patients by the level of care – to include an evaluation of prescribing practices at a primary health care and secondary health care. Currently in Khomas Region, there is one national referral hospital, one intermediated hospital, one health centre and ten clinics.

3.4. Sample size and sampling methods

A total of three samples were evaluated in this study: health facility, patient prescriptions (health passports) and prescribers.

3.4.1. Health Facility Sampling

The three health facilities were purposively sampled in the study based on the level and/or type of care as classified by the MoHSS. The World Health Organisation (1993) recommends that different types or levels of health facilities in a given location should be included in order to account for differences in medicine prescribing and utilization patterns. We included two primary health care facilities – Khomasdal Clinic (KMDC) and Katutura Health Centre (KHC) and one hospital – Intermediate Hospital Katutura (IHK).

The KHC and the IHK were purposively selected based on the fact that KHC is the only health centre and Khomas Region has two hospitals but Windhoek Central Hospital was not eligible for inclusion in this study as it's a tertiary health facility that provides National referral services. Medicine prescribing indicators are designed for use at primary health care levels such as health centres, clinics, dispensaries or hospital out-patient departments (WHO, 1993). The prescribing indicators are less useful in inpatient settings, or in specialty out-patient clinics in referral hospitals where the drug use patterns are more complex. The Khomasdal clinic was also purposely selected among the ten clinics in the Khomas Region based on its proximity and demographic and service similarity to health centre and hospital included in the study. The other clinics such as Donkerhoek, Wanaheda, Otjomuise, Hakahana, Baumgart and Okuryangava were not included because they are located mainly in informal settlements and Groot Aub and Dordabis as they are located in rural areas. This may introduce confounding factors when comparisons in prescribing patterns are made among different public health care facilities.

3.4.2. Prescription sampling

The sample size for patient prescriptions was determined using Kish Leslie (1985) method for a single sample estimation of proportions. We used the smallest estimated proportion of the indicators as the p value to estimate the sample size. Power of the study was set at 80%. The level of significance was $\alpha = 0.05$ with a critical value of 1.96 for a two-tailed test. The calculation for the sample size was as follows. P = 0.26 which was determined

from a previous study on the level of compliance to STG that was estimated as 26.2% (Akpabio *et al*., 2014)

$$n = \frac{Z\alpha^2 * SD^2}{L^2}$$

$$n = \frac{(z\alpha)^2 * \{\sqrt{(p * (1- p)^2\}}}{(\alpha)^2}$$

$$n = \frac{(1.96)^2 * \{\sqrt{(0.262 * (1-0.262)^2\}}}{(0.05)^2}$$

n= 584

So a total of 584 prescriptions were to be evaluated at each of the two health care levels of hospital and PHC. Since the study was conducted at two different levels of health care, we estimated the total sample at 2*584= 1168. We included an additional 6.5% to account for prescriptions that may have missing data. So a maximum number of prescription records to be collected was 1, 243.

The WHO (1993) also recommends that the total number of prescriptions to be evaluated by health facility should be triangulated based on the patient work load in out-patient departments of each health facility. Also the WHO manual (1993) on "How to investigate drug use in health facilities: selected drug use indicators", for the purpose of Surveys describing current prescribing practices the WHO recommends at least 600 prescriptions

per level of health facility should be included in medicine use surveys giving a total value of 2*600= 1, 200 as study was conducted at two health care levels.

Systematic stratified random sampling technique was used to collect prescription samples. The allocation of samples per selected three health facilities was calculated on the basis of patient workload statistics obtained from health facilities. The average number of patients seen at out-patient pharmacies per month was calculated, using statistics from preceding 12 months i.e. January 2014 to January 2015. The average number of patients seen at out-patient pharmacy of IHK per month was 6940, 4310 per month at KHC and 1180 per month at KMDC. It shows that on total 12430 patients were served by out-patient pharmacies of these three health facilities on average monthly which translates into 10% patients being seen at KMDC, 35% at KHC and 55% at IHK.

Therefore, the researcher calculated that out of total 1243 prescriptions, 10% would be collected at KMDC, 35% would be collected at KHC and 55% would be collected at IHK. It should also be noted that indicator studies should be restricted to a sample of general illness encounters, representing a mix of health problems and ages as per WHO guidelines (WHO, 1993). Therefore, general out-patient prescriptions were selected and not the ones from specialized clinics.

The WHO recommends that a minimum of 100 prescription records per each selected health facility should be selected in order to get reliable results for a medicine use indicator study (WHO, 1993). The researcher ensured that he followed this recommendation.

We evaluated all health passports (prescriptions) of all patients who received care at the out-patient departments of the three departments during the study period. The prescriptions were collected from patient health passports. For each of the three health facilities included in this study, prescriptions were included based on a simple stratified random sampling technique based on prescriptions of every third patient who received care at the out-patient department during each day of the study period. We excluded prescriptions with incomplete information such as missing diagnosis or missing details of the patient. Prescriptions originating at other health facilities were excluded from study

3.4.3. Prescriber Sampling

The sample of prescribers to be included in the study was determined purposively as only prescribers that were prescribing in out-patient departments at the time of data collection in the selected health facilities and whose names were appearing on the prescriptions collected were purposively included in the study. A total of 74 prescribers worked at the three public health facilities at the time of data collection. Of these 74 prescribers, 44 were employed at IHK, 21 at KHC and 9 at KMDC. At any given time, 12 prescribers worked at OPD in IHK, 8 at KHC and 5 at KMDC giving a total of 26 prescribers working at OPD in all three selected study sites. We used the duty rosters to identify the prescribers working at out-patient departments dispensing in the selected three sites to include them in the sample being studied. Using the roster, 40 prescribers were expected to work in three sites at OPD during data collection period. All those 40 prescribers were selected for prescriber interviews. We did not include prescribers in the inpatient departments

among our study population. For prescribers' interviews, those who were working in inpatients and other specialised clinics were excluded from the study.

3.5. Selection criteria

The inclusion (3.5.1) and exclusion criteria (3.5.2) for the three sample populations is provided below.

3.5.1. Inclusion criteria

Intermediate Hospital Katutura and Katutura Health Centre were purposively selected as they are the only two health facilities of their level in Khomas Region. Only one clinic was included based on the similarity in the patient and prescriber demographics to the health centre and hospital in the Region. All out-patient patient prescriptions written by prescribers employed at the out-patient departments of the three health facilities were included in the study. Only prescribers working in out-patient department of three selected health facilities who prescribed at the time of data collection were included.

3.5.2. Exclusion criteria

We excluded the National referral hospital, Windhoek Central Hospital because WHO (1993) recommends to exclude referral hospitals due to complexities in the patient cases and medications required to manage disease states. Incomplete prescriptions without a diagnosis were excluded from the study. Prescriptions from in patient department and specialised clinic were also excluded due to complexity of their nature. We excluded all

prescribers that do not work in the out-patient departments as well as those that did not prescribe to out-patients at the time of data collection and those who did not consent to participate in the study.

3.6. Data collection instruments

Data collection instruments consisted of – The Patient Prescriptions' extraction tool **(Annex 1)** to collect information from patient prescriptions and- The Survey for prescribers' tool **(Annex 2)** to collect information from prescribers**.** The Patient Prescriptions' extraction tool was used to collect information on patient demographics such as age and sex, clinical records on patients' diagnosis, details of the medication prescribed, health facility, type of prescriber, diagnosis and or signs and symptoms of the patient's condition. The Patient Prescriptions' extraction tool was pretested on 10 prescriptions at IHK and standardized before rolling it out to other facilities. The Patient Prescriptions' extraction tool had a set of 26 items or questions which mainly cover patient details, health facility details, clinical and treatment records and prescriber details. The Patient Prescriptions' extraction tool enabled assessment of prescribing indicators and compliance of treatment prescribed with the treatment recommended by the current STGs.

The Survey for prescribers' tool was used to collect data from the prescribers **(Annex 2).** The tool was piloted on two intern doctors at IHK and standardized before being rolled out for data collection. Data on the prescribers' details such as qualification and practice were collected; personal identifying data such as names were excluded. Other information

collected from prescribers included their cadre, their knowledge, attitudes and behaviours regarding good prescribing practices such as access to STGs and training, factors that drive the compliance to STGs and sources other than STGs utilised for referencing when prescribing.

3.7. Reliability and validity of the instrument

The validity and reliability of the above tools – prescription abstraction tool and self-administered questionnaire was censured by pilot testing at different sites and among the study populations. The patient data abstraction collection tool was piloted among 10 patients at KSH and standardized prior to full scale data collection. The self-administered questionnaire was piloted among two intern doctors at the OPD of KSH, this was standardized prior to data collection. Minor changes were made to both tools before the final data collection. These changes included a decision of including only prescriptions with diagnosis was made after piloting of the tool, as it was observed that it was difficult to include prescriptions with no diagnosis in this type of research. The data collected was entered in Microsoft Excel 2010 for data summarization and exported to SPSS Version 23 for exploratory statistical analysis.

3.8. Data collection procedure

The data was collected in two phases– the first phase was the collection of prescribing data from the patient passports. The second phase was to collect data on prescribing behaviours from the prescribers and their use of STGs. This is done in order to minimize

the Hawthorn effect and social desirability bias of prescribers wanting to demonstrate artificial compliance to STGs, which might bias the finding and conclusion of the study (Burns & Grove, 2005).

The data from the patients' prescriptions were collected during the study period between 1st February 2015 and 31st July 2015. Data from the patient health passports was collected by the researcher and two experienced data collectors. The data collectors were trained on the objectives and ensuring data quality and completeness. The most current prescription in the patient's health passport was studied. Only prescriptions written on the day of the study visit were evaluated.

Data collection from the prescribers to determine the level of compliance and use of STG in the prescribing of medicines was collected using a self-administered questionnaire. Only prescribers whose names appeared on the prescriptions evaluated in the first phase of the study were assessed. Self-administered questionnaires were delivered to prescribers during the study period 1st to 31st July 2015 to the prescriber consultation rooms. Prescribers who consented to participate completed questions on prescribing practices, STG compliance patterns and factors influencing compliance to good prescribing practices. During the collection of the questionnaire, a structured interview was conducted with the prescribers in each health facility under study to assess the availability and access to Namibia STGs and further shed light on factors that might impact on their prescribing

practices. The interview was structured in such a way that the answers could be thematically analysed and/or quantified.

3.9. Study variables

The study variables were subdivided by the type of study population – to include prescribing related variables and compliance to STG variables. The study took the health facilities, patient prescriptions and prescribers as the study units for analysis. The WHO Medicines Prescribing Indicators adopted by MoHSS Namibia were used as dependent variables; these are average number of medicines per prescription, percentage of medicines prescribed by generic name, percentage of prescriptions with an antibiotic prescribed (as per antibiotic list of MoHSS PMIS manual-2012, Appendix-3), percentage of prescriptions with an injection prescribed and percentage compliance with STGs . The independent variables used were; type of health facility, patient gender, patient age, and disease group.

Table 1: Independent and dependent variables

Specific objective	Variable	Indicator
i. Determine the prescribing indicators of different prescribers in the public health facilities in Khomas Region	Prescribing practices	• Ave number of medicines per prescription • % of prescriptions with an antibiotic • % of prescriptions with an injection • % of medicines prescribed by generic name
ii. Determine the level of compliance in prescribing practices with references to the Namibian Comprehensive STGs	STG compliance and use	• % compliance to STGs

3.10. Thresholds for prescribing indicators

According to the manual "How to investigate drug use in health facilities: selected drug use indicators" core medicine use indicators are divided into three groups Prescribing indicators, Patient care indicators and Health facility indicators (WHO, 1993). In this study researcher has studied prescribing indicators in chosen study sites. The prescribing indicators measure the performance of prescriber in several areas related to the appropriate medicine use. The prescribing indicators measure general prescribing tendencies within a given setting. Definitions of different indicators analysed their purpose, target and acceptable results are provided.

3.10.1. Average number of medicines per out-patient prescription (Polypharmacy)

The purpose of this indicator is to measure the degree of Polypharmacy. According to the Pharmaceutical Management Information System (PMIS) Manual, Poly-pharmacy is defined as the prescribing of more than the required number of medicines for a diagnosed disease condition. A high average number of medicines per prescription may indicate poor prescribing practices and irrational medicine use.

MoHSS (2012) threshold for the number of medicines per prescription in out-patient prescriptions is two (2) medicines per prescription while 2.5 medicine per prescriptions are considered acceptable (MoHSS, 2012b). Polypharmacy is also defined as "the long-term simultaneous use of two or more drugs (Banning *et al*, 2009). For the purpose of this study we considered prescriptions with 3 or less medicines as appropriate while prescriptions with more than 3 medicines were considered inappropriate regarding average number of medicine per prescription.

Following formulae was used to calculate average number of medicine per prescription.

$$\text{Average number of medicines per Out-patient prescription} = \frac{\text{Total number of medicines prescribed in all prescriptions}}{\text{Total no. of Prescriptions}}$$

The above formulae provided an overall view of average number of medicine per prescription cumulatively for the total prescription and per different sites. Later,

prescriptions were judged as an entity by following the criteria that each prescription was considered polypharmacy if it had 3 or more medicine.

3.10.2. Percentage of medicines prescribed by generic name

According to WHO guidelines on the use of International non-proprietary names (INNs) for pharmaceutical substances, International Non-proprietary Names (INNs) identifies pharmaceutical substances or active pharmaceutical ingredients. Each INN is a unique name that is globally recognized and is public property. A non-proprietary name is also known as a generic name. The INN system as it exists today was initiated in 1950 by a World Health Assembly resolution WHA 3.11 and began operating in 1953, when the first list of International Non-proprietary Names for pharmaceutical substances was published (WHO, 1953). Using generic names ensures common language among health care providers.

The purpose of the indicator "percentage of medicines prescribed by generic name" is to monitor the use of brand prescribing in a public setting. Brand prescribing can lead to confusion for prescribers as well as dispenser due to similar names leading to possible medication errors, adverse drug reactions and unfavourable clinical outcomes. According to MoHSS PMIS manual (2012), target result for this indicator is that 100 percent medicines are prescribed by generic name while 80% or above medicine prescribed by generic name is considered acceptable (Niaz et al., 2015). For the purpose of this study,

prescriptions with at least 80% medicine prescribed by generic name were considered appropriate.

The Following formula was used to calculate percentage of medicines prescribed by generic names in general and different study sites.

$$\begin{pmatrix}\%\text{ of medicines prescribed by generic}\\ \text{names in outpatient prescription}\end{pmatrix} = \frac{\begin{matrix}\text{No.of items prescribed by generic}\\ \text{names in sample prescriptions}\end{matrix}}{\text{Total No.items prescribed}} \times 100$$

The above formula provided an overall view of percentage generic prescribing cumulatively for the total prescription and per different sites. This was calculated by summing all the medicines prescribed by their generic name at each site and in total and dividing them with total number of medicines prescribed at each site and in total and multiplying them with 100 to get percenatge. Later, prescriptions were judged as an entity by following the criteria that each prescription was compliant to generic prescribing if 80% or more medicine were prescribed by generic name or else it was not compliant to generic prescribing standards if less than 80% medicines were prescribed by their generic names.

3.10.3. Percentage of prescriptions with an antibiotic

The purpose of this indicator is to assess the extent of antibiotic use in order to promote their rational use. According to MoHSS PMIS manual, target result for this indicator is less than 25% prescriptions having an antibiotic whereas acceptable result for this indicator is less than 35% prescriptions with an antibiotic (Niaz et al., 2015). Assessment of extent of antibiotic prescribing was done in order to promote their rational use thus reducing the development of antimicrobial resistance. MoHSS set target for this indicator is to have less than 25% of total out-patient prescription having an antibiotic while less than 35% is acceptable (MoHSS, 2012b). For purpose of this study any prescription containing one or more antibiotics was considered to be having an antibiotic as per MoHSS PMIS manual (MoHSS, 2012b). The following formula was used to determine percentage prescriptions with an antibiotic. MoHSS PMIS manual antibiotic list was used for reference (MoHSS, 2012b).

$$\%\ \text{of OPD prescriptions with an antibiotic} = \frac{Number\ of\ prescriptions\ containing\ an\ antibiotic}{\text{Total Prescriptions}} \times 100$$

3.10.4. Percentage of prescriptions with an injection

The purpose of this indicator is to assess the extent of injection use in order to promote their rational use. Though there is no MoHSS standard for this indicator, less than 15% prescriptions with an injection is considered acceptable (WHO, 1993).

Assessment of extent of injection prescribing was done in order to promote their rational use thus reducing the chances of unwanted infections due to un-necessary injections. For purpose of this study any prescription containing one or more injections was considered to be having an injection. Following formulae was used to calculate % prescriptions with an injection.

$$\%\ \text{of OPD prescriptions with an Injection} = \frac{Number\ of\ prescriptions\ containing\ an\ injection}{\text{Total prescriptions}} \times 100$$

3.10.5. STG compliance

Compliance to Namibia STGs was analysed among all the prescriptions sampled from selected study sites by indication and dosage schedule. STG compliance of more than 90% is desired whereas more than 85% compliance to guidelines is considered acceptable (Management Sciences for Health, 2012).

3.11. Data management and analysis

The main outcome of the study was analysis of medicine prescribing indicators and level of compliance to Namibia STGs. Data collected by using the patient prescription extraction tool and the survey for prescribers' were entered into Microsoft Excel(R) 2010 in two different data basis, one for prescription records and the other for prescribers'

survey. The data was then exported to SPSS Version 23 for descriptive and inferential statistical analysis.

The data on the prescribing indicators, including the average number of medicine per prescription, prescribing by generic name, antibiotic prescribing and injection prescribing and the level of compliance to STGs were analysed quantitatively using descriptive statistics, using frequencies and measures of central tendencies such as median and mean as well as measures of dispersion including standard deviation. Factors associated with the prescribing patterns are analysed using frequencies and associations were determined using Chi-squared test for categorical variables, student's T-test and ANOVA (analysis of variance) for continuous variables , with the level of significance (α) set at $p = 0.05$ and a 95% confidence interval. We used Cramer's V to determine the strength of association between categorical variables and Eta for continuous variables.

The data on prescribers' interviews was analysed in two ways. Frequency of responses on awareness, availability, access, use, and training on STG were compared by level of the health care facility and cadre of the prescriber. These responses were analysed using frequencies and associations were determined using Chi-squared test with the level of significance (α) set at $p = 0.05$ and a 95% confidence interval. We used Cramer's V to determine the strength of association between categorical variables. Qualitative data on reasons which make use of STG easy or difficult, recommendations to overcome difficulties in the use of STGs, and sources used in addition to STGs in prescribing were

analysed thematically. Similar responses were manually organised into different thematic areas. The themes were generated based on similarity of responses from one prescriber to another. For each thematic area, a set of sub-themes was generated according to specific response by prescribers

3.12. Ethical considerations

Ethical considerations for this study were met by the following: Permission to conduct the research was granted by the University of Namibia (UNAM) and Ministry of Health and Social services (MoHSS) (Brink, 2009). Confidentiality and anonymity of patients whose prescriptions were assessed and prescribers was ensured throughout the research by use of codes. Specific identifiers such as the names of the patients and prescribers were not collected but rather a specific numbering was assigned to each study participant for identification purpose. Confidentiality was ensured by not collecting respondent specific information that directly links them to the participant names. The privacy of the participants was insured by making sure that no one else had access to the collected data except the researcher (Brink, 2009). The study was non-invasive and thus no harm was inflicted on any respondents in this study. All study respondents were required to give written informed consent in order to participate in the study (Annex 2). Participation in the study was voluntary and participants had the option to opt out at any point of the study or interview.

3.13. Summary of the methodology chapter

This chapter presented the research methodology and study design used to achieve the study objectives. The chapter described the study population, sample size, sampling procedure, inclusion and exclusion criteria, data collection instrument deployed, reliability and validity of instrument through pilot testing, ethical considerations, data management and analysis, definition of prescribing indicators and study population unit variables. Chapter four provides the summary of results.

CHAPTER FOUR : RESULTS

4.1. Overview of the results chapter

This chapter presents the findings of the study according to specific objectives. In Section A of this chapter patient records review results are presented under different subsection as follows; **(4.2)** Demographic characteristics of patients **(4.3)** Percentage of prescriptions with an antibiotic; **(4.4)** Average number of medicines per prescription **(4.5)** Percentage of medicines prescribed by generic name; **(4.6)** Percentage of prescriptions that include an injection and **(4.7)** level of compliance to Namibian STGs

Section B of this Chapter presents prescribers' interview results according to following subsections; **(4.8)** on access, use and attitudes towards Namibia's STG in prescribing; **(4.9)** on Demographic characteristics of prescribers at OPD in the Khomas; **(4.10)** on awareness and utility of STGs by prescribers at OPD units; **(4.11)** on Frequency and ease of use of the STG by prescribers **(4.12)** on Sources of information in prescribing of medicines; **(4.13)** on Factors promoting the use of STGs in prescribing of medicines; and **(4.14)** on Strategies for effective use of STGs in prescribing of medicines. At the end of the chapter a summary **(4.15)** is provided.

A. PATIENT RECORDS REVIEW RESULTS

4.2. Demographic characteristics of patient prescriptions at OPD units

According to **Table 2** below, a total of 1,243 prescriptions were reviewed – this gives a response rate of 100%. Prescriptions were collected from three (3) public health facilities including Intermediate Hospital Katutura (IHK), Katutura Health Centre (KHC) and Khomasdal Clinic (KMDC). Over half of the prescriptions were from hospital level 56% (n=696/1243) compared to those from the primary health care facilities 44% (n=547/1243). The majority of the prescriptions obtained from the PHC level of care were from the Health centre 79.2% (n= 433/547) compared to the clinic setting 20.8% (n= 114/547). The majority of the prescriptions were initiated by medical doctors 87.3% (n=1085/1243) as compared to the nursing professionals 12.7% (n=158/1243). The majority of the prescriptions were for female 55.6% (n=691/1243) and adult (≥ 18 years) 73.4% (n=912/1243) patient populations. There was a statistically significant difference between the number of prescriptions by health facility level and; the health facility ($p < 0.001$), prescriber cadre ($p < 0.001$), patients gender ($p < 0.008$) and the use of antibiotics ($p < 0.028$). There were no significant associations ($p > 0.05$) between the number of prescriptions by health facility level and patients' age, categorized according to the MoHSS Health Information System (HIS) age categorization by adult (≥ 18 years) or child (<17 years) (MoHSS, 2012a).

Table 2: Demographic distribution of patient prescriptions (n = 1243)

Demographic	Health Facility Level		Total	χ^2	p-Value	Cramer V
	Hospital (Number)	PHC (Number)				
Facility name						
IHK	696	-	696	1243	0.000*	1
KHC	-	433	433			
KMDC	-	114	114			
Prescriber cadre						
Medical	684	401	1085	172.1	0.000*	0.372
Nursing	12	146	158			
Patient gender						
Female	364	327	691	6.945	0.008*	0.075
Male	332	220	552			
Patient category						
Adult	513	399	912	0.091	0.762	0.009
Child	183	148	331			
Antimicrobial use						
Yes	409	353	762	4.298	0.038*	0.059
No	287	194	481			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.2.1. Distribution of prescriptions by prescriber cadre/qualification

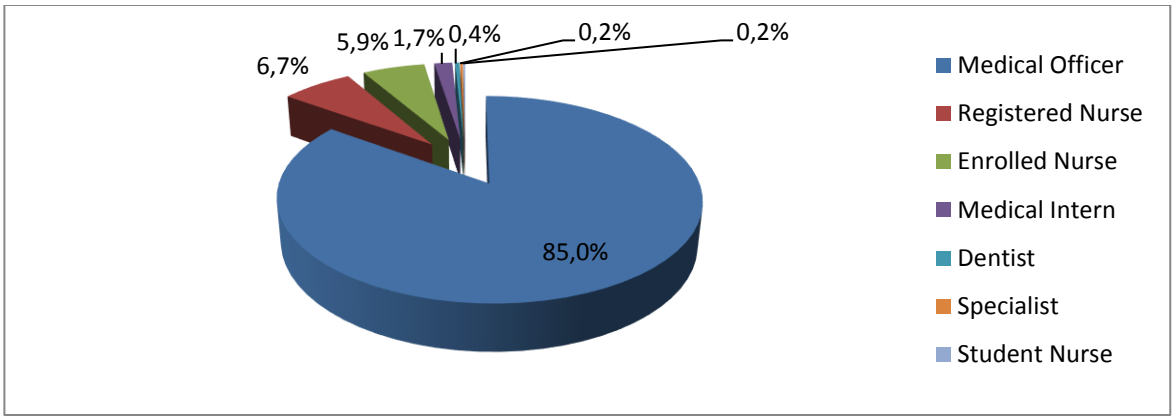

Figure 2: Distribution of prescriptions by prescriber cadre/qualification (n=1,243)

According to **Figure 2** above, a total of seven (7) categories of cadres were involved in prescribing of medicines at OPD in the selected health facilities in Khomas Region. The majority of the prescribers were medical professionals, most of who were medical officers (85%). The other main prescribers of medicines at OPD were either enrolled or registered nurses. Specialists, Dentists, Medical interns and Nursing students also initiated some of the prescriptions at the OPD.

4.2.2. Distribution of prescriptions per disease system

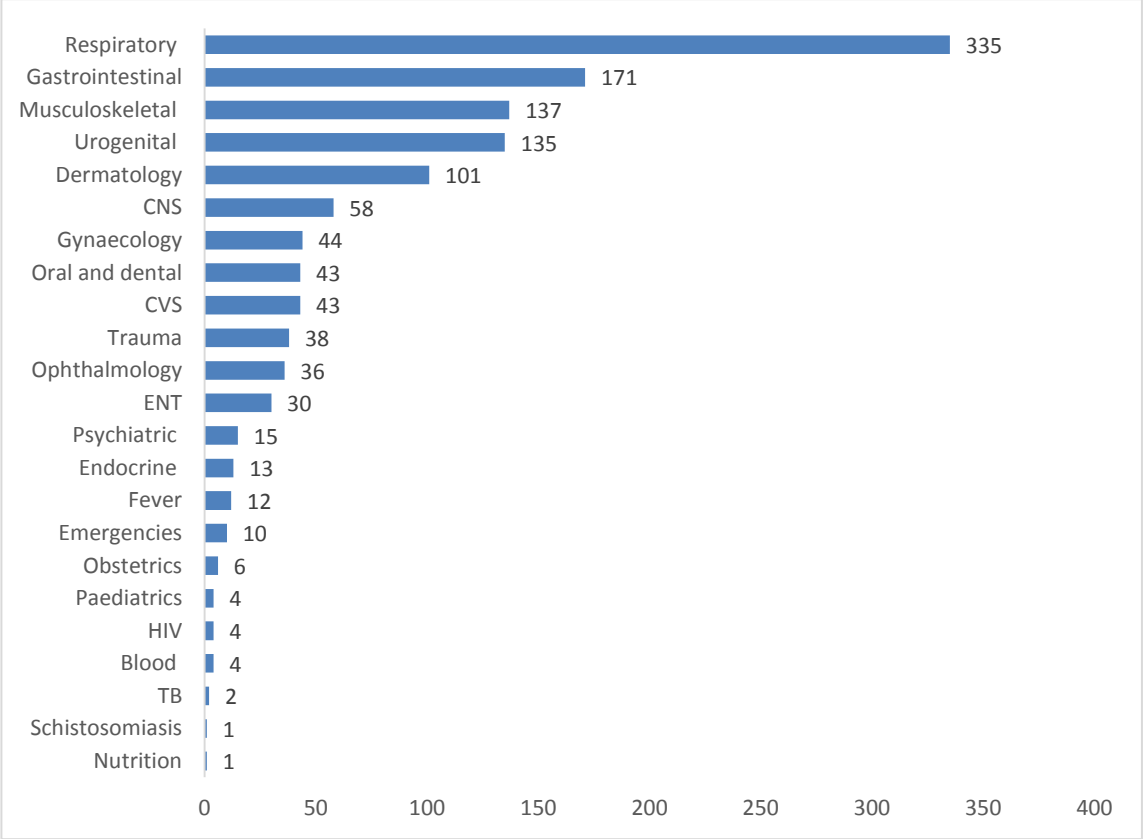

Figure 3: Frequency of prescription distribution as per disease system (n=1,243)

As shown in **Figure 3** above, 26.9% (n= 335/1243) prescriptions were for respiratory system followed by gastrointestinal (GIT) 13.8% (n= 171/1243), musculoskeletal system 11% (n=137/1243) and urogenital system 10.9% (n= 135/1243). The least number of prescriptions were for treatment of nutrition conditions and schistosomiasis 0.1% (n= 1/1243) followed by TB 0.2% (n= 2/1243) and blood systems 0.3% (n= 4/1243).

4.2.3. Distribution of prescriptions per pharmacological class of medicine

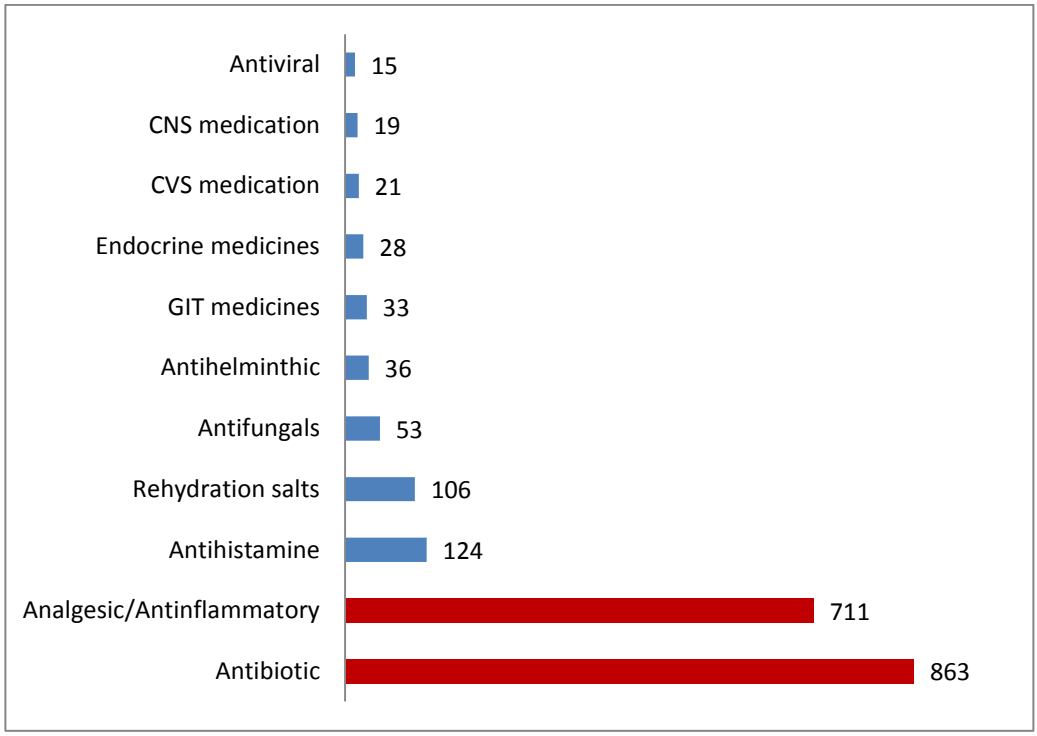

Figure 4: Medicines classes prescribed (n= 1,243)

The **Figure 4** above provides number of prescriptions that had a particular class of medicines. The antibiotics 69.4% (n= 863/1243) and analgesics and/or anti-inflammatory medicines 57.2% (n= 711/1243) were the most prescribed medicines at OPD units at the selected health facilities in Khomas Region. A wide range of medicines ranging from antimicrobials, medicines for non-communicable diseases and allergic diseases were prescribed at the OPD units. Amoxicillin, metronidazole and azithromycin were the most prescribed antibiotics. Paracetamol as a single drug or in combination with codeine was the most prescribed analgesic. The most prescribed antihistamine was Chlorpheniramine.

Clotrimazole pessaries and Albendazole were the most prescribed antifungal and anthelminthic agents respectively. Amitriptyline was the most prescribed CNS medication and perindopril and Amiloride /Hydrochlorothiazide were the most prescribed CVS medications.

4.3. Prescribing indicator 1: Percentage (%) of prescriptions with an antibiotic

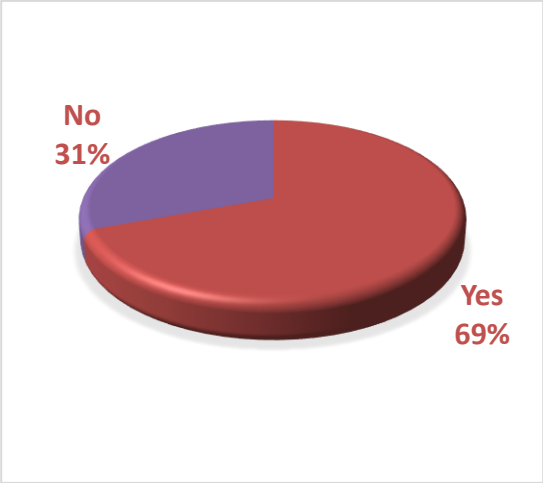

Figure 5: Prescriptions with an antibiotic (n= 1,243)

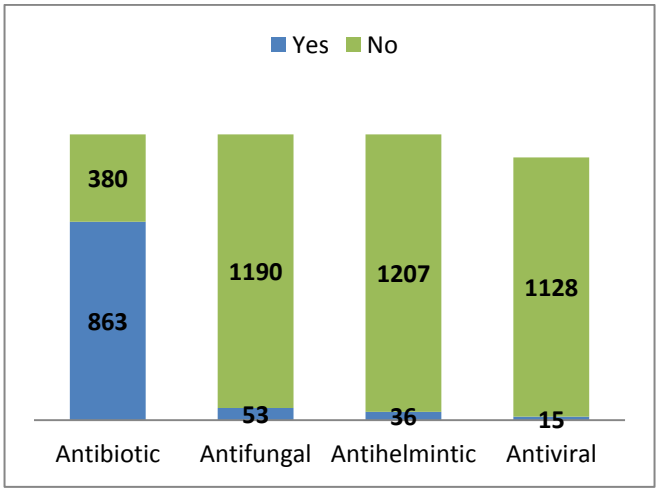

Figure 6: Antimicrobial prescribing pattern (n= 1,243)

According to **Figure 5** above, more than two thirds of the prescriptions included an antibiotic 69% (n=863/1243). Other antimicrobials that were prescribed included: antifungal agents 4.4% (n= 53/1243) for which Clotrimazole was the most prescribed; anthelminthic 2.9% (n=36/1243) for which Albendazole was the most prescribed and antiviral agents 1.2% (n=15/1243) - acyclovir was the most prescribed.

4.3.1. Frequency of antibiotic prescribing by type of antibiotic

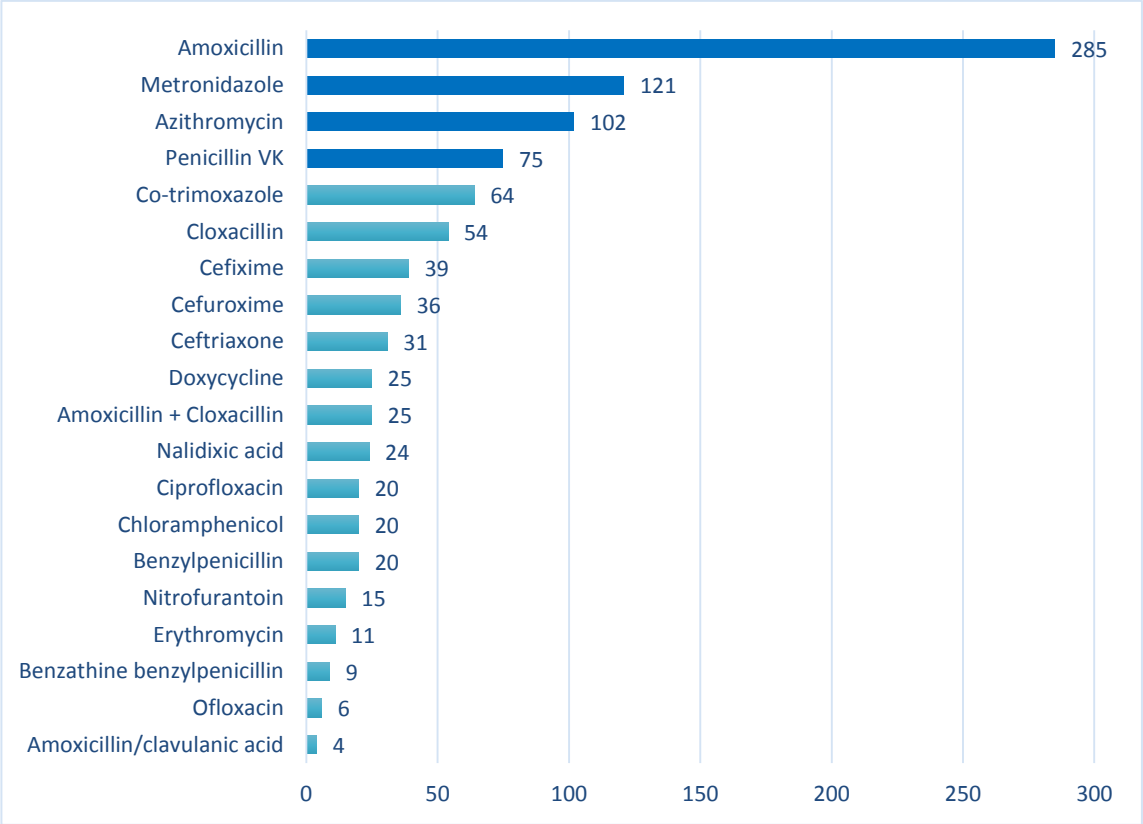

Figure 7: Frequency of antibiotic prescribing by type of antibiotic (n=986)

According to **Figure 7** above, total of 986 antibiotics were prescribed for the 1,243 prescriptions - giving an average number of 0.79 antibiotics per prescription. The most prescribed antibiotics were amoxicillin 29% (n= 285/986), metronidazole 12.3% (n= 121/986), Azithromycin 10.3% (n= 102/986) and Penicillin VK 7.6% (n= 75/986). The majority of the antibiotics prescribed were beta-lactam antibiotics, mainly from the Penicillin and Cephalosporin class**.**

4.3.2. Factors associated with prescribing of antibiotics at the OPD

According to **Table 3** below, there was a significant statistical association between the prescribing of antibiotics and the prescriber cadre ($p = 0.014$), patient age category ($p < 0.001$), and the prescribing of antihistamines ($p = 0.042$). We did not find any significant difference ($p > 0.05$) between antibiotic prescribing and health facility level and patient gender. There was a statistically significant difference between antibiotic prescribing and the diagnosis ($p < 0.001$) - **Figure 8** below.

Table 3: Factors associated with prescribing of antibiotics at the OPD

Demographic	Prescriptions with antibiotics		Total	χ^2	P - Value	Cramer V
	Yes	No				
Health facility level						
Hospital	468	228	696	3.565	0.059	0.054
PHC	395	152	547			
Facility name						
IHK	468	228	696	4.541	0.103	0.060
KHC	317	116	433			
KMDC	78	36	114			
Prescriber type						
Medical officer	740	345	1085	6.045	0.014*	0.070
Nurse	123	35	158			
Patient gender						
Female	481	210	691	0.024	0.877	0.004
Male	382	170	552			
Patient age category						
Adult	479	433	912	105.05	0.000*	0.291
Child	280	51	331	4		
Anti-histamine used						
Yes	96	28	124	4.143	0.042*	0.058
No	767	352	1119			
Analgesic used						
Yes	491	220	711	0.108	0.743	0.009
No	372	160	532			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.3.3. Patterns of antibiotic prescribing by disease systems

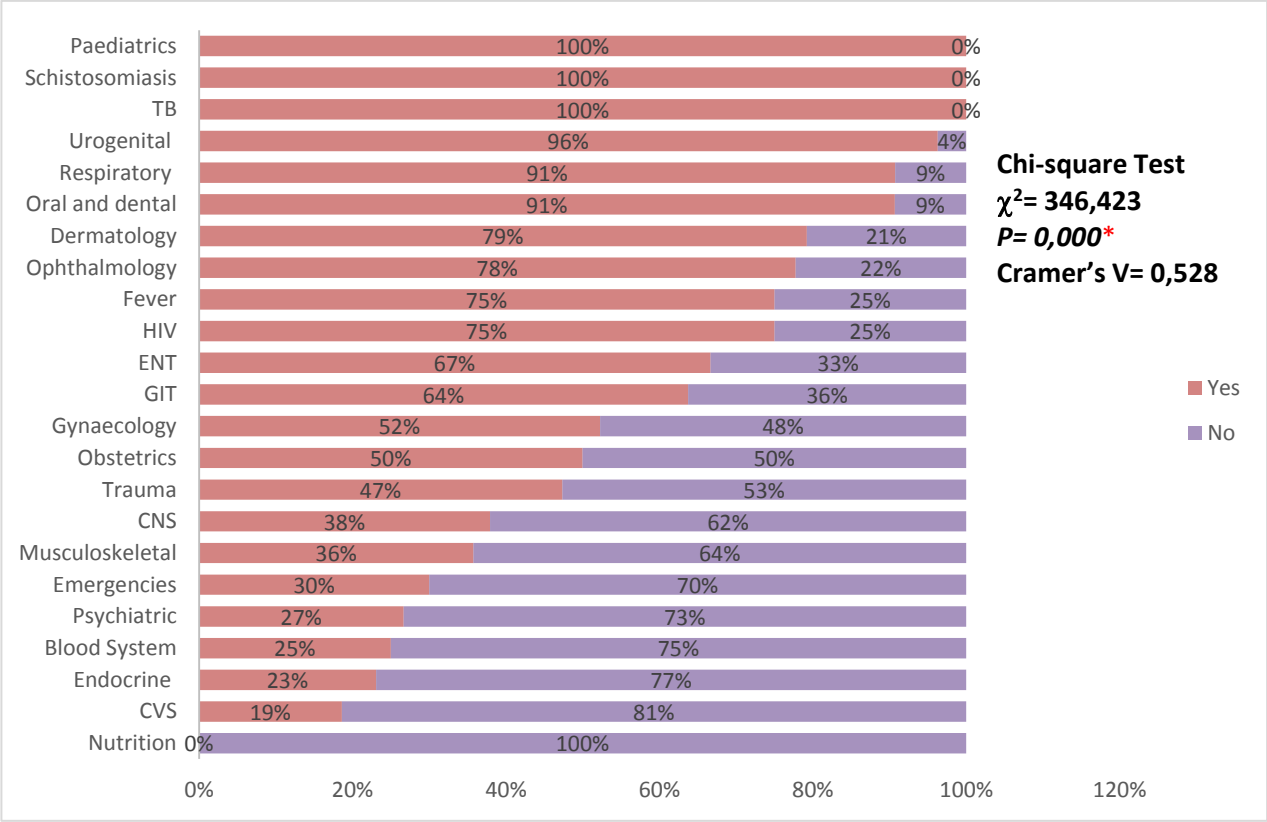

Figure 8: Patterns of antibiotic prescribing by disease system (n= 1,243)

According to **Figure 8,** above antibiotics use by disease system ranged between 0% - 100%. The use of antibiotics in all the systems was above 25% threshold (MoHSS, 2012b) except for nutrition 0% (n=0/1), cardiovascular 19% (n= 8/35) and endocrine system 23% (n=1/4). Prescribing of antibiotics was maximum -100%; in paediatrics (n= 4/4), schistosomiasis (n=1/1) and TB (n=2/2) followed by urogenital 96% (n= 130/135), respiratory 91% (n=304/335) and oral/dental disorders 91% (n= 39/43).

4.4. Prescribing indicator 2: Average number of medicines per prescription

Out of 1,243 prescriptions reviewed, an overall average of (3.02 ± 1.14) medicines were found per prescription. Out of the three health facilities, average number of medicine per prescription was highest at IHK at (3.15± 1.197). The average number of medicines per prescription at KMDC and KHC were (2.93 ± 1.142) and (2.85 ± 1.017) respectively. Among different prescriber groups, nurses (enrolled and registered) prescribed (3.05 ± 0.983) medicines per prescription and Medical officers prescribed (3.02 ± 1.162) medicines per prescription. The average number of medicines per prescription for male patients was (3.03± 1.094) and for female patients was (3.02± 1.177). The average number of medicines per prescription for adult patients was (2.98± 1.180) compared to (3.14± 1.016) for children.

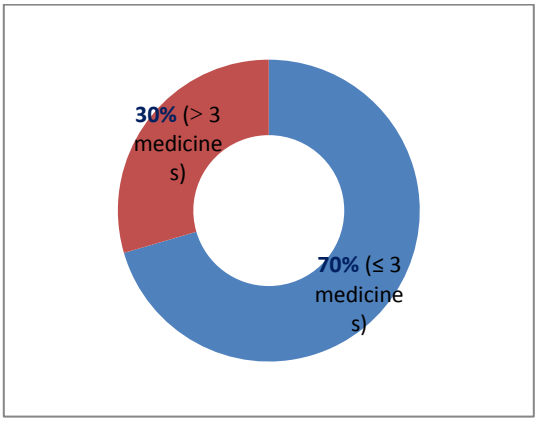

Figure 9: Average number of medicines per prescription (n= 1,243)

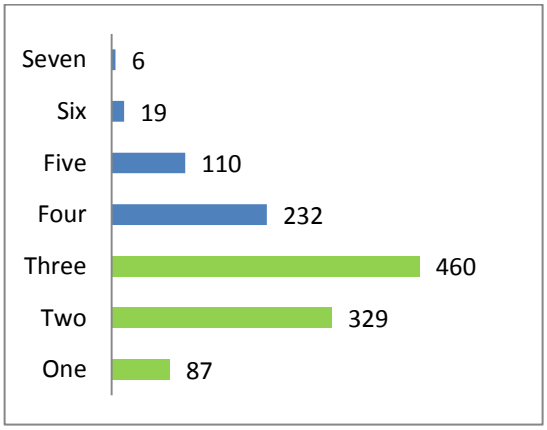

Figure 10: Number of medicines per prescription (n= 1,243)

According to **Figure 9** above, majority of the prescriptions had three or less medicines (70%). The number of medicines per prescription ranged from one to seven medicines,

with the greatest number of prescriptions having three medicines 37% (460/1243) as shown in **Figure 10**.

4.4.1. Factors associated with number of medicines per prescription

Table 4 below, provides results for factors associated with average number of medicine per prescription when medicines were analysed cumulatively irrespective of individual prescriptions. There was a significant statistical association between the average number medicine per prescription and the health facility ($p < 0.001$), patient age category ($p= 0.028$), and the prescribing of antibiotics, injection, antihistamines, analgesics, compliance to generic prescribing and STG compliance ($p < 0.001$). We did not find any significant difference ($p > 0.05$) between average number of medicine per prescription and prescriber type and patient gender. There was a statistically significant difference between average number of medicine per prescription and disease system ($p < 0.001$) as shown in **Figure 11** below.

Table 4: Factors associated with average number of medicine per prescription (n=1243)

Demographic	Mean ± SD	F	P -Value	Eta
Health facility level				
Hospital	3.15 ± 1.197	18.924	0.000*	0.123
PHC	2.87 ± 1.044			
Facility name				
IHK	3.15 ± 1.197	9.682	0.000*	0.124
KHC	2.85 ± 1.017			
KMDC	2.93 ± 1.142			
Prescriber type				
Medical officer	3.02 ± 1.162	0.098	0.755	0.009
Nurse	3.05 ± 0.983			
Patient gender				
Female	3.02 ± 1.177	0.018	0.893	0.004
Male	3.03 ± 1.094			
Patient age category				
Adult	2.98 ± 1.180	4.833	0.028*	0.062
Child	3.14 ± 1.016			
Antibiotic used				
Yes	3.15 ± 1.097	37.756	0.000*	0.172
No	2.73 ± 1.184			
Injection used				
Yes	3.63 ± 1.121	44.505	0.000*	0.172
No	2.95 ± 1.121			
Anti-histamine used				
Yes	3.63 ± 1.158	39.968	0.000*	0.177
No	2.96 ± 1.119			
Analgesic used				
Yes	2.87 ± 1.011	30.832	0.000*	0.156
No	3.23 ± 1.265			
Generic Compliant				
Yes	2.76 ± 1.171	40.080	0.000*	0.177
No	3.18 ± 1.091			
STG Compliant				
Yes	2.98 ± 1.130	5.007	0.025*	0.063

No	3.14 ± 1.160

* = ($p < 0.05$)-Statistically significant- Student's T Test

4.4.2. Average number of medicines per prescription by disease system

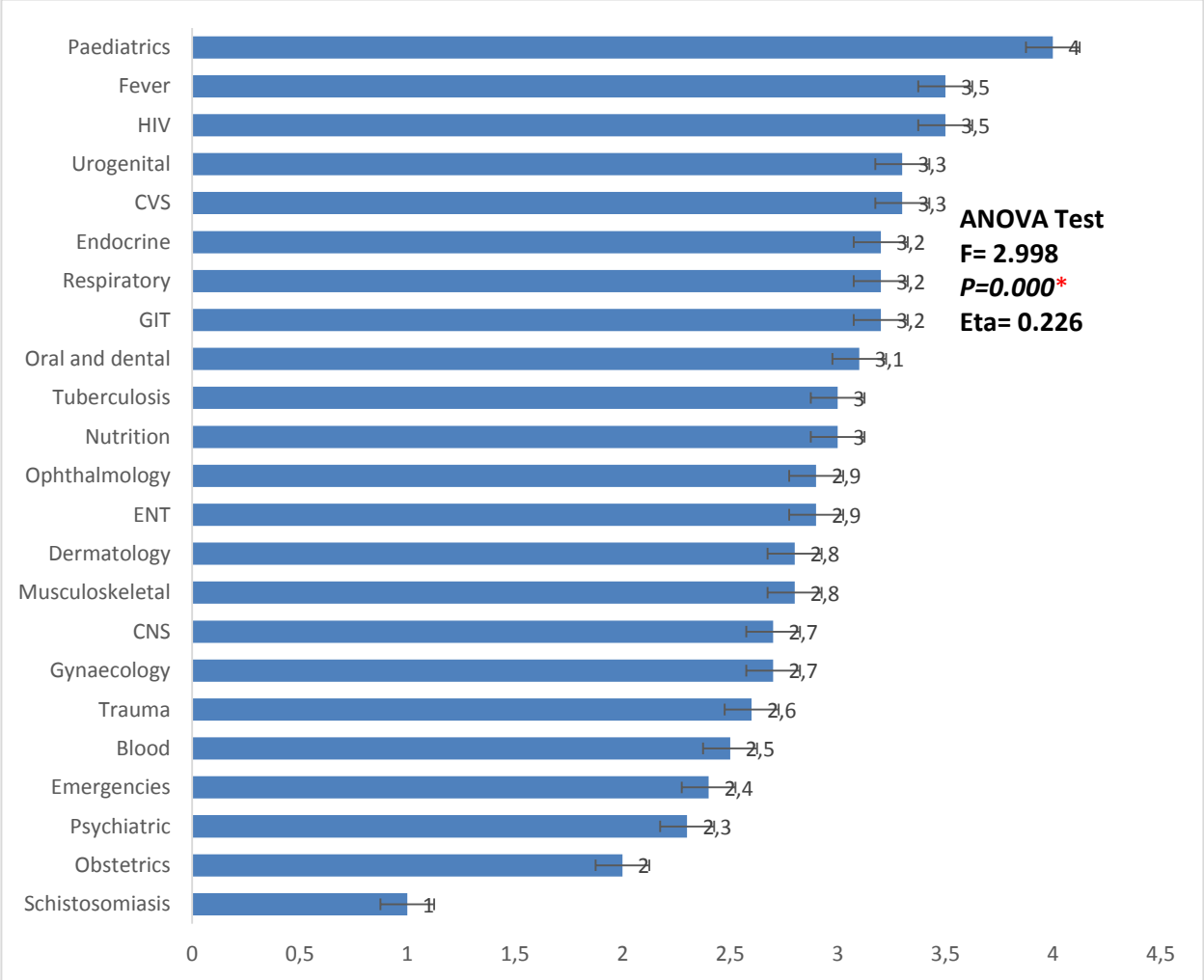

Figure 11: Average Number of medicine per prescription per disease group

The average number of medicines per prescription was lowest in schistosomiasis (1.00 ± 0.000) followed by obstetrics (2.0 ± 0.894), psychiatric disorders (2.33 ± 1.397) and emergencies (2.40 ± 0.699). Highest average number of medicine per prescription was for

paediatrics (4.0 ± 0.816) followed by fever (3.50 ± 1.679), HIV (3.50 ± 2.082), urogenital (3.27 ± 1.271) and cardiovascular systems (3.28 ± 1.485).

Table 5 below provides results for factors associated with average number of medicine per prescription when each prescription was analysed individually. For purpose of this study, all the prescriptions with 3 or fewer medicines per prescription were considered as appropriate while prescriptions containing more than 3 medicines were considered inappropriate (MoHSS, 2012b). There was a significant statistical difference between the average number of medicines per prescription and the health facility ($p < 0.001$), if antibiotic and analgesic was prescribed ($p < 0.001$) and disease system ($p = 0.001$) - (**Figure 12)** below. There was no statistical difference ($p > 0.05$) between the average number of medicines per prescription and the Prescriber group, prescriber type, patient gender and patient age **(Table 5).**

Table 5: Factors associated with number of medicines per prescription

Demographic	Average number of medicines		Total	χ^2	P - Value	Cramer V
	≤ 3 meds	> 3 medicines				
Facility type						
Hospital	456	240	696	18.7	0.000*	0.123
PHC	420	127	547			
Facility name						
IHK	456	240	696	20.31	0.000*	0.128
KHC	338	95	433			
KMDC	82	32	114			
Prescriber type						
Medical officer	764	321	1085	0.015	0.903	0.003
Nurse	112	46	158			
Patient gender						
Female	483	208	691	0.248	0.618	0.014
Male	393	159	552			
Patient age						
Adult	651	261	912	1.354	0.245	0.033
Child	225	106	331			
Antibiotic used						
Yes	570	293	863	26.6	0.000*	0.146
No	306	74	380			
Analgesic used						
Yes	540	171	711	23.9	0.000*	0.139
No	336	196	532			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

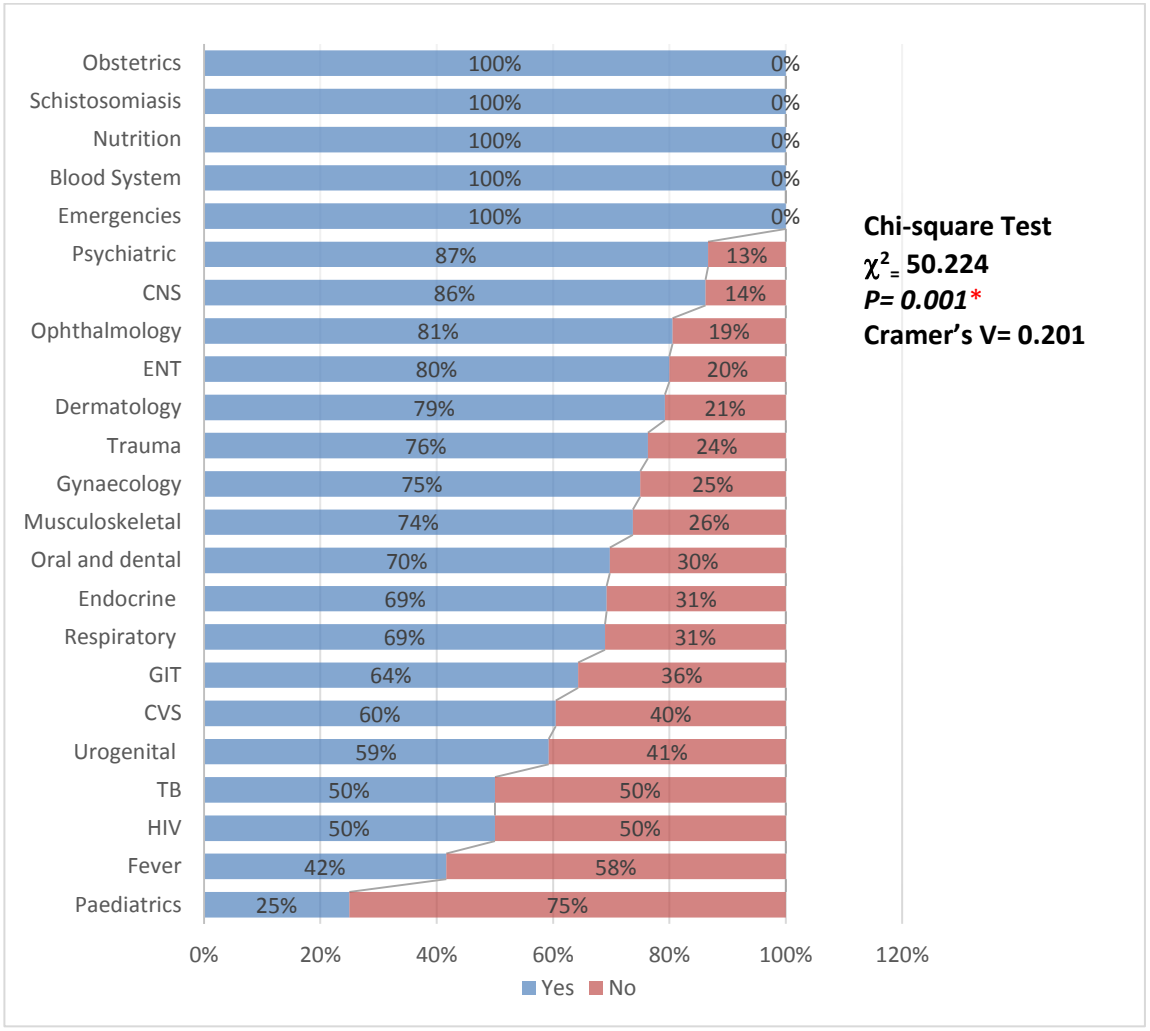

Figure 12: Average number of medicines per prescription by disease category

According to **Figure 12** above, prescriptions with more than 3 medicines per disease category ranged from 0% to 75%. The highest number of prescriptions with more than three medicines prescribed was for paediatrics 75% (n= 1/4) followed by fever 58% (n= 5/12).

4.5. Prescribing indicator 3: Percentage of medicines prescribed by generic name

4.5.1. Percentage of medicines prescribed by generic name

A total of 3,759 medicines were prescribed in the sampled 1,243 prescriptions, of which 63.6% (n=2390/3759) were prescribed using their generic names.

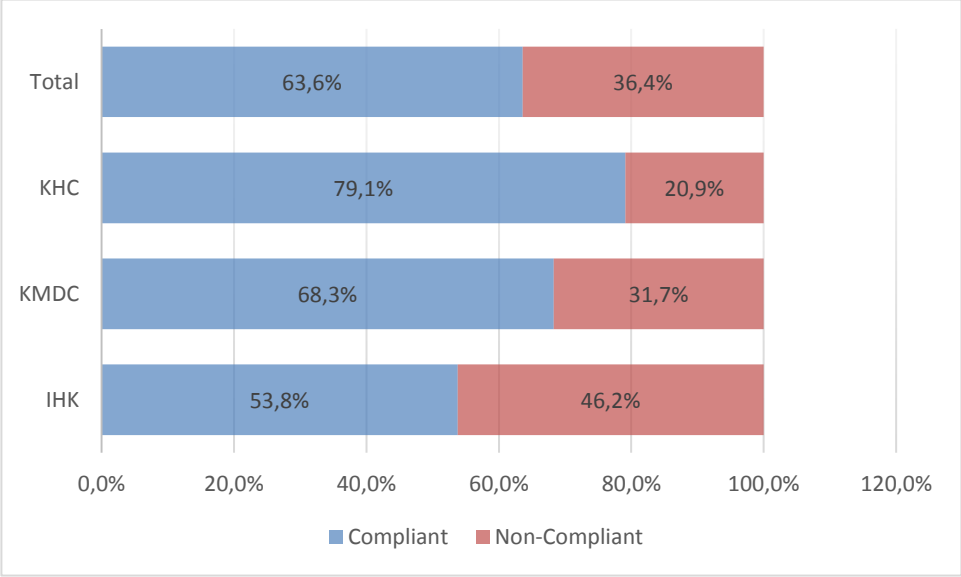

Figure 13: % medicines prescribed by generic name (n= 3,759)

When analysing generic prescribing cumulatively, irrespective of prescription, as shown in **Figure 13** above, the level of generic prescribing was highest at KHC 79.1% (n=983/1234) followed by KMDC 68.3% (n=228/334). The lowest percentage of medicines were prescribed using generic names at IHK 53.8% (n= 1179/2191). Cumulative analysis of medicine prescription using generic name shows that all the health facilities under study performed below MoHSS set standards of 80% (MoHSS, 2012b).

4.5.2. % of medicine per prescriptions with generic name

For purpose of this indicator, the prescription was considered generic prescribing compliant if 80% or more of the medicines included in the prescription were prescribed using their generic name (MoHSS, 2012b). As shown in **Table 6** below, analysis of prescriptions to judge if they met the set criteria revealed that only 36.6% (n= 382/1241) prescriptions were compliant to generic prescribing standards (≥ 80% medicines prescribed by generic name).

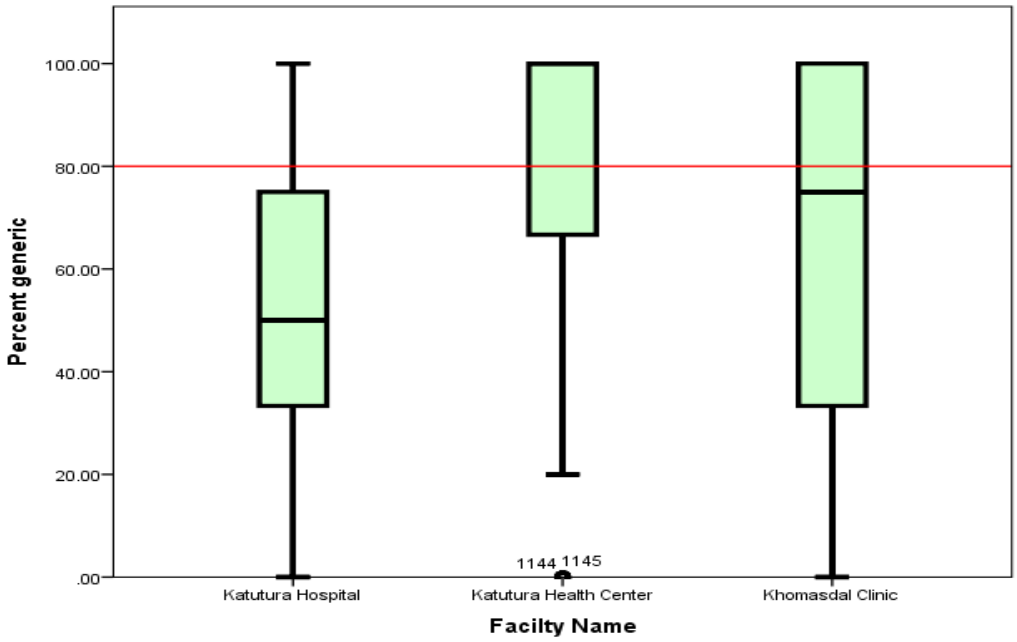

Figure 14: Generic prescribing per health facility (n= 1,243)

As shown in **Figure 14** above, the lowest compliance to generic prescribing was at hospital level 20.9% (n=145/694) as compared to 56.7% (n=310/547) at PHC facilities. 44.4 % (n=70/158) prescriptions written by nurses were compliant to generic prescribing

as compared to 35.6 % (n=385/1083) prescriptions compliance among medical officers. Generic prescribing compliance was found to be lower if an analgesic was prescribed 31.7% (n=225/711) compared to when no analgesic was prescribed 43.2 % (n= 230/532).

4.5.3. Factors associated with prescribing medicines using generic names

Table 6 below summarizes factors affecting generic prescribing. The prescribing with generic names was statistically significantly associated with the: health facility type *($p < 0.001$)*, prescriber type ($p = 0.033$), disease group *($p < 0.001$)* as shown in **Figure 15** below and if an analgesic was prescribed (*$p < 0.001$)*. There was no association ($p > 0.05$) between generic prescribing and the patient gender, patient age, and if an antibiotic was prescribed.

Table 6: Factors associated with generic prescribing

Demographic	Generic medicine prescribing		Total	χ^2	P - Value	Cramer V
	≥ 80%	< 80%				
Facility name						
Hospital	145	549	694	168.64	0.000*	0.369
PHC	310	237	547			
Facility name						
IHK	145	549	694	181.80	0.000*	0.383
KHC	262	171	433			
KMDC	48	66	114			
Prescriber type						
Medical officer	385	698	1083	4.56	0.033*	0.061
Nurse	70	88	158			
Patient gender						
Female	257	433	690	0.23	0.634	0.014
Male	198	353	551			
Patient age						
Adult	340	571	911	0.638	0.424	0.023
Child	115	215	330			
Antibiotic used						
Yes	319	544	863	0.11	0.740	0.009
No	136	242	378			
Analgesic used						
Yes	225	486	711	18.055	0.000*	0.121
No	230	300	532			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.5.4. Generic prescribing by disease system

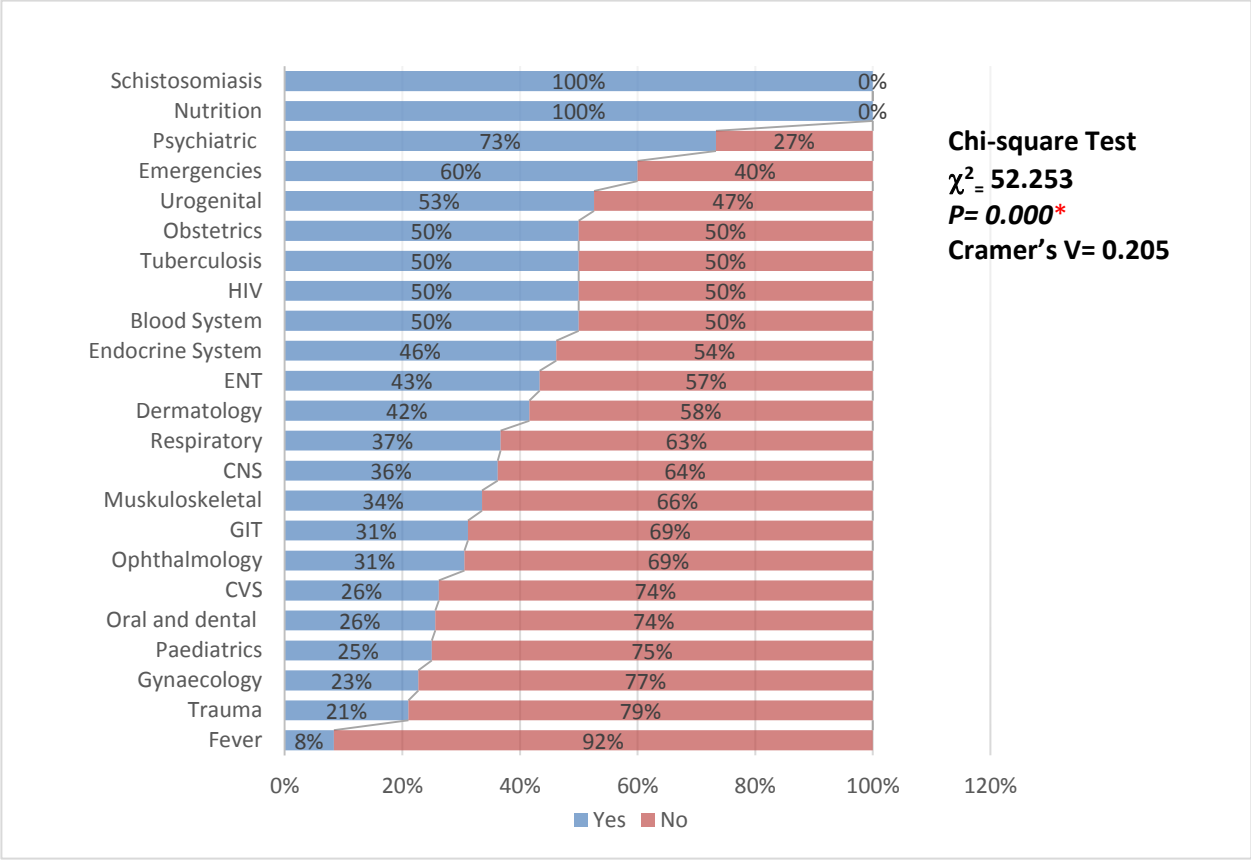

Figure 15: Generic prescribing by disease category (n= 1243)

According to **Figure 15** above, the generic prescribing compliance by disease system ranged from 8% to 100%. The lowest compliance to generic prescribing was for fever 8% (n=1/12) followed by Trauma 21% (n=8/38) and Gynaecology 23% (n=10/44). The highest compliance to generic prescribing was in Schistosomiasis and nutrition 100% (n=1/1) followed by psychiatric disorders 73% (n=11/15) and emergencies 60% (n=6/10).

4.6. Prescribing indicator 4: Percentage of prescriptions that include an injection

Overall 10.8% (n=134/1243) prescriptions had an injection prescribed in the three sites under study.

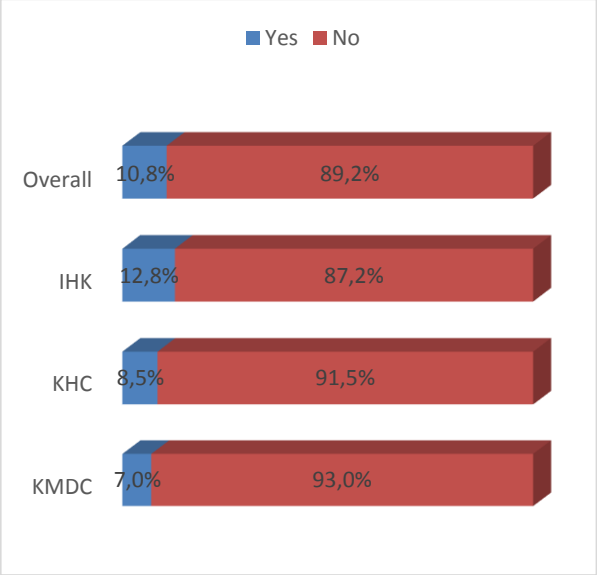

Figure 16: % prescription with injection per health facility (n= 1,243)

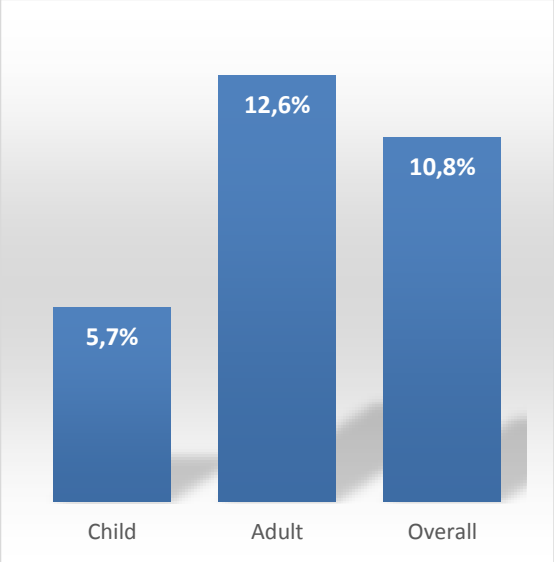

Figure 17: % prescriptions with injection per patient age (n= 1,243)

The highest percentage of prescriptions containing an injection were originating from IHK 12.8% (n=89/696) while least percentage of prescriptions with an injection originating from KMDC was 7.0 % (n=8/106) and 8.5% (n=37/396) prescriptions contained an injection at KHC. The use of injections in adults was higher where 12.6% (n=115/912) prescriptions contained an injection, compared to only 5.7% (n=19/312) of prescriptions for children contained an injection.

4.6.1. Factors associate with prescribing of injections

Table 7 below summarizes factors affecting injection prescribing. Injection prescribing is significantly affected by facility level (p= 0.010), facility type *(p= 0.033)*, Patient age *(p< 0.001)* and Disease group *(p< 0.001)* as shown in **Figure 18** below. No significant association was found between injection prescribing (p> 0.05) and Prescriber type, patient gender, generic prescribing and antibiotic prescribing.

Table 7: Factors associated with percentage of prescriptions with an injection

Demographic	Prescriptions with Injections		Total	χ^2	P - Value	Cramer V
	Yes	No				
Facility name						
Hospital	89	607	696	6.624	0.010*	0.073
PHC	45	502	547			
Facility name						
IHK	89	607	696	6.842	0.033*	0.074
KHC	37	396	433			
KMDC	8	106	114			
Prescriber type						
Medical officer	121	964	1085	1.226	0.268	0.031
Nurse	13	145	158			
Patient gender						
Female	76	615	691	0.077	0.781	0.008
Male	58	494	552			
Patient age						
Adult	115	797	912	14.158	0.000*	0.107
Child	19	312	331			
Antibiotic used						
Yes	86	777	863	1.950	0.163	0.040
No	48	332	380			
Av. med/Rx						
≤ 3	65	811	876	34.831	0.000*	0.167
>3	69	298	367			

* = (p < 0.05)-Statistically significant- Pearson Chi-square Test

4.6.2. Injection prescribing by disease category

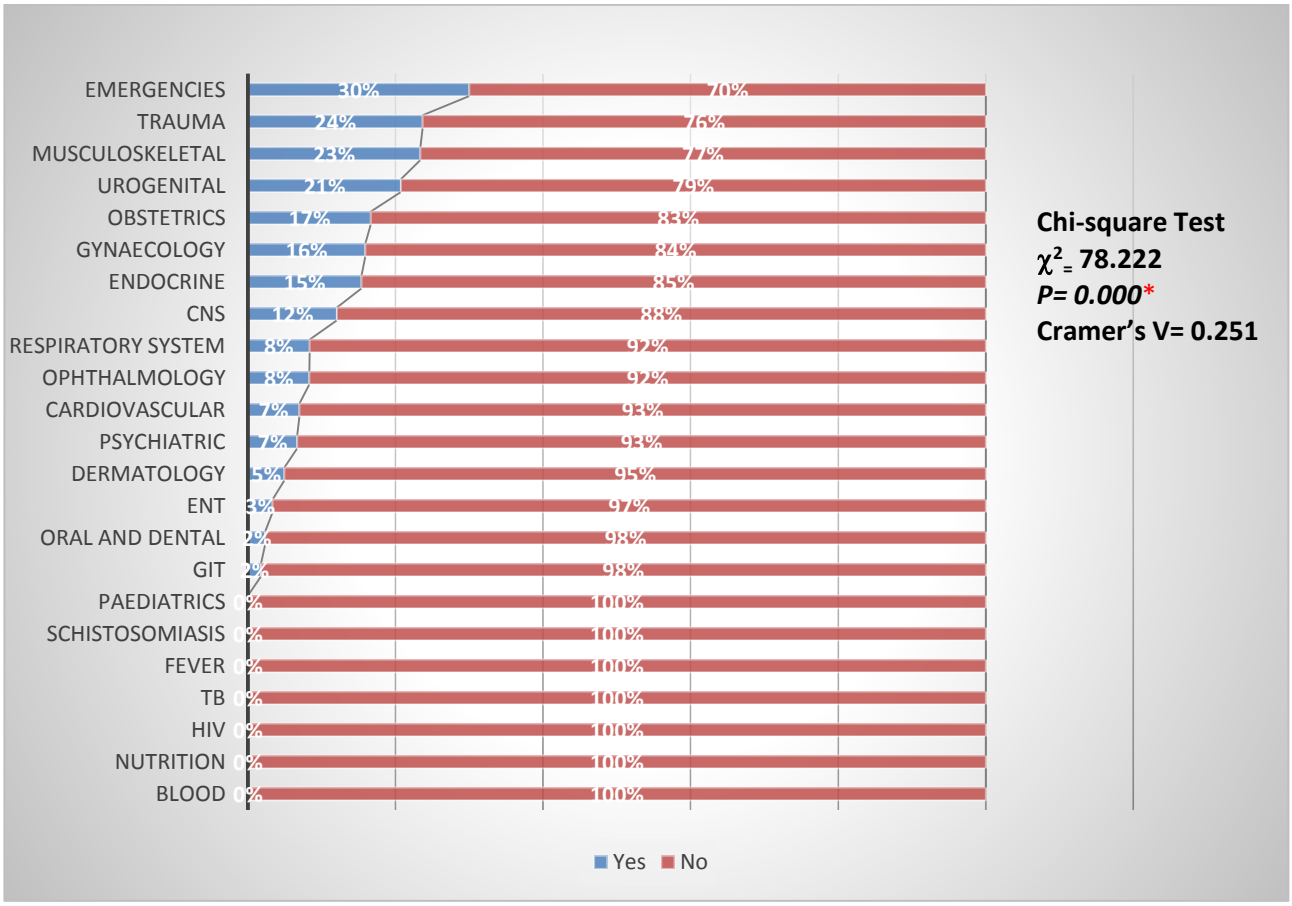

Figure 18: Injection prescribing per disease condition (n= 1,243)

The prescribing of injections by disease system ranged from 0% to 30% **(Figure 18)**. The prescriptions with the highest level of injections were in emergencies 30% (n= 3/10) followed by trauma 24% (n= 9/38) and musculoskeletal system 23% (n= 32/137). The prescriptions with fewest injections included were for treatment of blood system and nutrition conditions 0% (n=0/4).

4.7. Prescribing Indicator 5: Level of Compliance to Namibian Standard Treatment Guidelines

Overall, out of the 1,243 prescriptions, the majority 73% (907/1243) complied with Namibia STGs **(Figure 19)** by indication of the medicine or treatment by disease condition. STG compliance at PHC facilities was higher 76.1% (n=416/547) than at the hospital 70.5% (n=491/696) **(Figure 20)**. Among PHC facilities, STG compliance was higher at KHC 77.9% (n=337/433) than KMDC 69.3% (79/114). STG compliance in adults was 75.2% (n= 686/912) as compared to children 66.8% (n= 221/331).

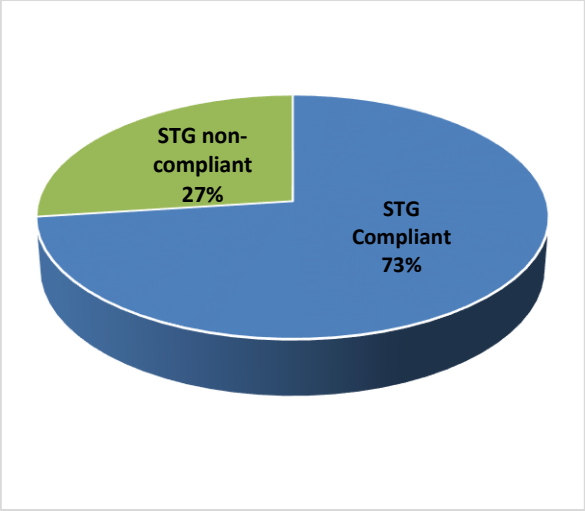

Figure 19: Overall STG compliance (n= 1,243)

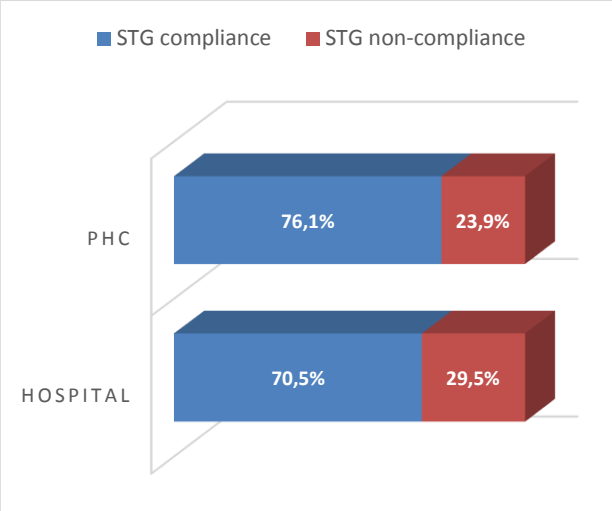

Figure 20: STG compliance at hospital vs PHC (n= 1,243)

4.7.1. Factors associated with compliance to STGs by treatment indication

As shown in **Table 8** below, compliance to STG prescribing was significantly associated with the health facility level (p= 0.030), health facility (p = 0.018), patients age category

(p = 0.003), average number of medicines per prescription (p = 0.019), prescribing antibiotics (p < 0.001) and disease system (p < 0.001) - **(Figure 21)**. There was no significant association (p > 0.05) between compliance to STGs and prescriber cadre, gender of the patient, prescribing by generic and presence of analgesics or antihistamine on the prescription

Table 8: Factors associated to compliance by treatment indication (n = 1,243)

Demographic	STG Compliance		Total	χ^2	P - Value	Cramer V
	Yes	No				
Facility level						
Hospital	491	205	696	4.706	0.030*	0.062
PHC	416	131	547			
Facility name						
IHK	491	205	696	8.036	0.018*	0.080
KHC	337	96	433			
KMDC	79	35	114			
Prescriber type						
Medical officer	785	300	1085	1.655	0.198	0.036
Nurse	122	36	158			
Patient gender						
Female	505	186	691	0.010	0.919	0.003
Male	402	150	552			
Patient age						
Adult	686	226	912	8.795	0.003*	0.084
Child	221	110	331			
Antibiotic used						
Yes	565	298	863	80.489	0.000*	0.254
No	342	38	380			
Analgesic used						
Yes	512	199	711	0.772	0.380	0.025
No	395	137	532			
Antihistamine used						
Yes	82	42	124	3.267	0.071	0.051
No	825	294	1119			
Av. med. 3 or less						
Yes	656	220	876	5.529	0.019*	0.067
No	251	116	367			
Generic compliant						
Yes	346	109	455	3.539	0.060	0.053
No	559	227	786			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.7.2. Compliance to Namibia STGs in prescribing by disease system

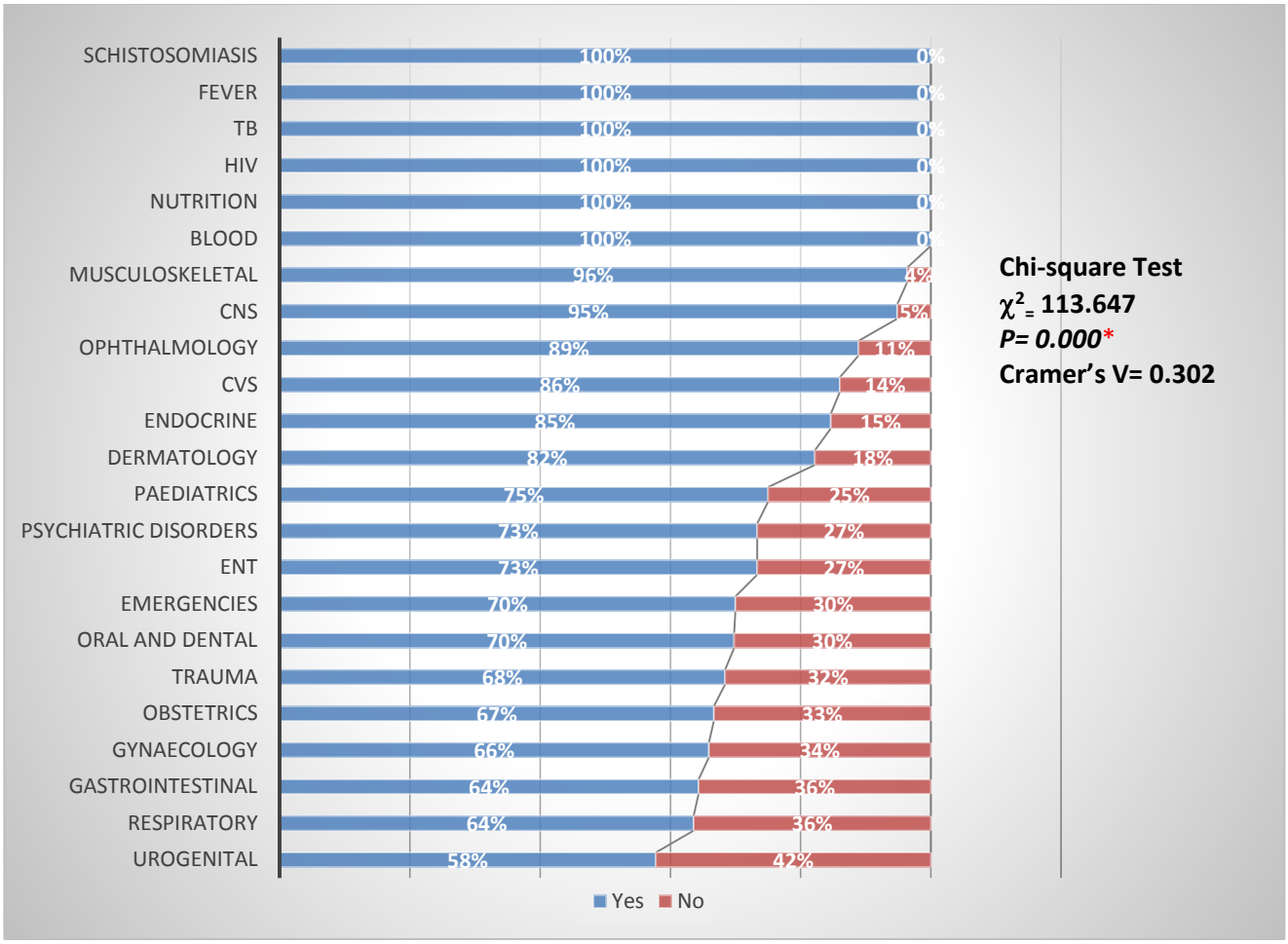

Figure 21: compliance to Namibia STGs in prescribing for specific disease categories (n= 1,243)

According to **Figure 21** above the compliance to STGs by disease system ranged from 58% - 100%. The desired compliance of > 95% was achieved in prescribing for Schistosomiasis (n=1/1), Fever (12/12), TB (n= 2/2), HIV (n= 4/4), nutrition (n=1/1) and blood and blood forming systems (n=4/4) with 100% followed by musculoskeletal system 96% (n= 132/137) and CNS 95% (n= 55/58). Acceptable compliance > 85% was achieved

in ophthalmology 89% (n=32/36), CVS 86% (37/43) and endocrine system 85% (n= 11/13). The rest of the systems showed below acceptable compliance to STGs. The least compliance to guidelines was in the prescribing of medicines for urogenital system 58% (n= 78/135), respiratory system (n= 213/335) and GIT (n= 110/171) with 64% followed by Gynaecology 67% (n= 29/44) and Obstetrics 63% (n= 4/6).

B. PRESCRIBERS' INTERVIEW RESULTS

4.8. Access, use and attitudes towards Namibia's STG in prescribing

An interview was conducted with the prescribers using a prescriber survey tool in each health facility under study, to assess the availability and access to Namibia STGs and further shed some light on factors that might impact on their prescribing practices.

4.9. Demographic characteristics of prescribers at OPD in the Khomas

A total of 37 prescribers were interviewed on the use of Namibia STGs – this gives a response rate of 92.5 % (37/40). **Table 9** below shows that the majority of the prescribers interviewed were from hospital 68% (n=25/37) compared to health centre or clinic 32% (n=12/37). More than half of the prescribers interviewed were medical officers 54% (n= 20/37). Other prescribers included Nursing cadres 33% (n= 12/37) and students or interns 13% (n= 5/37).

Table 9: Distribution of prescribers by professional cadre and health facility

Demographic	Prescriber cadre		Total	χ^2	P –Value	Cramer V
	Medical	Nursing				
Facility level						
Hospital	23	2	25	14.15	0.000*	0.681
PHC	4	8	12			
Health facility						
IHK	23	2	25	19.56	0.000*	0.727
KHC	2	8	10			
KMDC	2	-	2			
Cadre						
Enrolled nurse	-	4	4	37.00	0.000*	1
Medical intern	3	-	3			
Medical officer	20	-	20			
Registered nurse	-	8	8			
Student nurse	-	2	2			
Sources of information						
Algorithm charts	0	2	2	17.7	0.013*	0.692
Ward protocols	1	-	1			
Formularies	6	-	6			
Leaflets	-	1	1			
Online resources	3	-	3			
Medical textbooks	2	1	3			
Treatment guidelines	4	5	9			
No response	11	1	12			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.10. Awareness and utility of STGs by prescribers at OPD units

According to **Table 10** below; the majority of prescribers 94.6% (n= 35/37) were aware and had access to comprehensive Namibia STGs in their respective health facilities for reference. 32.4 % (n= 12/37) prescribers reported that they refer to STGs on daily basis. Only 18.9 % (n = 5/37) of prescribers had received at least one training on the use of the STGs.

Table 10: distribution of awareness and use of STGs by prescribers' cadre

Demographic	Prescriber cadre		Total	χ^2	P - Value	Cramer V
	Medical	Nursing				
Awareness of STG						
Yes	25	10	35	0.783	0.376	0.145
No	2	_	2			
Access to STG copy						
Yes	26	9	35	0.566	0.452	0.124
No	1	1	2			
Training on STG use						
Yes	5	2	7	0.010	0.919	0.017
No	22	8	30			
Frequency of STG use						
Daily	7	5	12	3.905	0.563	0.325
Never	3	-	3			
Once a month	8	3	11			
Once a week	5	2	7			
Once a year	1	-	1			
Once in 6 months	3	-	3			
Ease of STG use						
Difficult	4	2	6	1.266	0.531	0.185
Easy	20	8	28			
Advantages of STG use						
Comprehensive	5	-	5	3.963	0.139	0.327
Easy indexing	10	7	17			
No response	12	3	15			

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.11. Frequency and ease of use of the STG by prescribers

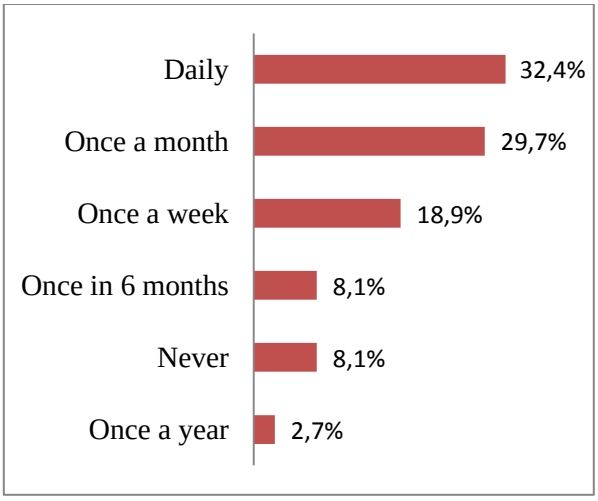

Figure 22: Frequency of use of the STGs (n= 37)

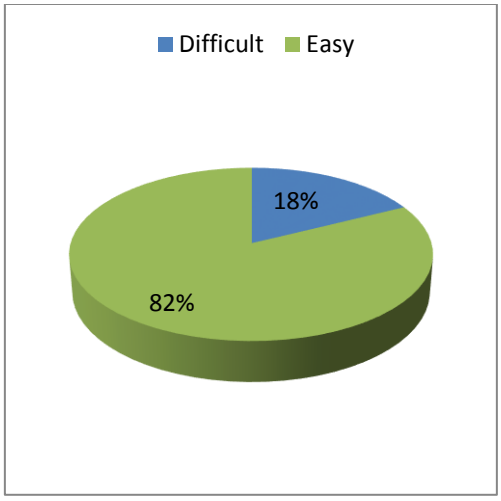

Figure 23: Ease of use of the STGs (n= 37)

According to **Figure 22 & 23 above**; Eight percent (8.1%) of the prescribers never make reference to the STG. The majority of the prescribers (82%) reported that it is easy to use the Namibian STGs**.**

4.12. Sources of information in prescribing of medicines

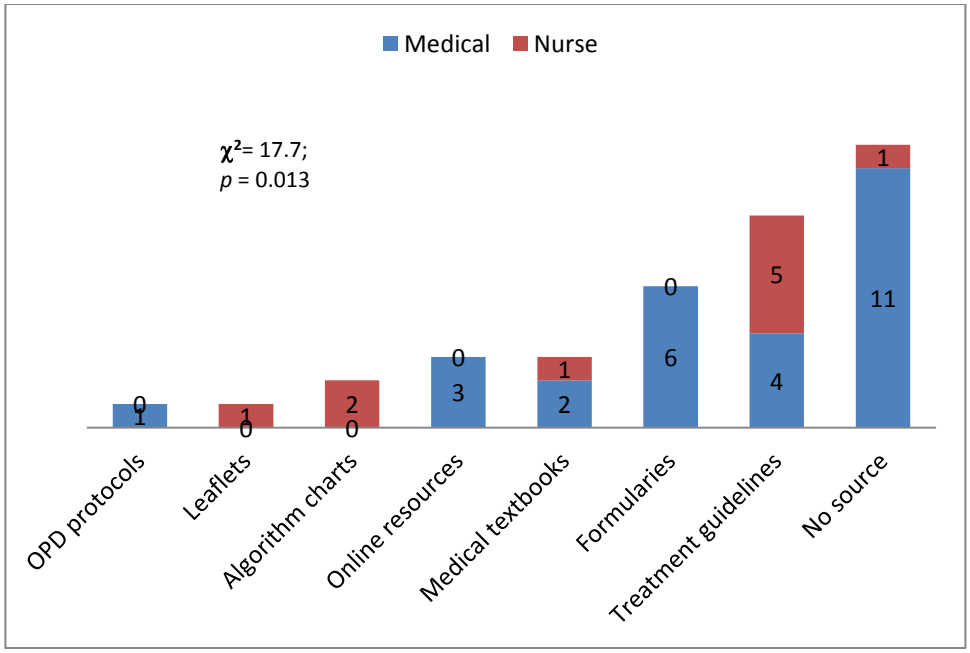

Figure 24: Sources of information used when prescribing medicines (n= 37)

According to **Figure 24** above, prescribers use a wide variety of references sources when prescribing medicines, ranging from patient leaflets to local and international STG and/or treatment protocols. The majority of the prescribers 48% (12/25) use printed guidelines in form of STGs formularies and Algorithms charts. The majority of the nurse prescribers 55.6% (5/9) use STGs compared to medical prescribers that use medicine formularies 37.5% (6/16). The main formularies used were the British National Formulary (BNF), South African Medicine Formulary (SAMF) and the MIMS. The most used printed treatment guidelines used were the Namibia STG, disease specific guidelines for HIV/AIDS, ART, TB, Malaria, PEP, and STI; the South African guidelines; Primary Health Care manual; flow charts and treatment protocols. Online sources of information

included Medscape and Wikipedia. The publications used for reference when prescribing in addition to STGs as reported by health care workers included Internal Medicine books such as Oxford pocket book; treatment Manual notes; Oxford clinical guidelines; Tally and O' Connor clinical examination; Nelson's textbook of Paediatrics and Neonatology. Nursing prescribers also used patient information leaflets, Doctor's notes and consultation with peers, specialists and medical officers to guide their prescribing.

4.13. Factors promoting the use of STGs in prescribing of medicines

The response rate ranged from 46% (17/37) for barriers to 60% (22/37) for factors promoting STG use.

4.13.1. Main thematic factors promoting the use of STGs in prescribing

According to **Table 11,** below the majority of the prescribers reported the simple indexing layout 77% (17/22), access to STGs 35.3% (6/17) and tailored information 29.4% (5/17) to health care cadre as the main factors driving use of the STG. The factors driving the use of the STG were categorized into six main thematic areas: **(a)** comprehensiveness of guideline to cover common disease conditions at all levels of health care; **(b)** simple and well-structured STGs for or indexing disease conditions; **(c)** access availability of STGs by health workers; **(d)** availability of recommended STG medicines at the facility; **(e)** relevant information to health care cadre or health facility level; and **(f)** portability of the STG and objectivity of the information in the STG.

Table 11: Factors promoting the use of STGs

Demographic	Prescriber cadre		Total	χ^2	P - Value	Cramer V
	Medical	Nursing				
Pros for STG use						
Comprehensive	5	-	5	3.963	0.139	0.327
Easy indexing	10	7	17			
No response	12	3	15			
Cons for STG use						
Access to STGs	2	4	6	11.346	0.078	0.554
Access to medicines	2	-	2			
Information overload	2	3	5			
Out-dated; needs	3	-	3			
review	2	-	2			
Does Not fit in pocket	16	3	19			
No response						

* = ($p < 0.05$)-Statistically significant- Pearson Chi-square Test

4.13.2. Sub-thematic factors promoting the use of STGs in OPD prescribing

(a) Comprehensiveness of guideline: a total of five (5) responses supporting that the guideline that covers the treatment and pathogenesis of common disease conditions at all levels of health care. Some of the responses included; *"Common diseases are found here, the treatment and pathologic conditions are clear" and "Practical, straightforward and inclusion of most conditions"*.

(b) Simple indexing system and ease to understand: there were a total of 17 responses who confirmed that the STG is well laid out to facilitate quick identification of disease conditions and medicines. Two responses 17% (2/12) were against the layout of the STG due to lack of time to make quick references. Such responses included: *"lack of time to page through the STG with high workloads"* and *"It is a bit difficult because you have to have enough time to sit and page back in the book and prescribe from it".* A total of 83% (10/12) responders agreed that the STG has a simple, clear and easy to understand, good lay out and the use of a colour coding system. Some of the responses included: *"Clear and easy to understand", "each condition in STGs is clearly set out", "They are easy to use because the index is clearly stating according to the alphabetical order plus the medicine index on conditions are separate which makes it even easier to use." "Pages are coloured coded and the STG is easy to carry". "The STG is divided into different section and each section is divided into chapters that cover specific diseases", "Treatment is clearly laid out step by step; well compiled".*

(c) Access / availability of STGs by health workers: there were a total of three responses on this theme; all responses reported that lack of access and availability of STG

copies: *"We have to share the book so sometimes you have to wait for it if your colleagues are busy with it". "They are not easily available". "The book is not easily accessible to every medical staff and it's only found in doctors' and pharmacists' consulting rooms".*

(d) Availability of recommended STG medicines at the facility: A total of three responses, one response indicated the lack of certain medicines recommended by the STG demotivated them from using the STG: ***"****Some medications are not in stock that is supposed to be used according to the STG****"***. Two responses reported that the medicines found in the STGs are available for use at the health facilities: *"contains available medicines in the state". "Medication available at local clinics"*

(e) Relevance of information to health care cadre or health facility level: A total of two responses indicated that the information in the STG is not structured for application by different prescribers – certain aspects are irrelevant or challenging to understand by some cadres. Responses included: *"The condition's managements are not according to the categories e.g. for nurses and doctors". "Information is not clear on how to give the treatment and there are no second choices in case if the medicines are not available"*;

(f) Portability of the STG; two responses were on the portability of the STG expressing the need to make it portable such as an electronic STG; *"Awkward shape and size to carry around, medicine always not available". "Not pocket fit. It is too thick, difficult to carry around"*

(g) Updated or objective information: one response that the information in the STG is not up-to-date as well as trusting the evidence in the STGs: *"Not evidenced based"*

4.14. Strategies for effective use of STGs in prescribing of medicines

The prescribers suggested the following interventions to improve on the use of the STG: the main interventions should include increasing access to the STG and essential medicines at the health facilities, Continuous professional training on STG, updating the guidelines regularly; resizing and layout of guideline as well as a system to continuously audit and monitor the use of the STG.

(a) Access to essential medicines: the medicines included in the essential medicine list (Nemlist) should be available all the times. The medications listed for treatment in the STG should be on the Nemlist and available in stock always.

(b) Training on use of STG / refresher courses: MoHSS should provide continuous refresher courses for prescribers; this will promote prescribers to make correct references of symptoms and treatments correctly. *"There is a need to include a list of available medicine in each health facility level as well as their common side effects".*

(c) Updating guidelines: Prescribers recommended posting of guidelines for identified recurrent problems (wrong prescriptions). Make them more available; update them to match current global medical guidelines. *"The STGs should be up-to-date and based on current literature". "It needs to be updated to accommodate the hospital level fully (and not referred to the hospital)".*

(d) Access and availability of STG: Every staff member must have his/her own book. STGs should be available commercially at reasonable price. STGs should be available more frequently. *"STG should be available at all health facilities, wards and out-patient units".*

(e) Organization of the STG: Make the smaller and more specific. *"Make the STGs more focussed on nursing diagnosis and not general diagnosis"*. *"STGs must be revised and written according to the health workers' category e.g. Management for nurses and doctors". "Too much information for one condition it required a lot of time"*. Direction on interpreting the main signs and symptoms: *"Please note first the sign and symptoms of different diseases than the diagnosis and the treatment.* "*Clearly outline 1st option for prescribing and Second option for prescribing in case if the patient comes back with the same problem"*. Reduce the size of the STG and make it pocket fit: *"STGs should be short and concise".*

(f) STG audits: Conduct regular evaluation on the use of the STG to make sure health workers adhere to it

4.15. Summary

This chapter provided an overview of the results of this study. Some highlights of the results are as follows. A total of 1243 prescription records were reviewed and 92.5% (37/40) target prescribers completed the study. The majority of the prescriptions were from the hospital (56 %), for adult (73.4 %) and female (55.6 %) patients. The most prescribed medicines at OPD were antibiotics (69.4 %), analgesics (57.2 %) or antihistamines (10 %). The most prescribed for disease systems were Respiratory (13.8 %), Gastrointestinal (13.8 %) and Musculoskeletal (11 %). Four out of the five (80%) prescribing indicators were below acceptable prescribing thresholds. Non-compliance to

prescribing of medicines was suboptimal with: average number of medicines per prescription; % of prescriptions with antibiotics, prescribing by generic names and STGs compliance. The main factors associated with non-compliance to STG prescribing was associated with facility level ($p = 0.018$); age category of the patient ($p = 0.003$) and antibiotic prescribing ($p < 0.001$). The use of STG in prescribing of medicines was low 73%, below WHO threshold. The main factors driving the use of STGs were access to STGs and/or training; access to STG recommended medicines at the health facility and the simplicity in indexing of the STG.

CHAPTER FIVE : DISCUSSION OF RESULTS

5.1. Overview of the discussion chapter

In this Chapter the results are discussed under two main sections: **Section A** discusses the findings from the patient records review and **Section B** from the prescriber interviews on use of standard treatment guidelines. The demographic characteristics of the study population are discussed **(5.2)**, followed by results of the prescribing indicators including STGs compliance are organized in five subsections; (**5.3 – 5.7)**. In **Section B** four subsections **(5.8 – 5.12)** present discussions on demographic characteristics of prescribers, awareness and utility of STGs by prescribers at OPD units, sources of information in prescribing of medicines, factors promoting the use of STGs in prescribing of medicines and strategies for effective use of STGs in prescribing of medicines. In each section results of the study are discussed in line with the findings in literature **(Chapter 2)**. Limitations of the study are discussed in section (**5.13)**.

A. DISCUSSION OF PATIENT RECORDS' REVIEW RESULTS

5.2. Demographic characteristics of study population

In this study over half of the prescriptions were at the hospital level of care compared to primary health care **(Table 2).** A significantly high number of prescriptions were initiated by medical compared to nursing professionals **(Table 2)**. A wide range of cadres are

involved in prescribing of medicines at the OPD units in Khomas Region - including medical, dental and nursing professionals as well as medical interns, students and specialists **(Figure 2)**. This finding is in line with a similar study conducted in Namibia (Akpabio *et al*., 2014). A high number of prescriptions were initiated for female patients and in adult patients which is in line with another study conducted in Sudan that also found more female enrolment in the study (Eldin & Ali, 2013). This might be due to women's behaviour of seeking health more than men and perception of men being seen as weak if they seek health care might have kept them away from health facilities. However, a study in India found more prescriptions initiated for male than female patients (Karande *et al*., 2015). Antibiotics, antihistamines and analgesics were the most prescribed category of medicines at the OPD units **(Figure 3).** This finding is in line with another study conducted in Ethiopia which also found antibiotics being most prescribed class of medicines and Amoxicillin being most prescribed antibiotic, which is also the case in our study (Desalegn, 2013). The highest numbers of prescriptions were for a diagnosis of respiratory tract infections, gastrointestinal infections and musculoskeletal disorders **(Figure 3)** which is in line with another study conducted in India that had similarity in diagnosis patterns (Karande *et al*., 2015). We found a statistically significant association ($p < 0.005$) between the number of prescriptions by health facility level and prescriber category, patient gender and patient age.

5.3. Prescribing indicator 1: percent of prescriptions that include an antibiotic

In this study, the % of prescriptions with antibiotics were sub-optimal (69%), **Figure 5.** This is more than twice the WHO recommended threshold of 25% of prescriptions including an antibiotic and the acceptable limit of 35% set by MoHSS (MoHSS, 2012b). The level of antibiotic prescribing was found to be worse at PHC level (72.2%) compared to hospital level (67.2%) (**Table 3).** This difference may be due to the variability in the staff and operation and education at the different levels of health care. In this study there was a diverse group of prescribers' cadres that included nurses and medical interns/students. A study in Korea however did not find an association of antibiotic compliance to level of education and level of health care settings (Choi *et al.,* 2012). This difference could also be attributed to WHO's Integrated Management of Childhood illness (IMCI) strategy implementation at PHC level leading to more antibiotic prescribing at lower level as this strategy advocates for treatment at PHC level (Basaleem & Amin, 2011). A similar study in Namibia showed lower antibiotic prescribing than this study (Akpabio *et al*., 2014). The level of antibiotic prescribing in this study is higher than antibiotic prescribing levels reported by the MoHSS PMIS as 44% Nationally and 30% in Khomas Region (Niaz et al., 2015).

Similar studies in developing countries have reported antibiotic prescribing levels ranging from 26% to 75% (Karande *et al.,* 2015; Bhartiy *et al.,* 2008; Patel *et al.,* 2005; Al-Mendalawi & Al-Niemet, 2008; Keohavong *et al.,* 2006; Cheraghali *et al.,* 2004; Holloway *et al.,* 2013; Danysz, 2010; Desalegn, 2013b; Eldin & Ali, 2013). Antibiotic

prescribing in OPD units in the Khomas Region in this study was higher than found by a study done in South Africa where antibiotic prescribing levels ranged between 26 - 46% (Danysz, 2010) ; studies conducted in Ethiopia by Desalegn, (2013) and Sudan by Eldin & Ali, (2013) that reported antibiotic prescribing levels of 58.1% and 64% respectively.

The over-prescribing of antibiotics was higher among children (84.6%) **(Table 3)**. Similar studies in Canada and Botswana reported high antibiotic prescribing in children (24-80%) due to a high incidence of respiratory tract infections in under five children (Wang, Einarson, Kellner, & Conly, 1999; Boonstra *et al.*, 2005). Our findings of 91% of prescriptions for respiratory infections including an antibiotic **(Figure 8)** are higher than other studies. Studies in the United States and Canada, found that antibiotic prescribing ranged between 24% - 80% for viral Upper RTI particularly among under five children (Nyquist *et al.*, 1998; Wang *et al.*, 1999; Linder & Page, 2001, Mainous, Hueston, & Love, 1998). A study in Botswana reported 30% antibiotic prescribing in under five children diagnosed with acute respiratory tract infections and diarrhoea (Boonstra *et al.*, 2005). A study in Namibia at KHC reported a high rate of antibiotic prescribing (78%) for URTI (Kunda, 2014). This is similar to findings in this study that also found a high antibiotic use (91%) in respiratory system conditions. Such high antibiotic prescribing patterns in respiratory system are alarming as this disease system is universally prone to antibiotic misuse (Robert *et al*., 1996). If such trends continue, a risk of antimicrobial resistance to commonly used first line antibiotics may emerge rendering them being resistant to common pathogens.

5.4. Prescribing Indicator 2: Average number of medicines per prescription (Polypharmacy)

In this study, over 2/3 (70%) of the prescriptions included three or less medicines (**Figure 9)** which is within threshold set by WHO, (1993). However a study in India by Patel *et al.*, (2005) reported that 48.3% prescriptions were with less than 3 medicines. The average number of medicines per prescription for this study was slightly higher (3.12 ±1.14) than the recommended threshold of a maximum of 3.0 medicines per prescription (MoHSS-PMIS Manual, 2012; WHO, 1993). Other studies report an average number of medicine per prescription ranging from 2.1 to 3.4 ; with Iran having the highest average of 3.4 (Karande *et al.,* 2015; Holloway *et al.,* 2013; , Cheraghali *et al.,* 2004; Desalegn, 2013 and Eldin & Ali, 2013). Our findings were higher than a study in Ethiopia (1.9) (Desalegn, 2013) but similar to a study in Sudan (Eldin & Ali, 2013). This comparison shows that average number of medicine per prescription for this study was comparable to the findings in other countries. Our finding is higher than previous findings from the Namibia MoHSS PMIS report which found an average of 2.9 medicines per prescription (Niaz et al., 2015) but almost similar to a study conducted in selected six regions of Namibia that reported 3.25 medicine per prescriptions on average number of medicine (Akpabio et al., 2014) .

We found that prescriptions for obstetrics, schistosomiasis, nutrition, blood system, emergencies, psychiatric, CNS, ophthalmology and ENT disease systems, had a perfect

compliance to average number of medicines per prescription indicator (< 3) by disease condition **(Figure 12).** Non-compliance to WHO recommended number of medicines per prescription was higher in prescriptions initiated at the hospital and in adult patients (**Table 4).** Despite the fact that at the hospital level, there are mechanisms to control overprescribing (polypharmacy) through therapeutic committees, the average number of medicines per prescription was highest in the hospital. The high medicines per prescription at the hospital may be related to the factors such as workload and patient turnover, these factors should be investigated further. It may also be due to the fact that the hospital treats more complex cases resulting in more medicines per prescription.

A high number of medicines per prescription (polypharmacy) was more prevalent in prescriptions for, fever, HIV, TB, urogenital system, cardiovascular system, gastrointestinal system and respiratory system **(Figure 12)**. Polypharmacy (> 3 medicines per prescription) was associated with prescriptions that had either an antibiotic, injection and prescribed by non-generic names **(Table 5).** It shows the fact that most of the RUM indicators are inter related as irrational prescribing of antibiotics and/or injections will lead to polypharmacy.

The average number of medicines per prescription in this study found to be similar among different prescribing cadres such as medical officers and nurses. There was also no statistically significant difference in number of medicines prescribed for male and female

patients **(Table 4).** It shows that interventions to improve polypharmacy should be general and target all cadres prescribing all age groups.

5.5. Prescribing indicator 3: Percent of medicines prescribed by generic name

In this study, cumulative compliance to prescribing by generic name when total medicines prescribed were analysed (irrespective of individual prescription) was found to be 63.6% **(Figure 13)**; this is less than the threshold for generic prescribing set at 80% by MoHSS PMIS (MoHSS, 2012b). The compliance to generic prescribing was highest at health centre level and lowest at hospital level **(Figure 13)** but was below threshold of 80% in all the study sites. Similar studies in USA, India, Lao, Sudan, Ethiopia and South Africa have reported varying levels of compliance to generic prescribing ranging from: 0% to 98.7%, by country and health facility level (Steinman *et al.,* 2007; Karim *et al.,* 1996; *Bhartiy et al.,* 2008, Eldin & Ali, 2013 Karande *et al.,* 2015 ; Keohavong *et al.,* 2006; Karim *et al.,* 1996 and Desalegn, 2013). The highest compliance was reported in a study in Ethiopia which found a generic prescribing level of 98.7% (Desalegn, 2013). Other African countries have reported lower levels of generic prescribing including South Africa (21%) (Karim *et al.,* 1996) and Sudan (48%) (Eldin & Ali, 2013). The findings on level of generic prescribing in this study are lower than the Namibia PMIS report (2015) that showed 77% generic prescribing nationally. However the same PMIS report reflected that generic prescribing in the Khomas Region was only 54% (Niaz et al., 2015).

In order to more accurately describe the prescribing behaviour at study sites with respect to generic prescribing, individual prescriptions were also analysed to identify generic prescribing patterns. If 80% or more medicine on a prescriptions were prescribed by generic name, the prescription was considered generic compliant as per MoHSS PMIS manual (MoHSS, 2012b). Overall only 36.6% prescriptions were compliant to generic prescribing **(Table 6)** which is very low, but still higher than the less than 10% prescriptions compliant to generic prescribing found in an Indian study (Patel *et al.*, 2005). At individual study sites generic prescribing was 60.5% at KHC, 42.1% at KMDC and 20.9% at IHK. Low generic prescribing at the hospital versus PHC facilities might be due to more variety and number of prescribers at the hospital. Presence of more students and interns as well could also be a possible reason. It could also be due to pharmaceutical promotion targeting hospitals more frequently than PHC facilities. Brand names' prescribing was more common for fever (8%) followed by trauma (21%) and gynaecology (23%). This could be due to commonly prevalent brand name use for commonly prescribed anti-inflammatory and analgesic medicines such as paracetamol alone or in combination with codeine that are expected to be prescribed in such disease systems

5.6. Prescribing indicators 4: Percent of prescriptions that include an Injection

In this study, the level of prescriptions that include an injection was found to be 10.8% **(Figure 16)**; this is acceptable when compared with the WHO threshold for prescriptions that include an injection, which is set to less than 15% (WHO, 1993 and Eldin & Ali, 2013). Fewer prescriptions included an injection at primary health care level; 7.0% at

KMDC and 8.5% at KHC than at hospital level (12.8%) – **(Figure 16)**. This could be due to the policies that restrict the type of medicines and dosage forms by the level of the Health facility (MoHSS Nemlist, 2016). This could also be attributed to more specialized care and complex referred cases from PHC to hospital. The MoHSS doesn't monitor use of injections as part of their regular monitoring system, PMIS (MoHSS, 2012b) due to the fact that irrational use of injections was not found to be a major problem during the National Medicine Use Surveys conducted in 1997, 1999 and 2001 (Lates & Shiyandja, 2001).

The literature shows that studies in India, Bangladesh, Lao, China, Iran and Ethiopia found the level of prescriptions that include an injection varied greatly from 0.2% to 78% (Bhartiy *et al.,* 2008; Keohavong *et al.,* 2006; Tang *et al.,* 2013; Cheraghali *et al.,* 2004; Wang *et al.,* 2014; Chowdhury *et al.,* 2011;Desalegn, 2013) . Injection prescribing at OPD units in Khomas Regions is satisfactory when compared to the guidelines set by WHO, which is good sign. The prescribing of injections was higher in adult patients compared (12.6 %) to children (5.7 %) – **(Figure 17)**; disease category of trauma 24%, musculoskeletal system with 23% and urogenital system with (21%) and Gynaecology (16%) – **(Figure 18)**. This can be attributed to immediate pain relief required in trauma and different musculoskeletal disorders as onset of action of medicines is higher in injections versus other dosage forms. High use in urogenital systems could be due to the fact the STGs recommend the use of ceftriaxone injection for certain conditions.

5.7. Prescribing indicators 5: compliance to STG by treatment indication

In this study, the majority (73%) of the prescriptions were compliant to STGs recommendations **(Figure 19)**. The target compliance level is set at 85% (Management Sciences for Health, 2012), therefore STG compliance was suboptimal but was quite similar at all health facilities: Hospital (70.6%), PHC (76.1%) **(Figure 20)**. A study by Holloway *et al*., (2013) reported STG compliance in PHC settings in developing countries to range: 30% to 40%; this is much less than STG compliance of this study . In Nigeria, compliance to antibiotic guidelines was found to be 52% (Obaseiki-Ebor *et al.,* 1987). Compliance to STG guidelines at OPD in Khomas Region in our study (73%) is higher than reports from a STG post-implementation study conducted in selected regions of Namibia that estimated compliance to range from: 26.2% -55.1% with the compliance in the Khomas Region at 20.7% (Akpabio *et al.,* 2014). This could be due to the fact that this study looked at a set of certain conditions while our study accessed prescriptions in general. A further possible reason for this study finding higher compliance to STGs than other similar studies, may be due to the fact that the study excluded prescriptions where the diagnosis was not supported by the signs and symptoms recorded in the health passport.

STG compliance was lower in prescriptions for children (66.8%) compared to adults (75.2%) **(Table 8)**. These findings are similar with another study done in Bangladesh which found compliance to STGs of 29.5% in children and 52.7% in adults (Afreen &

Rahman, 2014). Thus it is important to target paediatric prescribing when launching interventions to improve STG compliance. In this study compliance to STGs was lower for prescriptions with a diagnosis of urogenital system (58%), respiratory system (64%) and gastrointestinal system (64%).

Our findings for STG compliance in respiratory infections (64%) were lower than compliance (89.5%) reported by a study in Canada (Arnold *et al*., 1997). Our findings were somewhat similar to a study conducted in Iran (23-66%) (Cheraghali *et al*., 2004). Our findings were higher than compliance to treatment guidelines in other studies in different respiratory conditions in different countries such as 3.3% to 13% in Bangladesh (Afreen & Rahman, 2014); 13% in USA (Adjemian *et al*., 2014); 14% in Sierra Leone (Bruycker *et al*., 2013); and 26% in Botswana (Boonstra *et al*., 2005).

A similar study conducted at KHC in Khomas Region, Namibia estimated a lower level of compliance to STGs in the management of URTI at 47% (Kunda, 2014). The difference in results could be due to methodological variations as our study was not focussed on a single disease, unlike the study by (Kunda, 2014) that was specific for upper respiratory tract infections and used a smaller sample size.

In this study we found compliance to STG varied considerably according to the condition being treated – **(Figure 21)**: gastrointestinal diseases (64%); trauma (68%); CVS disorders (86%); CNS (95%). These findings reveal higher compliance to STGs compared to studies conducted for treatment of diarrhoea that showed compliance to STGs between 2.7% and

12% (Cheraghali *et al.,* 2004; Howteerakul *et al.,* 2003; Pathak *et al.,* 2011; Boonstra *et al.,* 2005). Compliance to STGs in Trauma in this study was higher compared to that of a study in US that ranged between 16% to 17% (Hesdorffer, Ghajar, & Iacono, 2002). Compliance to STGs for treatment of CVS in this study was comparable to studies in different countries that was found to be in the range of 32.5% and 87% (Komajda *et al.,* 2005; Clause & Hamilton, 2002; Soheilipour *et al.,* 2009; Abdulameer *et al.,* 2012; Pillay *et al.,* 2009). STG compliance for CNS in this study was similar to reports of studies on CNS conditions conducted worldwide revealed percentage compliance in the range of 42% to 95.8% (Schneider *et al.,* 2005; Sweileh *et al.,* 2013; Wang *et al.,* 2014).

The above results shows that there is risk of irrational prescribing particularly in systems such as Urogenital, Respiratory and GIT when guidelines are not adhered to, especially at clinic level, which is the first contact between health care prescribers and the public. Keeping in view the above findings, non-adherence to guidelines may lead to irrational prescribing, particularly in children, and may lead to unwanted clinical outcomes and antimicrobial resistance.

B. DISCUSSION OF PRESCRIBERS' INTERVIEW RESULTS

5.8. Demographic characteristics of prescribers

This study was purposively designed so that more prescribers from hospital compared to health centre or clinic participated, as more patients are seen at OPD in the hospital and more prescriptions were sampled from this health facility. Though more than half of the prescribers interviewed were medical officers, other cadres including nurses, interns and students are involved in prescribing of medicines at OPD units. These findings are in line with similar study conducted in selected regions of Namibia (Akpabio *et al*., 2014). The variation in type of cadre prescribing may influence the quality and compliance of prescribing at these units. Similar studies have shown that middle level cadres such as students and nurses have a limited capacity to effectively prescribe all categories of medicines (Latter & Courtenay, 2004).

5.9. Awareness and utility of STGs by prescribers at OPD units

The study found that the level of awareness and availability (94.6%) of the comprehensive Namibia STGs is very high **(Table 10).** This finding is in line with Akpabio *et al*., (2014) who reported 94.8% availability of the STGs in the six selected regions and 80% availability in Khomas. However certain prescribers (8.1%) at the OPD units have never seen a copy and never make reference to the STG. 32.4% of the prescribers routinely refer to the STG on a daily basis **(Figure 22)** whereas 20% of prescribers reported using STGs

daily in Khomas according to Akpabio *et al*., (2014) . In this study, less than one fifth (1/5) of the prescribers had completed training on use of STG **(Table 10).** A very high number of the prescribers (82%) find it easy to make references using the Namibia STGs**.**

5.10. Sources of information in prescribing of medicines

In this study prescribers reported using a wide variety of references sources in prescribing of medicines ranging from patient leaflets to local and international STG and/or treatment protocols. Most prescribers use printed guidelines in form of STGs, treatment and Algorithms charts as the main source of information. Most nurse prescribers use STG compared to medical prescribers that use medicine formularies and peer consultation. A Study in Uganda on access and use of medicines information indicated similar sources of information such as National STGs, formularies such as BNF and peer consultation as possible sources used by physicians in public hospitals (Tumwikirize *et al*., 2008).

5.11. Factors promoting the use of STGs in prescribing of medicines

In this study, the thematic factors influencing the use of the STG included: **(a)** comprehensiveness of guideline to cover common disease conditions at all levels of health care; **(b)** simple and well-structured STGs for or indexing disease conditions; **(c)** access availability of STGs by health workers; **(d)** availability of recommended STG medicines at the facility; **(e)** relevant information to health care cadre or health facility level; **(f)** portability of the STG and **(g)** objectivity of the information in the STG. Findings of our study were in line with a study conducted on application of standard treatment guidelines

in rural community health centres, Timor-Leste (Higuchi, Okumura, Aoyama, Suryawati, & Porter, 2012)

5.12. Strategies for effective use of STGs in prescribing of medicines

In this study, the thematic interventions recommended by prescribers to improve on the use of the STG included: increasing access to the STG and essential medicines at the health facilities, Continuous professional training on STG, updating the guidelines regularly; resizing and layout of guideline as well as a system to continuously audit and monitor the use of the STG.

Findings of this study were in line with a similar study conducted in selected regions of Namibia that suggested: increased access, frequent availability; training on use of STGs; regular updates and more active TCs to monitor and evaluate prescribing through medicine use evaluations to improve effective use of STGs (Akpabio *et al*., 2014).

5.13. Study limitations

This study was based on WHO core medicine use indicators. These indicators provide a first line overview of medicine use at a certain level and indicate towards existence of a problem or best practice but are limited up to certain level. Further research to explore each identified problem is required to identify the causes and possible solution to the problem (WHO, 1993).

Data for calculation of prescribing indicators was extracted from patient health passports while receiving their medicine at the out-patient pharmacy. These patient passports are

patient held records and therefore the researcher had no possibility to go back to the primary record if data was found to be missing or unclear at a later point. Also, poor quality of data and challenges of poor record management arose during the assessment. This limitation was overcome by restricting the review to the latest prescription of patients that were available for treatment during the period of assessment and collecting bigger sample size as recommended by WHO for such medicine use evaluations (WHO, 1993). This study did not take into account the dosage and duration of the treatment as patient held records did not have detailed information on prescribed pathological tests in order to arrive onto certain diagnosis and the results. Therefore, this study was limited to recommend treatment as per STGs and the prescriptions under study were considered STG compliant if the medicine prescribed and dosage and duration of treatment was in line with recommended by STG.

The study also noted that initially researcher had planned to collect 10% samples from KMDC, 35% from KHC and 55% from IHK. But during the time of data collection, flow of patients at KMDC was lower than expected thus leading to 1% less than expected samples. 1% more than expected samples were included from IHK due to high influx of prescriptions at IHK.

5.14. Summary

This chapter has provided discussion of results and has compared the study results with similar studies conducted worldwide. Following chapter six provides conclusion and recommendations.

CHAPTER SIX : CONCLUSION AND RECOMMENDATIONS

6.1. Overview of chapter six

This chapter gives conclusions and recommendations based on the findings of the study. This chapter is organized in three sections: section **6.2** includes conclusions from the patient records review and section **6.3** includes conclusions from the prescriber interviews. In section **6.4** recommendations are made according to the specific objectives of this study which were to;

i. Determine selected prescribing indicators at out-patient departments (OPD) in the public health facilities in Khomas Region, Namibia.
ii. Determine the level of compliance to Namibia STGs among prescribers at OPD in the public health facilities in Khomas Region, Namibia.

6.2. Conclusions: medicine prescribing patterns and indicators

The study conclude that the prescribing patterns for some core indicators (prescribing indicators) are suboptimal at OPDs in the Khomas Region. Compliance to prescribing indicators was suboptimal for 80% (4/5) of the indicators measured in this study (MoHSS, 2012; WHO, 1993; Management Sciences for Health, 2012).

The average number of medicines per prescription (polypharmacy) is high, the antibiotic prescribing is high, generic prescribing is below threshold and compliance to STG is sub-optimal (< 85%). The prescribing of injections at the OPDs in the Khomas Region was the only indicator found to be within the recommended range.

The study found a very high use of antibiotics, analgesics and antihistamine medicines at OPD units. A high incidence of acute infections including GIT, URTI and GUT are major factors driving the prescribing of medicines at OPD units and use of antibiotics. The non-compliance to prescribing requirements may be due to the wide range of cadres involved in the prescribing of medicines at OPD units, which may influence the quality of medicine prescribing. Compliance to good prescribing practices was better at the health centre than compared to the hospital (high level of care) and the clinic (lowest level of care). There could be intrinsic factors associated with the health facility that drive the prescribing indicators.

6.3. Conclusions: prescriber interview on use of STGs

We conclude that though the awareness of the STGs is high among prescribers, the use and access is limited. The main factors driving the use of the STG are access to the STG copies and availability of medicines recommended by the STG as well as the simplicity in indexing of the STG and objectivity of the information used. A wide variety of resources are reported to be used to guide prescribing decisions and this may influence the quality and compliance to good prescribing patterns at the OPD units. Prescribers'

interviews suggest that STGs should be revised; made available to all health professionals and the treatment options described in STGs should be available and in stock at all times.

6.4. Recommendations

The recommendations from this study are addressed to policy makers in the MoHSS, Health Professional Councils and Societies, Medical and Nursing training institutions and health care professionals and other relevant stakeholders' in order to point out the areas of concern and possible way forward to plan and implement interventions to improve such areas.

6.4.1. Recommendations: Improving Rational Prescribing

6.4.1.1. To the Ministry of Health and Social Services

a) Introduce compulsory RUM concept training in the orientation of newly appointed prescribers and interns to improve rational prescribing.
b) MoHSS to organise a training of trainers on RUM concept, particularly covering rational prescribing of antibiotics and importance of compliance to available standards and norms of prescribing. This team of trainers should carry out trainings at respective Therapeutic Committees of health facilities in all regions starting with the region understudy.
c) MoHSS is advised to revise and update STGs regularly and make sure they are readily available at all levels of health facilities and different departments.

d) It is recommended that the Nemlist is reviewed more regularly and that all the treatment options in STGs are included in Nemlist.

e) MoHSS is advised to make sure that pharmaceutical supplies listed on Nemlist should be available at all times, to avoid irrational medicine use and emergence of resistance.

f) Therapeutic Committees are important platforms to discuss therapeutic issues including RUM and STG compliance. These committees should remain active in all health care facilities and regional level to curb any irrational practices in the region.

g) Prescribing cadres of MoHSS should be provided with refresher training periodically on RUM concept and use of the STGs.

6.4.1.2. To Therapeutic Committees (TCs)

a) It is recommended that respective TCs plan interventions to strengthen medicine use indicators, especially prescribing indicators, among prescribers to combat Polypharmacy.

b) Generic prescribing has been found below MoHSS set criteria particularly at IHK. It is recommended that respective TCs devise measure such as training and education of prescribers to ensure improvement in generic prescribing in particular and other prescribing indicators in general.

c) Antibiotic over prescribing was observed at health facilities under study by different prescribing cadres particularly at KHC and by cadres such as nurses and

medical interns/ students. TCs of respective health facilities are advised to target such cadres and health care facility levels to train them on rational antibiotic prescribing to avoid antimicrobial resistance.

d) Results of medicine use indicators should be discussed at relevant TCs to sensitize staff in improving medicine use practices.

6.4.1.3. Teaching institutions:

a) Should ensure incorporation of a comprehensive component on Rational Use of Medicine (including medicine use indicators) at the time of development and review of curricula for formal trainings.

b) Medicine use indicators provide a basic idea of existence of a problem and require further research to further explore the magnitude and causes of the problem and possible solution. Therefore, the researcher recommends that Teaching institutions work together with the MoHSS and other stakeholders to plan for further investigation in the highlighted areas of this research.

6.4.1.4. Further Research:

a) Further research is recommended to establish existence of resistance to commonly used antibiotics, particularly those used in the public sector. This research focussed mainly on prescribing indicators, which is only one component of medicine use

indicators. Other groups of medicine use indicators include patient care and health facility indicators. Further research is needed in these areas.

b) Regular monitoring and feedback of medicine use indicators at national, regional and health facility level is important to improve rational use of medicines.

c) Researcher recommends further research in STG compliance keeping in view the signs and symptoms and other necessary diagnostic tests leading to diagnosis and dosage and duration of the treatment prescribed.

6.4.2. Recommendations: Improving compliance to use of STG

a) **Access to essential medicines:** the medicines included in the essential medicine list (Nemlist) should be available all the times and the medications listed for treatment in the STG should be in the Nemlist and are in stock always.

b) **Training on use of STG / refresher courses:** MoHSS should provide frequent refresher courses for prescribers; this will encourage prescribers to make correct references of symptoms and treatments correctly. There is also a need for training institutions to train medical nursing and pharmacy students on prescribing and compliance to STGs.

c) **Updating guidelines:** The STGs should be updated and based on current literature and to accommodate practice at all the different the health facility levels.

d) **Electronic Resources:** It is also recommended to incorporate a list of available medicine in each health facility level as well as their common side effects and

interactions and availing such information through a smart phone/tablet application that prescribers can use. Latest STGs can also be included in that application.

e) **Access and availability of STG:** The MoHSS should ensure that every staff member has his/her own book and that the STGs be available commercially at reasonable price. Training institutions should ensure that students and interns have copies of the STG during training and practice

f) **Organization of the STG:** The MoHSS should make the smaller and more specific. Direction on interpreting the main signs and symptoms: Reduce the size of the STG and make it pocket fit.

g) **STG audits:** Conduct regular evaluation on the use of the STG to make sure health workers adhere to it.

6.5. Summary

This chapter concluded that there is a risk of polypharmacy in the study sites, generic prescribing is below acceptable limits, antibiotic prescribing is high, STG compliance is below acceptable limit, while injection prescribing is reasonable. At the end of the chapter, the researcher has summarized recommendation to key to stake-holders for improving prescribing indicators and STG compliance.

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ANNEXES

Annex 1: Patient Prescriptions extraction tool

An Evaluation of Prescribing Practices in Out-patient Departments in Public Health Facilities in Khomas Region, Namibia

Instructions: Please Tick or fill the spaces below

<table>
<tr><td>101) Serial #: ----------</td><td>102) Date of Data Collection:</td><td>103) Date of Rx:</td><td>104) Data Collector Initials</td></tr>
<tr><td colspan="2">Health Facility details
105) Type: (1) □Hospital (2) □Health Centre (3) □Clinic</td><td colspan="2">106) Facility name:</td></tr>
<tr><td colspan="3">107) Prescriber's Rank/Position
(1) □Intern doctor
(2) □Medical Officer
(3) □Specialist (specify)
(4) □ Nurse (specify if indicated)
a. □Registered Nurse/midwife
b. □Enrolled Nurse
(5) □Other_____</td><td>108) is the prescriber trained on STGs use?
(1) □ YES (2) □ NO</td></tr>
</table>

Patient's Details 109) Gender: (1) □Male (2) □Female	110) Date of birth *(dd-mm-yyyy*): _____/_____/_____	111) Age: *(years or months)* 112) □Adult □Child
113) Diagnosis:	114) Diagnosis recorded on RX: (1) □ YES (2) □ NO	
115) List Presenting Complaints, History, signs and symptoms etc.		
116) Other diagnosis *(list below)*	117) Patient Referred for Specialized Care: (1) □ YES (2) □ NO	
118) Management of the Condition		

(1) Treatment Prescribed *(write exactly as the prescriber has written, including abbreviations)- please include non-pharmacological interven	(2) Generic Name used Y/N	(3) Dose & frequency	(4) Duration of treatment	Antibiotic Y/N	Injection Y/N	119) Treatment complies with STG *(if NO, indicate aspect that is not compliant with STG*) – For official use only.					
						□Yes	□ No				
							1	2	3	4	All

	tions at the end also											
a												
b												
c												
d												
e												
f												
g												
h												
I												

Any other comments/observation regarding this prescription

_____

_____

_____

_____

Annex 2: Survey for Prescribers

An Evaluation of Prescribing Practices in Out-patient Departments in Public Health Facilities in Khomas Region, Namibia

Introduction

Hello, I am ……., student of UNAM MPH Final Year to conduct an assessment of prescribing practices in public health facilities of Khomas Region of Namibia. This assessment is being carried in three Health Facilities of Khomas Region. The findings of this assessment will help to improve the quality of medicine use and patient care in Khomas Region of Namibia.

As a prescriber in this facility, you are highly regarded as a key respondent for this assessment. You are kindly requested to give genuine and accurate information for purposes of effective results.

Procedures and Confidentiality

Your participation is absolutely voluntary and there is no penalty for refusing to take part. All information that I record will be kept strictly confidential; your name will not be used and you will not be identified in any way.

Risks/discomfort and Benefits:

There is no risk to you if you agree to participate in this activity.

Consent to participate

I have read (or someone has read to me) and I have understood the information given above and what will be required of me if I choose to take part in the assessment. I therefore agree to take part in this study

……

…… …….....

Signature of respondent Respondents Cadre Date

Interviewer Name: _____

Thank you for accepting to take part in this assessment

Question 1:

Are you aware of the comprehensive Namibia Standard Treatment Guidelines (STGs)?

(1)□ Yes (2) □ No

Question 2:

Do you have STGs available in your work place?

(1)□ Yes (2) □ No

If Yes, Please show me the copy of STGs.

Question 3:

Have you received training on the use of STGs?

(1)□ Yes (2) □ No

Question 4:

How often do you use STGs while prescribing treatment for your patients?

(1)□ Daily (2) □ Once in a week (3) □Once in a month

(4) □ Once in 6 months (5) □ Once in a year

Question 5:

How do you find the use of STGs in your daily practice?

(1)□ Easy (2) □ Difficult

Question 6:

Please list the reasons which make the use of STGs easy or difficult for you depending upon your answer of the Question 5?

_____

_____

Question 7:

What are your recommendations to overcome difficulties in the use of STGs?

Question 8:

List the sources of information that you use in your practice in addition to STGs while choosing treatment for your patients?

_____

_____

_____

_____

_____

Thank you for accepting to take part in this assessment

Annex 3: Medicines classed as Antibiotics

Amikacin	Cefradine	Doxycycline
Amoxicillin	Ceftriaxone	Erythromycin
Ampicillin	Cefuroxime	Fusidic Acid
Azithromycin	Chloramphenicol	Gentamicin
Benzathine Benzyl penicillin	Ciprofloxacin	Metronidazole
Benzyl- Penicillin + Benzathine + Procaine	Clindamycin	Nalidixic Acid
Benzyl penicillin	Cloxacillin	Nitrofurantoin
Cefalothin	Co-trimoxazole	Phenoxymethylpenicillin
Piperacillin + Tazobactam	Procaine Benzyl Penicillin	

(Source: adopted from PMIS manual- MoHSS, 2012)

Annex 4: Letter of permission to conduct research- Postgraduate Studies Committee: University of Namibia

UNIVERSITY OF NAMIBIA
Private Bag 13301, 340 Mandume Ndemufayo Avenue, Pionierspark, Windhoek, Namibia

FACULTY OF HEALTH SCIENCES
SCHOOL OF NURSING AND PUBLIC HEALTH
UNIVERSITY OF NAMIBIA

Letter of permission:
Post graduate students

Date: 18 October 2011

Dear Student: Mr Niaz (sn 201025892)

The post graduate studies committee has approved your research proposal.

A medicine use evaluation of general prescribing practices with special reference to rational use of medicine in outpatient departments in public health facilities in Khomas Region of Namibia.

You have passed the section on coursework (RMP 5980) Nov 2010.

It may be required that you need to apply for additional permission to utilize your target population. If so, please submit this letter to the relevant organizations involved. It is stressed that you should not proceed with data collection and fieldwork before you have received this letter and got permission from the other institutions to conduct the study. It may also be expected that these organizations may require additional information from you.

Please contact your supervisors on a regular basis

Prof A van Dyk

Annex 5: Letter of permission to conduct study- Ministry of Health and Social Services, Namibia

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REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198 **Ministerial Building** **Tel: (061) 2032510**
Windhoek **Harvey Street** **Fax: (061) 222558**
Namibia **Windhoek** **E-mail:** eshaama80@yahoo.com
Enquiries: Ms. E. Shaama **Ref.:** 17/3/3 **Date:** 12 March 2012

OFFICE OF THE PERMANENT SECRETARY

Mr. Qamar Q. Niaz
P.O. Box 98112
Pelican Square
Windhoek

Dear Mr. Niaz

Re: A medicine use evaluation of general prescribing practices with special reference to rational use of medicine in outpatient departments in public health facilities in Khomas Region of Namibia

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for completion of your MPH Degree;
3.2 No other data should be collected other than the data stated in the proposal;
3.3 A quarterly report to be submitted to the Ministry's Research Unit;
3.4 Preliminary findings to be submitted upon completion of study;
3.5 Final report to be submitted upon completion of the study;
3.6 Separate permission should be sought from the Ministry for the publication of the findings.

Yours sincerely,

MR. K. KAHUURE
PERMANENT SECRETARY

"Health for All"