KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI.

COLLEGE OF HEALTH SCIENCES

FACULTY OF PHARMACY AND PHARMACEUTICAL SCIENCES

DEPARTMENT OF CLINICAL AND SOCIAL PHARMACY

ASSOCIATION BETWEEN HEALTH INSURANCE AND PRESCRIBING PATTERN OF ANTIBIOTICS IN MAMPONG MUNICIPALITY

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SEPTEMBER 2016

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A DISSERTATION SUBMITTED TO SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER

OF SCIENCE DEGREE (CLINICAL PHARMACY)

BY

CATHERINE OSEI-BONSU

SEPTEMBER 2016

DECLARATION

I declare that this is the result of my own research. References from the work of others have been clearly stated. I hereby declare that this work is an original one and has not been submitted for any degree, nor is it being submitted to any other university or institute for any other degree.

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DEDICATION

This work is dedicated first all to my husband, Mr. Wisdom Kemeh Danyo for his prayers, patience and for being supportive during the period of the course, my daughter Mawuwenam Kemeh Danyo and also to my parents, Mr. Charles Osei-Bonsu and Miss. Veronica Esi Addai for their prayers as well as words of encouragement during the course of my study.

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ABBREVIATIONS/ACRONYMS

AFMm - Affordable Medicines Facility-malaria

CDC - Centre for Disease Control

DNA - Deoxyribonucleic Acid

DSI - Digestive System Infections

GPRS - Ghana Poverty Reduction Strategy

JHS - Junior High School

LEAP - Livelihood Empowerment Against Poverty

MOH - Ministry of Health

NHIS - National Health Insurance Scheme

NHIA - National Health Insurance Authority

RNA - Ribonucleic Acid

RTI - Respiratory Tract Infection

STG - Standard Treatment Guidelines

UTI - Urinary Tract Infections

WHO - World Health Organisation

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CHAPTER 1

INTRODUCTION

1.0 Background Information

Antibiotics constitute the mainstay of modern health care delivery (Park et al 2005). They play a significant role in disease prevention and treatment in both developed and developing countries in spite of advances in medical science and technology. As essential medicines, they enhance the reduction of morbidity and mortality thus improving health care outcomes and the quality of life.

Although they have been described as part of the greatest blessings of modern medicine, antibiotics inappropriate use poses danger to humanity (Radyowijati and Haak, 2002). Over utilization of antibiotics has become a major challenge to health care delivery globally (WHO/HAI, 2011). It has been cited as accounting for numerous global health care problems including increasing incidence of antibiotic resistance and increasing health care bill (Razon et al 2001). The increasing incidence of antibiotic resistance in previously susceptible micro-organism due to over prescription of antibiotics has been described as a threat not only to patient safety and quality of care, but also national security and global stability (WHO/HAI, 2011). Moreover, resistance to antibiotics is a major problem globally thus requiring international as well as national efforts to counteract the emergence of resistance (Davey et al., 2008).

The restriction of antibiotic use by health personnel has been identified as one of the main strategies to reduce the over prescription of antibiotics by health workers (WHO/HAI, 2011;
Davey et al., 2008). This is especially important in the fact that research and development of new antibiotics apart from being very expensive, no longer remain priority for multi-national

pharmaceutical companies. Over the years, policy makers and health care authorities have developed and adopted a number of measures to promote rational prescribing and use of antibiotics in health care facilities (Razon et. al., 2005). These measures include: institution of proper implementation of infection control and prevention measures, development of antibiotic policies at both national and institutional levels, the development of national and institutional treatment guidelines to enhance rational prescription of medicines, the constitution of Drugs and Therapeutic guidelines at all levels of health care facilities to monitor the safe and effective use of medicines, restriction of physicians from dispensing and education of prescribers and patients.

Recently, health insurance systems have been identified as key player to enforce the rational use of antibiotics (Park et. al., 2005). This followed the observation of health insurances currently being the actual means of financing health care in most countries. An International Conference for Improving Use of Medicines (ICIUM) organized in 2004 came out with a conclusion that the coming up as well as expansion of insurance systems in Low and Middle Income Countries (LMIC) have tendency of improving usage of essential medicines and made suggestions on ordered processes within insurance systems to leverage better prescribing by ensuring rational selection and use of medicines (WHO/HAI 2011)

1.2 Flashback of Health Care Financing in Ghana

In Ghana, financing Health care has long been the source of worry and thus has a chequered history in the country. This may conveniently be divided into four phases: the Colonial (preindependence) era; at independence and post-independence era (1956 - 1969); Fee- for-Service era (1969 -2003), the National Health Insurance Era (2003 to date). All these systems are not without problems.

In the Colonial (pre-independence) era Revenue from user charges, and in particular cost recovery for drugs, was a significant feature of the annual report of the Medical Officer of Health during this period (Adams, 2001).

Following independence, the pursuit of a socialist ideology caused the removal of user fees for social services including health and education. Financing of health services was entirely through tax revenue. This led to free services which gradually came to be associated with decline in quality of health delivery especially during the period of economic decline between 1975 and 1983. (Adams, 2001).

The full cost recovery period, started in 1985 with the introduction of full cost recovery for drugs and an upgraded fixed fee for other services. It was during this period that the term "Cash and Carry" was introduced. It is worth noting that the emergence of user fee payment brought about a decrease in the patronage of health services in Ghana.

The Hospital Fees Regulations 1985 (LI 1313) enactment has paved a chance for national feefor-service system. This Legislative Instrument mandated health facilities to charge fees on services such as consultation, laboratory, medical, surgical, dental, medical examinations and hospital accommodation. Patients paid the full cost of their medicines to boost the internally generated funds to prevent the shortage of essential medicines.

1.3 Problem Statement

Health insurance is been perceived as another vital option for financing health care in developing countries. It is also thought to have the tendency to relieve people from escalated health care bills (Jutting, 2003).

The National Health Insurance Scheme (NHIS) commenced in Ghana in 2003 to replace the cash and carry system of financing health. (NHI Act 650). The scheme operates in 145 districts with 95% coverage of disease conditions commonly diagnosed amongst the people of Ghana. The scheme continuity is being shaken as a result of many challenges. (NHIA Report 2010) The NHIS bills are continually increasing, with the national cost of claims for 2009 that is 372 million Ghana cedis being twice as that of 2008 165 million Ghana cedis. (NHIA Report 2010)

It was estimated that more than 27% of the medicines bill was attributed to anti-malaria medicines. More than 51 million Ghana cedis were spent on medicines for the treatment of malaria in 2009. With the benefit from the Affordable Medicines Facility – Malaria (AFMm) program 50% annual savings has been projected (NHIA report 2010)

In order to boost the finances to ensure continuity of NHIS, some defensive strategies proposed include:

1. Matching medicines to diagnosis to ensure rational use of medicines.
2. The use of a standard prescription forms to ensure rational prescribing.

A clinical audit division established in 2010 helped in reducing financial leakages and the recovery of 16.8 million Ghana cedis from service providers. (NHIA report 2010) What is the impact of National Health Insurance on antibiotic prescribing pattern to ensure cost-effective use of antibiotics to reduce some of the financial leakages in the scheme? What policies are in place to control antibiotics prescribing?

1.4 Rationale of the study

The part played by health insurance to ensure cost-effective use of medicines has been documented by health authorities and researchers in a few studies (WHO/HAI, 2011). Health insurance systems have been shown to have an impact on the cost-effective use of medicines by ensuring good prescribing. Although much is known in the developed countries on insurance system strategies used to target medicines that is not so in the developing countries. (WHO/HAI, 2011).

The Government of Ghana in 2001 initiated a National Health Insurance Scheme (NHIS) as the sole vehicle of financing health care. This move was climaxed in September 2003 when the National Health Insurance Act (Act 650) was passed. The Act aims amongst other things to ensure the provision of good basic health care needs in Ghana through the district mutual health insurance schemes (MOH, 2004).

Although health insurance scheme has been identified as a critical tool to ensure rational use of medicines, data on the role of health insurance in achieving this noble dream is very limited in both developed and developing countries. While several studies have focused on some strategies to ensure rational prescribing of antibiotics, little work has been done on role of health insurance schemes in this direction. In Ghana no significant study has been done in this direction. Such a study would be of great use to stakeholders such as the Ministry of health (MOH), Ghana Health Service (GHS), National Health Insurance Authority (NHIA), and policy makers in the health sector.

In Ghana much is not known on the prescribing pattern of antibiotics at the Out-patient level. Even though the rational use of antibiotics is being emphasized in health care the effect of health

insurance on the prescribing pattern of antibiotics is a dark area which needs more light to help in decision making in rational prescribing of antibiotics.

Research Questions

1. What are the socio-demographic characteristics of the outpatient service users in the Mampong Municipality?
2. What antibiotic regimens are prescribed at the Out-patient level in the municipality?
3. Is there any difference in antibiotic prescription between subscribers and non-subscribers of the scheme?
4. What factors are influencing health personnel antibiotics prescribing in the Municipality?
5. How does prescribed antibiotic regimen compare with local guidelines?
6. What is the rate of antibiotic usage at the health facilities in the Municipality?

1.5 General Objective:

To determine the association between health insurance and the prescribing pattern of antibiotics in the Mampong Municipality of Ghana

1.6 Specific Objectives:

1. To determine the socio-demographic characteristics of the outpatient service users in the Mampong Municipality.
2. To examine antibiotic regimens most prescribed at the Out-patient level in the municipality
3. To identify any difference in antibiotic prescription between subscribers and nonsubscribers of the National Health Insurance Scheme.

4. To determine the factors influencing the prescribing of antibiotics by prescribers in the Municipality.
5. To examine how prescribed antibiotic regimen compare with local guidelines.

CHAPTER 2

LITERATURE REVIEW

2.1 Profile of study area

The site of the study was Mampong municipality of the Ashanti region of Ghana. Mampong municipal is one of the twenty-seven Districts in Ashanti Region. The district capital is about 57km from the regional capital, Kumasi. It is bounded on the south by Sekyere South, the north by Brong Ahafo region, the East by Sekyere Central and the North West by Ejura Sekyedumasi Districts.

The Municipal form about 2.2% of total land area of the Ashanti Region and has a population of 95,377 based on 2010 population and housing census with growth rate of 2.7% per annum. Currently, the percentage of residents insured is 103, 311, which corresponds to about 58 percent of the estimated population. The annual outpatient attendance in the public hospitals in 2011 was 98, 450, with over 90% of the clients accessing health services are insured with the national health insurance scheme.

There are 74 communities with 48 Community Based Surveillance Volunteers who report disease outbreaks, and other health issues. For effective management of Health Administration the municipal is divided into five sub-municipalities namely; Mampong, Kofiase, Adidwan, Krobo and Yonso.

The major towns in the municipality are Mampong, Kofiase, Asaam, Benim, Mprim, Ninting, Apaah and Adidwan.

2.1.1 Distribution of Key Health Staff in The Municipality

Key Human Resource-2014

Category	2011	2012	2013	2014
Medical Doctors	7	11	8	4
Medical Assistants	5	5	6	5
Pharmacist	2	2	3	
Midwives	30	28	31	36
General Nurses	46	43	63	62
Enrolled Nurses	35	44	53	64
Community Health Nurses	23	42	41	48
Disease Control Officers	6	6	6	7
Public Health Nurses	2	2	2	1
OTHERS				245
TOTAL	380	389	421	424

2.1.2 Distribution of Key Health Staff in The Sub Municipality

Sub Municipal Key Human Resource -2014

Category	MAMPONG	KOFIASE	ADIDWAN	KROBO/C	YONSO	ASAAM	BENIM	TOTAL
Medical Doctors	4							4
Physician Assistants	3	1				1		5
Pharmacist	3							3
Midwives	28	2	2		1	2	1	36
General Nurses	54	4	2			2		62
Enrolled Nurses	36	12	6	6	6	5	3	74
Community Health Ns	18	10	5	5	5	2	3	48
Di s ease Control Of	6	1						7
	315	[illegible]	17	13	13	13	10	424

2.2 Types of Health Care Financing

The need for workable, excellent and a good way of financing health care to improve the availability and use of health care is the main set back in both developed and developing countries including Ghana. There are various ways in financing Health care either in a single or combined manner. (Adams, 2001). These could be grouped as:

i. Direct out-of-pocket payment that is "cash and carry" where the health care services are been provided.
ii. Cost sharing through health insurance.

Health care financing differs from country to country even in advanced countries. In United Kingdom, monies accrued from taxes are the source of funding for their National Health Service (Laing, 2004). Health care funding in Netherlands are payments from workers and their employers, to insurance companies. The United States mode of health care funding is known as competitive voluntary insurance market and amongst the developed countries only United States relies on this method of health care funding.

Health care in Canada, is referred to as Medicare is financially supported by the people but managed on private bases. Every citizen is covered with free care where health care is accessed. The mode of operation comprises five directives. Care must be universal, portable, comprehensive, accessible, and publicly administered. There are some flexibilities in Canada`s public health insurance such as local control, doctor autonomy and consumer choice – patients have the privilege to select their preferred physician and hospital.

2.3 Health Insurance

Health insurance is a type of insurance where advance payment known as premiums are made to care for subscribers health care bills either partially or fully. It is a prepayment system of health care financing. It consists of subscribers making small payments to the insurance company or the insurance scheme (premiums). The premiums paid by the subscribers are put together and the subscriber's medical bills are paid from the lump of money collected. (GHS and PHR plus, 2004). Health insurance is highly perceived as another vital means of financing health care in the less developed countries and is capable of adequately saving subscribers from paying higher medical bills which may come up unexpectedly. Health Insurance is perceived as a more humane means of health care financing in the sense that it involves pooling of risks (disease and injuries) and resources – mutual self –help and caters for a large population at any point in time. Next, the subscriber pays for his medical bills in advance when he/she is healthy and productive. That is, it is a more proactive form of health care financing. Finally, the insured does not make upfront payment immediately the health service is provided. This ensures removal of money as a barrier at the time of need, thus enhancing better accessibility to health services. An economic analysis of data collected from homes in several countries have shown that the small premiums paid help in eradicating extreme poverty and makes the less endowed ones in the society to access basic health care without delay to prevent complications. (The World Bank/WHO/ILO, 2004).

A distinction needs to be made here between health insurance and indemnity insurance. In the case of health insurance the scheme purchases health care from providers on behalf of its members, whereas in the case of indemnity insurance the scheme makes a one-off payment to the insurer and not the provider (Clark, 2001). In this case the scheme is able to control the quality of service

purchased from the provider, unlike the indemnity type where the member is directly reimbursed by the scheme (Adams, 2002).

2.4 Overview of National Health Insurance Scheme in Ghana

National Health insurance is currently used as the main vehicle the government of Ghana is utilising to cater for the funding of health care in the country. Funds from donors and taxes make up about 80% of the funds used for health care. Revenue from the out of pocket payment after service provision forms 20% that is internally generated funds (IGF). A change from "Cash and Carry" to Health Insurance will eventually change the mode of payment of medical bills, which implies that revenue from taxes would remain the sole contributor in financing Health for many years. The Health insurance is only to clear the cash and carry system but not to do away with cost recovery (MOH, 2004).

One of the aims of Health insurance is to help the government reach the set goal in the area of Ghana Poverty Reduction Strategy (MOH, 1999; GPRS I, 2003) and the health sector's Five Year Programme of Work, 2002 – 2006. This involves sharing risk of incurring health care to those insured. As the number of those insured increases there will be a corresponding increase of funds to care for medical bills of subscribers. Thus more insured clients imply less risk involved.

It is important to realise that subscribers have a more relaxed way of paying for medical services. Thus all Ghanaians as well as foreigners living in Ghana are mandated to be subscribers of any Health insurance scheme they prefer for a stipulated time of five years from the commencement of the scheme. (MOH, 2004)

Holistically, accessing health care becomes less challenging to the needy in the society. Moreover, accessing Health care is dependent on location of providers of services, cost of care and ability to pay and socio-cultural aspects of service provision (GPRS II, 2005). Financial challenges to Health care are due to the mode of payment of medical bills. The use of cash and carry system brought about poor access to health care. This shows that to access health care an individual does not have to pay money before his/her health needs are attended to in any Health insurance accredited facility. The prepayment made reduces the financial challenges to access health care. Whether a subscriber has money or not the individual can access health care at any time there is an onset of illness. Payment for health care at the point of delivery is very difficult for the poor and those with lower income in the society (MOH, 2004). Furthermore, in any ill health condition people are unproductive in that state thus out of pocket payment for their medical bills becomes a great challenge.

2.5 Differences of Health Insurance Schemes in Ghana

The Act 650 mandates three different types of insurance schemes to be used in Ghana:

i. District Mutual Health Insurance Schemes ii.
   Private Commercial Health Insurance Schemes and
iii. Private Mutual Health Insurance Schemes.

The different types of health insurance are expected to have the board of directors whose responsibilities are to steer the scheme's policies (MOH, 2004). All Health insurance schemes are mandated to be registered under the Companies Code, 1963 (Act 179) as either limited guarantee or liability. The choice of any type of scheme is dependent on the preference of an individual.

The District Mutual Health Insurance Scheme (DMHIS) is a combination of double concepts; the traditional Social Health Insurance Scheme for the formal sector workers and the traditional Mutual Health Organizations (MHO's) for the informal sector with a district focus (Adams, 2001). Thus the DMHIS involves members from both the formal and informal sectors of the economy. It is a decentralized system with ownership belonging to the members who have their required contributions (MOH, 2004). The DMHIS is made to ensure transparency, build subscriber confidence and in particular bring health insurance to the door steps of residents. However, it is in partnership with government in that it receives subsidy from government in the form of risk-equalization and reinsurance for catastrophic events (Atim, 2000).

The private mutual health insurance scheme does not necessarily have a district focus. It may either be community-based or occupational or faith-based (Adams, 2000). It is also social in character but this type is not entitled to receive subsidy from the National Health Insurance Fund or government.

Private Commercial Health Insurance refers to health insurance that is operated for profit based on market principles (MOH, 2004).

2.6 Challenges of Health Insurance

The National Health Insurance Scheme financial sustainability

The sustainability of the National Health Insurance Scheme financially is a great challenge due to high demand for health insurance as well as the corresponding increase in the utilization of services rendered in health care. Additional sources of funding for the scheme are needed as well as

enforcing cost effective means to reduce losses. Some strategies identified to address the financial sustainability of the scheme can be grouped into the following:

1. D**efensive Strategy:**
    - To intensify monitoring and supervision in the use of the Consolidated Premium Account.
    - To intensify Clinical Audits at health insurance accredited facilities.
    - The trial use of another mode of payment such as Capitation in Ashanti region as an initial step towards nationwide rollout.
    - Service providers and subscribers to enforce the gatekeeper policy of the Ministry of Health.
    - Identification of diagnosis/treatment miss match to check irrational use of medicines.
    - The use of prescription forms uniformity to ensure rational prescribing.
    - The use of unannounced visits and subscriber interviews to identify and clear the scheme of inefficiencies.

2. **Efficient management of funds:**

    To manage NHIA funds efficiently in order to make good returns a strategic way of investing the funds is necessary. The proper choice of assets and right timing to initiate an investment would help the system generate enough funds to manage the scheme. Also the formation of an investment research team to continually review economic policies, investment environment and capital market expectations for optimal investment decision making (NHIA Annual Report 2011).

3. **Strategic ways of Sourcing for funds:**

- Other sources of funding that can be considered involves petro-chemical levy, charges at the DVLA (Driver and Vehicle Licensing Authority), NHIL (National Health Insurance Levy) and sin tax to be increased.
- Renewal of premiums yearly based on the economic state of the country.
- Internally generated funds in the form of raising funds to address other activities.
- Seeking assistance from development partners such as the World Bank to help in streamlining the policies on purchases and the management of claims. (NHIA Report, 2011)

The Identification of the poor in the informal sector

The National Health Insurance scheme was introduced to help the poor in society access health care without any financial barrier. The poor are not adequately covered because they are not easily identified for exemption. To address this challenge there is the need for collaboration between NHIA and the managers of the LEAP (Livelihood Empowerment Against Poverty) program to identify the poor in society for NHIS coverage. (NHIA Annual Report 2011)

ID card Management

The subscribers of the scheme experience delay obtaining their cards on time because the entire. Process of data entry / batching, card production and distribution is delayed. The management of NHIA has introduced a new system for ID card distribution in Ashanti

region and the outcome of the intervention has shown improvement in ID card distribution in the region. The new system is expected to start in the three northern regions. (NHIA Annual Report 2011)

Claims Management

There is late submission of claims by the NHIS accredited facilities as a result of inadequate capacity at the health facility in the claims management. The NHIS district offices also have challenges in vetting claims effectively. With the roll out of e-claims submission nationwide and the implementation of national claims register it is expected that this challenge could be dealt with. Monitoring and evaluation system for quality control by NHIA would also help address this challenge. (NHIA Annual Report 2011)

Information Communication Technology (ICT)

The slow nature of the internet network and frequent power outages coupled with large numbers of subscribers and inadequate scheme staff results in irregular use of the system at the district level. Upgrading the data center as well as increasing the bandwidth is a strategy to be adopted by NHIA to improve the performance of ICT. (NHIA Annual Report 2011)

2.7 Health insurance schemes and Access to medicines

Most of the health insurance schemes in the world include medicines benefits package to ensure accessibility of essential medicines to reduce Out-of-pocket spending (Faden et al 2011). There

are potential challenges that affect the sustainability of access to quality medicines to insured clients. These include:

- Over use of the services as a result of unrealistic expectations of the insured client especially in developing countries.
- Voluntary enrolment of people onto the insurance scheme especially high health risk individuals.
- Fraudulent means to access insurance services especially medicines by non-insured clients.

To address these challenges, the implementation of co-payment for medicines or other methods of payment must be exploited in line of evidence –based medicines coverage policies.

(Wagner and Ross-Degnan 2009). The enforcement of measures to improve rational use of medicines is feasible in health insurance.

2.8 Interventions to improve use of medicines

There are four strategies that were developed and implemented to address inappropriate use of medicines worldwide (Le Grand, 1999). These are:

- Educational strategy: this involves training of health providers at undergraduate stage, in-service training by workshops or seminars, clinical supervision, distribution of printed materials and provision of unbiased medical information.
- Managerial strategy: this includes the development and implementation of essential

medicines list and Standard Treatment Guidelines, changes in selection as well as procurement of medicines, clinical supervision and implementation of good dispensing practice principles.

- Regulatory strategy: this is based on enforcement of regulations of medicines registration to ensure the availability of only the safe and effective medicines, licensing prescribers and medicines outlets, regulating the prescribing and dispensing besides regulating the promotional activities of the pharmaceutical companies.
- Economic strategy: this includes changes in methods of medicines reimbursement by Health insurance, removing financial incentives from medicines sales, changing the copayment method (pay flat fees for every prescription) into co-insurance (paying percentage from the prescription cost) and separation of dispensing process from the prescribing.

The core policies to promote rational medicine use consist of twelve core interventions. (WHO 2002) these are:

- A formidable national team to coordinate policies on medicine use.
- Implementation of usage and revision of Standard Treatment Guidelines.
- Implementation of procedures for developing and revising an Essential Medicines List (or Hospital Formulary) based on treatment of choice.
- Establishment of an active Drug and Therapeutics Committees in district and hospitals with defined responsibilities for monitoring and promoting rational medicine use.
- Problem solving based pharmacotherapy in undergraduate curricula.
- Continuing professional development through in-service training as a requirement for

licensure.

- Establishing Supervision, audit and feedback teams.
- Independent information on medicines in the form of drug information centers
- Public education about medicine usage.
- Avoidance of unrealistic financial incentives
- The enforcement of appropriate regulations
- Adequate government expenditure to ensure availability of medicines and staff at all times.

2.9 Types of Antibacterial Drugs

2.8.1 Penicillins

Mechanism of action: The bactericidal nature of penicillins act by interfering with bacterial cell wall synthesis. They diffuse well into body tissues and fluids but penetration into the cerebrospinal fluid is poor unless the meninges are inflamed. (Kumar et al 2005)

Indications for use: Benzylpenicillin (Penicillin G) is administered only parenterally but inactivated by bacterial beta-lactamases and is the first line choice for serious infections such as infective endocarditis, meningococcal, streptococcal, clostridial infections, actinomycosis, anthrax and spirochaetal infectons (syphilis ,yaws).

Phenoxymethylpenicillin (Penicillin V) is an oral preparation that is mainly used to treat streptococcal pharyngitis and as prophylaxis against rheumatic fever and pneumococcal infections.

Flucloxacillin is resistant to the inactivation of the Penicillinase enzymes and is effective for infections caused by penicillin-resistant staphylococci. Flucloxacillin is stable in acidic environment and thus can be administered both orally and parenterally.

The activiy of Ampicillin is against some Gram-positive and Gram-negative organisms but susceptible to penicillinase such as those produced by *staphylococcus aureus*, *Escherichia coli* and *Haemophilus influenzae* strains. Ampicillin is mostly prescribed for the treatment of exacerbations of chronic bronchitis and middle ear infections as well as urinary –tract infections. It can be given both orally and parenterally but absorption is decreased by food.

Amoxicillin is a derivative of Ampicillin with similar antibacterial activity but has better absorption rate when administered orally to produce higher plasma and tissue concentrations. Also the presence of food does not affect its absorption from the stomach.

Clavulanic acid inhibits lots of bacterial beta-lactamases. When combined with other effective agent such as Amoxicillin (Co- Amoxiclav) or ticarcillin (Timentin) the extent of the drug activity is broadened. The combination is active against beta-lactamasesproducing bacteria that are resistant to Amoxicillin. These include resistant strains of *Staph. Aureus, E. coli*, *H. influenzae*, many *bacteroides* and *Klebsiella spp.* Piperacillin in combination with the beta-lactamases inhibitor. Tazobactam (Tozacin) is

effective in the treatment of appendicitis, peritonitis, pelvic inflammatory disease and complicated skin infections. Ampicillin and Flucloxacillin combination (Co-fluampicil) is used for the treatment of infections involving streptococci and staphylococci.

Pivmecillinam is borken down into mecillinam which is the active drug component but not active against *Pseudomonas aeruginosa or* enterococci. It has a major activity against Gram- negative bacteria including *E. coli, Klebsiella, Enterobacter* and salmonellae.

Interactions: Penicillins render Aminoglycosides inactive when mixed in the same solution.

Toxicity: Hypersensitivity (skin rash, urticarial, anaphylaxis) is the well-known side effect of the penicillins. Encephalopathy may result when a high dose is given to patients with severe renal failure. Diarrhea is common with the broad-spectrum penicillins when given orally. (BNF 2010)

2.8.2 Cephalosporins

These are broad-spectrum antibiotics which have advantage over penicillins since they are resistant to staphylococcal penicillinases but are still inactive against methicillinresistant staphylococci. They have poor penetration abilities into cerebrospinal fluid unless the meninges are inflamed. Cefotaxime is recommended for the treatment of CNS infections. Cephalosporins are grouped into first, second, third and fourth generations.

First generation cephalosporins*:* cephalexin, cefradine and cefadroxil are examples which are active against Gram-positive cocci and Gram-negative organisms and they are generally used for treatment of urinary tract infections.

Second generation cephalosporins: cefuroxime, cefamandole, cefoxitin, cefaclor, and cefprozil are examples which are more effective against *E. coli, Klebsiella spp*. and *Proteus mirabilis* but are less effective against Gram-positive organisims. They are usually used in treating Gram-negative and aerobic-anaerobic infections as well as peritonitis.

Third generation cephalosporins: cefotaxime, ceftazidime, cefpirome, ceftriaxone, cefpodoxime and cefixime are examples more active against aerobic Gram-negative organisms than the first and the second generation. They are used for severe infections, septicaemia, pneumonia and meningitis.

Fourth generation cephalosporins: cefepime is active against Gram-negative bacteria like *P. aeruginosa*, it is also used in febril and neutropenic patients.

Toxicity: the early cephalosporins caused proximal tubule damage and the newer derivatives have fewer nephrotoxic effects. (BNF 2010)

2.8.3 Other beta-lactam antibiotics

Monobactams: Aztreonam is the only member of this class with a monocyclic synthetic beta-lactam antibiotic with its antibacterial spectrum limited to Gram-negative aerobic bacteria. The mechanism of action is by inhibition of the synthesis of bacterial cell wall.

Indication for use: Aztreonam is active against only aerobic Gram-negative bacilli such as *Pseudomonas aeruginosa, Neisseria meningitides,* and *Haemophilus influenza.* Aztreonam is combined with other agents which are active against Gram-positive cocci. Aztreonam injection is largely used for the treatment of intra-abdominal sepsis as an alternative to Aminoglycosides in combination therapy.

Carbapenems: These include imipenem, meropenem, and ertapenem. These are semisynthetic beta-lactams which are active against the majority of Gram-positive, Gram-negative and anaerobic bacterial pathogens. They differ in their dosage and frequency of administration. Imipenem is given in combination with cilastain a specific enzyme inhibitor which blocks its renal inactivation.

Indication for use: they are used for severe nosocomial infections and mixed aerobe and anaerobe infections.

Toxicity: less than 5% of cases are reported on nausea, vomiting and diarrhea. Imipenem is not used in the management of meningitis because it causes seizures. (Kumar et al 2005)

2.8.4 Aminoglycosides

These antibiotics are polycationic compounds of amino sugars which interrupt bacterial protein synthesis by inhibiting ribosomal function. They include amikacin, gentamycin, neomycin, netilmicin, streptomycin, and tobramycin. They are unabsorbed from the gastro intestinal tracts thus administered parentrally for systemic infections.

Indication for use: all the aminoglycoside listed above are bactericidal and active against some Gram-positive and many Gram-negative organisms. Streptomycin is active against *Mycobacterium tuberculosis* .Neomycin is only used for topical treatment of eye and skin infections. Netilmicin and amikacin have similar spectrum but are more resistant to the aminoglycoside-inactivating enzymes produced by some bacteria. furosemide must be avoided. Nephrotoxicity occurs mostly in the elderly and patients with renal failure.

2.8.5 Tetracyclines

These are bacteriostatic drugs which inhibit bacterial protein synthesis by interrupting ribosomal function. Their value has declined due to increased bacterial resistance. Examples include tetracycline, oxytetracycline, demeclocycline, lymecycline, doxycycline and minocycline. (BNF 2010)

Indication for use: tetracyclines are active against *V. cholera, Rickettsia spp., Mycoplasma spp., Coxiella burnetti, Chlamydia spp., and Brucella spp.*

Interactions: the absorption of tetracyclines is reduced by concomitant use with antacids, milk and oral iron replacement therapy.

Toxicity: tetracycline binds to calcium to cause brown discoloration of teeth and sometimes dental hypoplasia when given to children, pregnant women, and breastfeeding mothers. Photosensitivity may occur in some patients.

2.8.6 Macrolides

These include erythromycin, clarithromycin, azithromycin, and telithromycin. They inhibit bacterial protein synthesis by interrupting ribosomal function. With the exception of erythromycin, the others have superior pharmacokinetic properties with enhanced tissue and intracellular penetration and longer half-life that allows once or twice daily dosage.(Kumar et al 2005)

Indication for use: erythromycin is active against many penicillin –resistant staphylococci as well as chlamydia and mycoplasmas and is used as an alternative in penicillin-allergic patients. Azithromycin is used for the treatment of lyme disease and trachoma. Clarithromycin is recommended as a component of triple therapy regimens for the eradication of *Helicobacter pylori*.

Interactions: macrolides interact with theophylline, carbamazepine, digoxin, and cyclosporine thus dose adjustment of these agents is necessary when there is concurrent use.

Toxicity: intestinal prokinetic properties of macrolides results in diarrhea, vomiting and abdominal pain.

2.8.7 Sulphonamides and trimethoprim

Sulphonamides inhibits thymidine and purine synthesis by inhibiting microbial folic acid synthesis while trimethoprim is 2, 4-diaminopyrimidine which prevents the reduction of dihydrofolate to tetrahydrofolate.

Indication for use: sulphamethoxazole and trimethoprim are combined (co-trimoxazole) because of their synergistic effect. The combination is used in the treatment and prevention of *Pneumocystis carinii* infection and listeriosis. Toxoplasmosis, nocardiosis, chronic bronchitis and urinary tract infections are the other uses of co-trimoxazole. Sulfasalazine is used in inflammatory bowel disease.

Interactions: sulphonamides enhance the activity of oral anticoagulants and hypoglycaemic agents.

Toxicity: sulphonamides cause folate deficiency and megaloblastic anaemia with prolong usage. Skin eruptions like toxic epidermal necrolysis and Stevens-Johnsons syndrome as well as other blood dyscrasias like bone marrow depression and agranulocytosis may occur especially in the elderly with the use of co-trimoxazole. It can also provoke haemolysis in individuals with glucose-6-phosphate dehydrogenase deficiency. (Kumar et al 2005)

2.8.9 Quinolones

These include ciprofloxacin, norfloxacin, ofloxacin and levofloxacin. Newer ones available are moxifloxacin, gemifloxacin and gatifloxacin. They inhibit bacterial DNA synthesis by inhibiting topoisomerase IV and DNA gyrase the enzyme responsible for maintaining the superhelical twists in DNA. Structurally they are related to nalidixic acid. (Kumar et al 2005)

Indication for use: they are broad spectrum antibiotics active against Gram-negative (*Pseudomonas aeruginosa*) and some Gram-positive bacteria. They are used in treating gonorrhea, urinary and respiratory tract infections, bone and joint infections, infections of the gastro intestinal system and chlamydia.

Interactions: Quinolones may induce convulsions with concurrent use with NSAIDs, ciprofloxacin can induce toxic concentrations of theophylline.

Toxicity: tendon damage after 48 hours of starting treatment may occur. Photosensitive rashes, gastrointestinal disturbances and neurotoxicity can occur with the use of quinolones. They should be avoided in children and pregnancy.

2.8.10 Nitroimidazoles

These include metronidazole, tinidazole and nimorazole. They cause strand breaks in microbial DNA and are active against anaerobic bacteria and some protozoa.

Indications for use: metronidazole is used for the treatment of trichomonal vaginitis, bacterial vaginosis, surgical and gynaecological sepsis, antibiotic- associated colitis and in the eradication of *Helicobacter pylori*.

Interactions: they cause disulfiram-like reaction with alcohol and also enhance the anticoagulant effect of warfarin.

Toxicity: they cause polyneuropathy with prolong usage and metallic taste.

Nitroimidazoles should be avoided in pregnancy.

2.8.11 Chloramphenicol

Chloramphenicol competes with messenger RNA for ribosomal binding and also inhibits peptidyl transferase. It contains a nitrobenzene which is responsible for its activities against bacteria and toxicity in humans.

Indications for use: chloramphenicol is only used for treatment of life-threatening infections such as those caused by *Salmonella typhi and Haemophilus influenza* since it is associated with serious haematological side-effects. It is also used topically for the treatment of purulent conjunctivitis.

Interactions: chloramphenicol potentiates the activity of phenytoin, anticoagulants and oral hypoglycaemic agents.

Toxicity: it causes severe bone marrow suppression, circulatory collapse in neonates and infants (grey baby syndrome)

2.8.12 Fusidic acid

Fusidic acid and its salts are narrow-spectrum antibiotics. It inhibits bacterial protein synthesis.

Indications for use: the main use is in infections caused by penicillin-resistant staphylococci such as osteomyelitis (well concentrated in bones) and endocarditis.

Toxicity: Fusidic acid has hepatotoxic effects.

2.8.13 Glycopeptides

These include vancomycin and teicoplanin and they inhibit bacterial cell wall synthesis.

Indications for use: they are used for treating endocarditis and other serious infections caused by Gram-positive cocci and also dialysis-associated peritonitis.

Toxicity: vancomycin causes ototoxicity and nephrotoxicity but teicoplanin is less nephrotoxic. Too rapid infusion of vancomycin can cause symptomatic release of histamine (red man syndrome).

2.8.14 Clindamycin

This is active against Gram-positive cocci and many anaerobes. It is well concentrated in bone and excreted in bile and urine.

Indications for use: used for the treatment of infections associated with methicillinresistant *Staphylococcus aureus (*MRSA). It is also used for staphylococcal joint and bone infections such as osteomyelitis and intra-abdominal sepsis and as prophylaxis for endocarditis in patients allergic to penicillins.

Toxicity: clindamycin is associated with antibiotic-associated colitis (pseudomembranous colitis) thus patients must discontinue its use as soon as diarrhea develops.

2.8.15 Oxazolidinones

These include linezolid which inhibit the synthesis of protein by binding to the bacterial ribosomal RNA to prevent the 70S complex functional formation vital to bacterial translation.

Indications for use: linezolid is active against Gram-positive bacteria including methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci. It is not active against Gram-negative organisims.

Interactions: linezolid is a reversible non-selective monoamine oxidase inhibitor (MAOI) and has the potential to interact with serotoninergic and adrenergic agents as well as pethidine and other opioid analgesics.

Toxicity: severe optic neuropathy, hypertension, rash, and gastrointestinal disturbances may occur.

2.10 Antibiotic Resistance

Resistance to antibiotics remains a challenge globally. Transfer of new resistant strains across boundaries and continents is feasible. There is a tremendous quick spread of resistant forms. The leaders responsible for world health have made it clear that microorganisms that are resistant to antibiotics are known as “nightmare bacteria” that “pose a catastrophic threat” to humanity globally.

Many health threats exist but antimicrobial resistance stands out as a very serious issue. Infections are common of late with certain microorganisms resistant to different types and class of antibiotics. (antimicrobials used to treat bacterial infections). There is great danger when the efficacy of antibiotics is lost because the treatment of infectious diseases and their complications becomes a great challenge for patients undergoing chemotherapy for cancer, dialysis for renal failure, and surgery, especially organ transplantation, where the treatment of secondary infection is vital.

The use of first-line and then second-line antibiotic treatment alternatives could lead to limitations as a result of resistance or more so unavailability, thus healthcare professionals are forced to use antibiotics that may be more toxic to the patient and frequently more costly and less effective. In the event of usage of alternative treatment, research has shown that patients with resistant infections are often much more likely to die, and survivors have significantly longer hospital stays, delayed recuperation, and long-term disability. Efforts to prevent such threats depend on the foundation of proven public health strategies such as immunization, infection control, protecting the food supply, antibiotic stewardship, and reducing person-to-person spread through screening, treatment and education. (Frieden , 2013)

Antibiotics usage is a vital indicator that leads to its resistance globally. In the practice of human medicine antibiotics are included in the frequently prescribed drugs. Moreover, of all the antibiotics prescribed about 50% are not needed or even actively effective for what they have been prescribed for. (Drugs et al. 2011)

2.11 Mechanism of Action and Resistance to Antimicrobial Agents

Antibiotics act at different sites of the bacterium. The site of action of an antibiotic includes the bacterial cell wall (Penicillin, Cephalosporins, Vancomycin, Monobactams), inhibition of protein synthesis (Macrolides, Aminoglycosides, Tetracycline, Oxazolidinones), inhibition of RNA synthesis (Rifampicin), inhibition of DNA synthesis (Quinolones and Metronidazole), and folic acid antagonists (Sulphonamides and trimethoprim).

The development of resistance to antibiotics by bacteria involve either a single point mutation or transfer to genetic material from another organism (transformation, transduction or R factor transfer) (Kumar et al 2005)

2.12 The Fight Against Antibiotic Resistance

1. Prevention of infections and spread of resistance strains

The use of antibiotics is reduced when infections are prevented from occurring. This implies that the rate of antibiotics resistance development is slowed down drastically. The spreading of antibiotics resistant strains can be prevented through infection prevention and this is possible in diverse ways.

The public health is endangered as a result of antibiotic resistance in addressing healthcare issues, in the prevention of antibiotics resistance lives of patients are better protected and their health well maintained. Moreover, healthcare facilities, insurers and patients are able to save money that would have been used on more complex care and medication necessary to treat antibiotic-resistant infections. (CDC Report 2013)

- **Tracking**

The documentation, reporting, collection of data from various hospitals and submission of data on antibiotics use and resistance modules to research institutes will go a long way to track antibiotics resistance. Such information will enable healthcare facilities improve on their patient management and also track the usage of antibiotics. A similar survey carried out found that the use of antibiotics was frequent, that most antibiotic use was for treating active infections, and that vancomycin was the most commonly used antibiotic overall. (CDC Report 2013)

- **Improving Antibiotic Prescribing**

One of the common occurrences in outpatient care is inappropriate and wrong antibiotics prescribing by doctors. In most cases laboratory investigations are not ordered to ascertain the causative organism of the infection treated thus prescribing antibiotics might be unnecessary. A typical example is patient demand for antibiotics in the management of cold when antibiotics are not necessary. Also in the case of satisfying patients expectations healthcare practitioners prescribe antibiotics which are not needed.

To improve antibiotics usage of outpatients CDC has provided healthcare authorities with resources through the collaboration of other partners.

- **Infection prevention**

When there are no infections antibiotics are not needed, scientifically it has been proven that reduction in the use of antibiotics leads to a corresponding decrease in resistance. This implies that national effort of infection prevention in all healthcare facilities will significantly decrease resistance.

- **Treatment Guidelines:**

Effective treatment of infections caused by antibiotics resistant strains will prevent the organism from spreading from one person to the other. The unavailability of laboratory test to detect causative organisms of infections is a great challenge. In some cases the treatment guidelines are relied on for the appropriate treatment of some infections such as tuberculosis and gonorrhea. For these infections, healthcare providers rely on treatment guidelines for proper management of infections. CDC monitors resistance trends in *Neisseria gonorrhoeae* (the cause of gonorrhea) and *Mycobacterium tuberculosis* (the cause of tuberculosis) and publishes treatment guidelines to limit the progression of these diseases and the spread of bacteria.

2. Tracking Resistance Patterns

Data collection of antibiotic-resistant infections, causative organism of infection and the risk factors are the cause of the resistant infection will enable experts to strategically develop measures to prevent spreading of resistant bacteria. (CDC Report 2013)

3. Antibiotic Stewardship: Improving Prescribing and Use

Whenever antibiotics are used it provokes bacteria resistance development. The need for antibiotics to prevent and treat infections is very important. But from research 50% of antibiotics prescribed are either unnecessary or misused. (an example is when a patient is given the wrong dose). The harmful effects on the patient cannot be overlooked, since antibiotics are not without side effects and the possibility of interacting with other medicines. Thus the misuse of antibiotics enhances antibiotics resistance.

The current frequent use of antibiotic as a limited resource may render it ineffective in future. In view of this doctors and health professionals globally have initiated a strategy on rational use of antibiotics often called antibiotics stewardship. This involves a commitment where the right antibiotics are chosen, administered, and used on patients who actually need them. For effective stewardship, the antibiotics must be beneficial to the patient, allergic reactions and side effects avoided where necessary and ensure that in the years ahead the life-saving potential of antibiotics are preserved. The rational use of antibiotics have shown tremendous benefit in saving money for patients and healthcare facilities. (CDC Report 2013)

4. Development of New Antibiotics and Diagnostic Tests

The occurrence of antibiotics resistance is a natural process which cannot be avoided but the progression can be slowed. Thus the development of new antibiotics effective for the treatment of resistant strains of bacteria are vital and also there is the need to develop diagnostic test to track resistance. (CDC Report, 2013)

2.13 The Impact of Health Insurance On Antibiotic Prescribing

The vital role played by antibiotics in the treatment of diseases caused by bacteria is responsible for morbidity and mortality in developing countries. Unnecessary escalated consumption levels have contributed to rise in drug resistance, especially use of antibiotics for treatment of high prevalence diseases. (Aryanti et al 2002)

The fear of legal action compels prescribers in industrialized countries to practice evidence based medicine. While those in other countries prefer a fast cure irrespective of evidence. (Ismail et al 1991)

Before the introduction of the national health insurance scheme in Ghana, a survey was carried out on antibiotics prescribing pattern in government healthcare facilities in the Wassa-west district of Ghana and the results were alarming. In one of the facilities the average percentage of patients receiving at least one antibiotic was as high as 98%. (Bosa et al 1997). What is the situation after the introduction of the national health insurance in 2003?

In Taiwan, before the introduction of the National Health Insurance program only few hospitals had any policy in place to control the prescribing of antibiotics. A study carried out after the

implementation of the Insurance program showed a massive change in antibiotic use pattern in their public Hospitals. (Shan-Chwen Chang et al 2001)

In rural China another study on out -patient care shows that the number of antibiotics prescribed for both insured and uninsured clients were the same. But newer and costly antibiotics were prescribed for insured clients. However, uninsured clients had the higher average number of medicines per out-patient visit as compared to insured clients. (Dong et al 1999)

2.14 Determinants of Antibiotic Prescribing

Acquisition of right knowledge is vital for better practice, but it may not be the criteria for enhancing the practices of antibiotic prescribing. Knowledge of diagnostics and therapeutics is key in inappropriate antibiotics prescribing. The use of broad spectrum antibiotics does not guarantee a cure. The educational level and knowledge of prescribers may influence the prescribing practices of health care providers.

The fear of losing a patient in the developing countries compels prescribers to prescribe antibiotics with- out considering their side effects and toxicities and other prescribers assume that side-effects or toxicity is negligible if the appropriate antibiotic is chosen.

The satisfaction of a client is not only in prescribing medicines but on how best the patient can have a better outcome from less harmful drugs other than antibiotics. Some prescribers are influenced by the demand of parents in prescribing antibiotics for their wards.

Higher profit margins on antibiotics might influenced prescribing of antibiotics and thus may compel prescribers to prescribe them inappropriately. A study in rural China, has shown that

health-system financing has influence on antibiotic prescribing frequency and type. Also doctors are noted for prescribing more expensive antibiotics for insured patients than noninsured patients. Prescribers who are not abreast with current trends of prescribing antibiotics follow peer norms without basis or facts in their prescribing practices. In Indonesia the use of streptomycin and phenobarbital in the treatment of diarrhea are as a result of peer norms.

Only few prescribers rely on microbiological reports for the basis of antibiotics prescribing. In a Malaysian study 80% of antibiotic prescriptions were written without reference to microbiological reports even though the prescribers had access to quality laboratory service.

In Tanzanian, a study has shown antibiotics over use in hospitals as a result of wide range of antibiotics at the facility of study.

Marketing drugs in developing countries to doctors and pharmacist by sales representatives of pharmaceutical companies target their financial gains as a priority. Prescribers rely on drug publications from these companies for information.

There are financial gains for prescribers to prescribe antibiotics and also hospitals internally generated funds from pharmacy contribute to antibiotics prescribing. (Dong et al 1999)

2.15 National Health Insurance Prescribing Guidelines

All NHIS subscribers must have their prescriptions written on approved prescription forms in the approved format. All accredited facilities shall prescribe for dispensing under the NHIS. There is a list of medicines within which prescribers are to conform for reimbursement to be effected.

Medical doctors, Dentist, Midwives, medical assistants and Nurses in specialized fields are authorized to prescribe medicines in accredited facilities. (NHIS medicines list 2013)

The level of prescribing is the lowest level of health care delivery at which a specific medicine can be prescribed. Enforcement of these levels ensures quality care, rational use of medicines and minimizes escalating cost of medicines to the National Health Insurance Scheme. There are several categorizations enlisted to guide prescribers on which medicines they are permitted to prescribe based on the health care facility they practice. Level A is the lowest level which refers to prescribers at the community such as community health nurses. Level M refers to midwife prescribers, level B1 refers to prescribers at health centers without doctor such as physician assistants, level B2 refers to prescribers at health centers with doctor, level C implies prescriber at the district hospital, level D points to prescribers at regional or teaching hospital and finally level SD is reserved for specialist prescribers. With these categories a medicine assigned to a level can be prescribed by prescribers at that facility level and those above. (NHIS Medicines list 2013)

Prescribers in NHIS accredited health facilities who are authorized to prescribe medicines include: Medical practitioners, Dentist, Midwives, Medical (physician) assistants and Nurses in specialized fields. All prescriptions written must meet the following requirements:

- Conform to Ghanaian laws including the Pharmacy Act 1994 (Act 489), the Medical and Dental Council Decree 1972 (NRCD 91) and the Nurses and Midwives Decree 1972 (NRCD 117).
- Legibly written in ink to be indelible.
- Written and completed by the prescriber

- Date written for quick reference
- Name and address of the patient stated Age and weight of the patient specified
- Diagnosis should be stated.
- Dosage forms, generic names of medication, strength, dose and dosage schedule should be stated
- Right quantity of medication to be supplied
- Signature of prescriber written in ink to be indelible

2.16 Antibiotic Prescription Pattern

The study of prescribing patterns seeks to monitor, evaluate and suggest modifications in practitioners prescribing habits so as to make medical care rational and cost effective.

Information about antibiotic use patterns is necessary for a constructive approach to problems that arise from the multiple antibiotics available. (Gupta, 1994)

In a study conducted in a teaching Hospital in Nepal, the five most commonly prescribed antibiotics were Ampicillin, Amoxicillin, metronidazole, Ciprofloxacin and Crystalline Penicillin. Also as high as 92% of patients were prescribed at least one antibiotics. (Shanker et al 2005)

Similarly, a study carried out in Wassa West District of Ghana identified the differences in average percentage of patients receiving at least one antibiotic was 41%, 45%, 79%, and 98% in different health centers. (Bosu et al 1997)

Irrational use of antibiotics for non-infective diarrhea cases is high in Bangladesh, China, India and Thailand. Fluoroquinolones are the most commonly prescribed antibiotic and Cephalosporins being second. (Fahad et al 2010)

2.17 The Prescribing Indicators

The WHO and the International Network for the Rational use of Drugs (INRUD) have developed a standard methodology to investigate medicines use problems, to help implement and evaluate interventions to promote the rational use of medicines. (WHO 1993) The prescribing indicators are:

- Average number of medicines per encounter
- Percentage of medicines prescribed by generic name
- Percentage of encounters with antibacterial prescribed
- Percentage of encounters with an injection prescribed
- Percentage of medicines prescribed from NHIS medicines list

For the purpose of this study three of the indicators were selected for the survey. The indicators selected are the average number of medicines per encounter, the percentage of encounters with antibacterial prescribed and the percentage of medicines prescribed from NHIS medicines list. Studies from Africa showed that the percentage of patients with an antibiotic prescribed was similar in all regions between 40% and 50%. The adherence to clinical guidelines in treatment of acute respiratory tract infections was highest in Latin America but studies from WHO between 1990 and 2006 showed that the percentage of compliance with clinical guidelines was below 50% in all regions. (WHO 2002).

CHAPTER 3

METHODOLOGY

SAMPLING TECHNIQUE

3.1 Sample-size:

To obtain an estimate that falls within ± 2.5% points of the true proportion with 95% confidence, the calculated minimum sample size was 236 (Lwanga et al 1991). Three hundred (300) respondents however were interviewed during the survey.

To obtain the sample size for the prescribers the municipal data for human resources were used to obtain the total number of prescribers in the municipality (32.0) but (22.0) were at post at the time of the data collection and they were interviewed.

3.2 Development and validation of survey instrument

The survey questionnaire for both out-patients and prescribers were pre-tested in Mampong Government Hospital. This is because the municipal hospital shares similar socio-demographic characteristics with the other study health facilities. The questionnaires were drafted to address the objectives of the survey. The format of the questionnaires was revised accordingly after the pre-test.

3.3 Data collection

The municipality has been divided into five (5) sub districts which is made up of one (1) hospital and four (4) health centres. All five facilities were included in the study with 60 respondents

interviewed at each facility to make a total of 300 respondents. A random sampling technique was employed in sampling the out-patients. An exit interview questionnaire was used for the outpatients selected in the collection of data. The out-patients were interviewed within four (4) weeks in July 2014. Prescribing indicators which include the average number of medicines per encounter, percentage of encounters with antibiotics prescribed and percentage of medicines prescribed from NHIS medicines list were also used to collect data from the out-patients who were interviewed. Two pharmacy students on vacation training assisted in the data collection after being informed about the study objective methodology and the expected outcome. All prescribers at post at the period of the survey were also interviewed with the use of a questionnaire to collect data.

3.4 Data analysis

Completed questionnaires were checked for consistency and the data were entered into the Statistical Package for Social Sciences (SPSS version 16.0). For accuracy the double entry method was used and a descriptive analysis was performed calculating mean, standard deviation and frequency.

3.5 Ethical consideration

Approval to conduct the study was obtained from the Municipal Health Administration. The respondents consent was obtained before administering the questionnaire.

3.6 Assumption

The study assumes that:

 All institutional records reviewed are 100% accurate.

CHAPTER 4

RESULTS

4.0 Out-Patient's Survey

4.1 Socio-demographic characteristics of the respondents

The number of clients interviewed were 300 using a pre-tested questionnaire. These consist of 25 (41.7%) males and 175 (58.3%) females with 211 (70.0%) being NHIS subscribers and 89 (30.0%) nonsubscribers of NHIS. Most of the respondents fall within the age groups 1-14years 96 (32.0%) and 14-34years 95(31.7%). Moreover 138 (46.0%) of the respondents had no formal education with 130 (43.3%) whose education level was up to JHS/MLSC thus 133 (44.3%) were unemployed with 114 (38.0%) being self- employed.

Table 4.1.1 Socio-demographic characteristics of the study population

Variables	**Mampong n(%)**	**Kofiase n(%)**	**Adidwan n(%)**	**Krobo n(%)**	**Yonso n(%)**	**Total n(%)**
Gender						
Males	24 (40)	25 (41.7)	28 (46.7)	28 (46.7)	20 (33.3)	**125 (41.7)**
Females	36 (60)	35 (58.3)	32 (53.3)	32(53.3)	40 (66.7)	**175 (58.3)**
Age						
<1	4 (6.7)	0 (0)	3 (5.0)	1 (1.7)	5 (8.3)	**13 (4.3)**

1-14	16 (26.7)	22 (36.7)	16 (26.7)	25 (41.7)	17 (28.3)	**96 (32.0)**
15-34	18 (30.0)	10 (16.7)	22 (36.7)	21 (35.0)	24 (40.0)	**95 (31.7)**
35-64	19 (31.7)	14 (23.3)	18 (30.0)	9 (15.0)	8 (13.8)	**68 (22.7)**
>65	3 (5.0)	14 (23.3)	1 (1.7)	4 (6.7)	6 (10.0)	**28 (9.3)**
Occupation						
Selfemployed	23 (38.3)	22 (36.7)	28 (46.7)	23 (38.3)	18 (30.0)	**114 (38.0)**
Unemployed	13 (21.7)	34 (56.7)	25 (41.7)	31 (51.7)	30 (50.0)	**133 (44.3)**
Civil servant	7 (11.7)	1 (1.7)	1 (1.7)	1 (1.7)	1 (1.7)	**11 (3.7)**
Student	17 (28.3)	3 (5.0)	6 (10.0)	5 (8.3)	11 (18.3)	**42 (14.0)**
Education						
JHS/MLSC	28 (46.7)	27 (45.0)	32 (53.3)	17 (28.3)	26 (43.3)	**130 (43.3)**
Secondary	8 (13.3)	2 (3.3)	1 (1.7)	2 (3.3)	7 (11.7)	**20 (6.7)**
Tertiary	7 (11.7)	3(5.0)	1 (1.7)	1 (1.7)	0 (0)	**12 (4.0)**
No formal Education	17 (28.3)	28 (40.7)	26 (43.3)	40 (66.7)	27 (45.0)	**138 (46.0)**
Health financing						

NHIS	48 (80.0)	43 (71.7)	28 (46.7)	44 (73.3)	48 (80.0)	**211 (70.0)**
Cash-andcarry	12 (20.0)	17 (28.3)	32 (53.3)	16 (26.7)	12 (20.0)	**89 (30.0)**

Table 4.1.2 Reasons for seeking hospital care (N=300)

Sub district	**Disease n (%)**	**Injury n(%)**	**Review n(%)**	**Others n (%)**
Mampong	48 (80.0)	7 (11.7)	4 (6.7)	1 (1.7)
Adidwan	49 (81.7)	10 (16.7)	0 (0.0)	1 (1.7)
Kofiase	55 (91.7)	3 (5.0)	1 (1.7)	1 (1.7)
Krobo	52 (86.7)	5 (8.3)	1 (1.7)	2 (3.3)
Yonso	55 (91.7)	3 (5.0)	0 (0.0)	2 (3.3)
Total	**259 (86.3)**	**28 (9.3)**	**6 (2.0)**	**7 (2.3)**

4.2 Antibiotics mostly prescribed for the out-patients in Mampong Municipality

From the research (Table 4.2.1) out of the 300 out-patients interviewed and their prescriptions analysed 186 (62.0%) of the prescriptions had at least an antibiotic prescribed. Penicillins were the mostly prescribed 99 (33.3%) followed by Sulphonamides 28 (9.3%), thirdly was Metronidazole 25 (8.3%) and fourth was Quinolones 16 (5.3%). The others Aminoglycosides, Cephalosporins, Teteracyclines and Macrolides were not significantly prescribed. Examples of Penicillins prescribed were Amoxicillin, Amoxicillin Clavulanic acid and Flucloxacillin. Mostly prescribed Sulphonamides and Quinolones were Sulfamethoxazole Tirmethoprim (Co-trimoxazole) and Ciprofloxacin respectively.

Table 4.2.1 Mostly prescribed antibiotics for out-patients

Class of Antibiotics	Mampong n (%)	Kofiase n(%)	Adidwan n(%)	Krobo n(%)	Yonso n(%)	Total n(%)
Penicillins	24 (40.0)	20 (33.3)	12 (20.0)	26 (43.3)	17 (28.3)	**99 (33.3)**
Aminoglycosides	0 (0.0)	0 (0.0)	3 (5.0)	0 (0.0)	1 (1.7)	**4 (1.3)**
Cephalosporins	9 (15.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	**9 (3.0)**
Sulphonamides	1 (1.7)	14 (23.3)	7 (11.7)	2 (3.3)	4 (6.7)	**28 (9.3)**
Quinolones	6 (10.0)	3 (5.0)	3 (5.0)	2 (3.3)	2 (3.3)	**16 (5.3)**
Teteracyclines	0 (0.0)	0 (0.0)	2 (3.3)	0 (0.0)	0 (0.0)	**2 (0.7)**
Macrolides	3 (5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	**3 (1.0)**
Metronidazole	0 (0.0)	0 (0.0)	12 (20.0)	3 (5.0)	10 (16.7)	**25 (8.3)**
Total	**43 (71.7)**	**37 (61.7)**	**39 (65.0)**	**33 (55.0)**	**34 (56.7)**	**186(62.0)**

4.3 Differences in Antibiotics prescriptions between subscribers and non- subscribers of NHIS

According to the survey, the insured respondents 211 (70.0%) were more than the noninsured ones 89 (30.0%). The percentage of prescriptions with antibiotics written for insured and noninsured respondents were 145 (78.0%) and 41 (22.0%) respectively. There were not any significant differences between the class of antibiotics prescribed for insured and noninsured clients from table 4.3.2.

One-way analysis of variance (one way ANOVA)

This type of analysis was used to compare the differences between the prescriptions of insured and noninsured clients. Comparison of subscribers, class of antibiotics prescribed and the total number of antibiotics prescribed were determined. A one-way analysis of variance revealed that there were not any significant differences between the groups in the class of antibiotics prescribed ($F= 0.27$, $p = 0.90$) and the total number of antibiotics prescribed ($F = 0.31$, $p = 0.87$) (Appendix 1.0)

Table 4.3.1Comparing the prescriptions of insured and noninsured clients

	Subscribers n (%)	**Percentage with antibiotics n (%)**	**with Conformity STG n (%)**
Insured	211 (70.0)	145 (78.0)	128 (68.8)
Noninsured	89 (30.0)	41 (22.0)	24 (12.90

Table 4.3.2 Comparing the class of antibiotics prescribed for insured and noninsured clients

Class of Antibiotics	Insured n(%)	Non-insured n(%)
Penicillins	79 (54.0)	20 (48.8)
Aminoglycosides	1 (0.7)	3 (7.3)
Cephalosporins	9 (6.2)	0 (0.0)
Sulphonamides	22 (15.2)	6 (14.6)
Quinolones	16 (11.0)	0 (0.0)
Teteracyclines	1 (0.7)	1 (2.4)
Macrolides	3 (2.1)	0 (0.0)
Metronidazole	14 (9.7)	11 (26.8)
Others	0 (0.0)	0 (0.0)
Total	**145 (78.0)**	**41 (22.0)**

4.4 Prescribed antibiotics in conformity with guidelines

From the survey out of the 186 prescriptions which had at least an antibiotic prescribed, 185 (99.5%) were in the NHIS drug list and 162 (87.1%) also conformed to the Standard Treatment Guidelines of the Ministry of Health. Only 1 (0.5%) and 24 (12.9%) did not conform to NHIS drug list and STG respectively.

Table 4.4.1 Conformity with guidelines (N=186)

Sub district	NHIS Drug List	STG Guidelines

	Yes	No	Yes	No
Mampong	43	0	38	5
Adidwan	38	1	30	9
Kofiase	37	0	36	1
Krobo	33	0	28	5
Yonso	34	0	30	4
Total	**185(99.5%)**	**1(0.5%)**	**162(87.1%)**	**24(12.9%)**

Table 4.4.2 Prescriptions not conforming to STG Guidelines (N= 24)

Diagnosis	Antibiotics Prescribed	No. of prescriptions not conforming to STG
Skin infection	Gentamycin/Erythromycin	1
Malaria	Chloramphenicol	1
Skin infection	Gentamycin/Metronidazole	1
Malaria	Tetracycline	1
RTI	Metronidazole	1
Malaria	Metronidazole	2
Skin infection	Metronidazole	6
Diarrhoea	Amoxicillin	1
RT I/DSI	Amoxicillin/Co-trimoxazole	1
UTI	Ciprofloxacin/Doxycycline	1
Skin infection	Ciprofloxacin	1
Malaria	Amoxicillin	1
Skin infection	Amoxicillin	6

N = Total number of prescription

4.5 The frequency of antibiotics use in the municipality

According to the survey out of the 300 prescriptions analysed there were a total of 1045 of medicines prescribed thus the average number of drugs per prescription is approximately 4.0 with the highest from Adidwan health center 234 (3.9) and the least from Yonso 176 (2.9).

Mampong had the highest percentage of antibiotics being prescribed 71.7% with the lowest from Krobo 55.0%. In all the municipality had the percentage of antibiotics prescribed as 62.0%.

Table 4.5.1 Frequency of antibiotics use (N=300)

Sub district	Avg No of drugs per prescription		% with Antibiotics
Mampong	192	3.2	43 (71.7)
Adidwan	234	3.9	39 (65.0)
Kofiase	215	3.6	37 (61.7)
Krobo	228	3.8	33 (55.0)
Yonso	176	2.9	34 (56.7)
Total	**1045**	**3.5**	**186 (62.0)**

Prescribers Survey

4.6 Factors influencing prescribers' antibiotics prescribing

From the survey, (Table 4.6.1) 22 prescribers were interviewed with most of the prescribers being midwives 16 (72.7%) and the same number of respondents had worked for less than five (5) years. 68.2% of the prescribers based their antibiotics prescribing on the diagnosis of the patient. The disease conditions which were commonly diagnosed (Table 4.6.2) with the possibility of antibiotics being prescribed had Respiratory Tract Infection (RTI) as the highest 84 (28.0%), followed by skin infections 54 (18.0%) thirdly is Digestive System Infections (DSI) 33 (11.0%) and the least is Urinary Tract Infections 7 (2.3%). The others112 (37.3%) comprise of

diagnosis free from antibiotics being prescribed. From the prescribers' interview (Table 4.6.1) 15 (68.2%) of the prescribers based their antibiotics prescribing on the diagnosis they come out with.

Table 4.6.1 Prescribers socio-demographic characteristics

Variables	**Respondents n (%)**
Gender	
Males	9 (40.9)
Females	13 (59.1)
Age	
< 25	6 (27.3)
25-40	13 (59.1)
41-50	1 (4.5)
51-60	2 (9.1)
Profession	
Specialist	2 (9.1)
Medical officer	1 (4.5)
Physician Asistant	3 (13.6)
Nurse/midwife	16 (72.7)

Duration of Practice	
< 5	16 (72.7)
5-10	3 (13.6)
11-20	2 (9.1)
Above 20	1 (4.5)
Antibiotics Prescribing Determinants	
Diagnosis	15 (68.2)
Laboratory Findings	2 (9.1)
Conformity with STG	5 (22.7)

Table 4.6.2 Written diagnosis (N=300)

Sub district	RTI (%)	DSI (%)	Skin (%)	Eye/Ear (%)	UTI (%)	Others (%)
Mampong	19 (31.7)	7 (11.7)	14 (22.3)	3 (5.0)	2 (3.3)	15 (25.0)
Adidwan	11 (18.3)	10 (16.7)	10 (16.7)	1 (1.7)	1 (1.7)	27 (45.0)
Kofiase	21 (35.0)	2 (3.3)	12 (20.0)	1 (1.7)	2 (3.3)	22 (36.7)
Krobo	17 (28.3)	6 (10.0)	11 (18.3)	2 (3.3)	1 (1.7)	23 (38.3)

Yonso	16 (26.7)	8 (13.3)	7 (11.7)	3 (5.0)	1 (1.7)	25 (41.7)
Total	**84 (28.0)**	**33 (11.0)**	**54 (18.0)**	**10 (3.3)**	**7 (2.3)**	**112 (37.3)**

CHAPTER 5

DISCUSSION

5.0 Socio demographic characteristics of the study population

Patient income, age, sex, health status, occupation, social and cultural context, level of health care facility and disease patterns are some of the factors that contribute to the selection and use of medicines. Majority of the out patients who access our public health facilities are insured but unemployed hence, they have taken advantage of the NHIS to carter for their health care needs. The municipality has most of the population with no formal education and if any at all up to JHS level. Most of the respondents are into farming and petty trading. As it was stated in NHIA report (NHIA report 2011) the managers of the scheme collaborate with the LEAP (Livelihood Empowerment Against Poverty) programme managers aid in identification of the poor people in the society for free enrollment. The aged are also exempted from paying premiums.

5.1 Antibiotics mostly prescribed

From the survey, (Table 4.2.1) the commonly prescribed antibiotics for out-patients care were Penicillins, Sulphonamides, Metronidazole, Quinolones and Cephalosporins. This is in conformity with two studies carried out in Nepal by (Fahad, 2010) where the same antibiotics were identified as the mostly prescribed antibiotics in their study with the exception of sulphonamides. The use of sulphonamides in the municipality is on the increase because of the use of Sulphamethoxazole and trimethoprim combination (co-trimoxazole) as prophylaxis for opportunistic infections for people living with HIV. Teteracyclines were the least prescribed antibiotics in the municipality this may be due to a change in the prescribing pattern from old to new antibiotics which are more effective

and also based on the choice of the prescriber. The level of health care facility had an influence on the prescribing of Cephalosporins and

Macrolides. Out of the five health facilities where the survey was carried out only Mampong Government hospital had the mandate to prescribe Macrolides and Cephalosporins. This was because the prescribing levels adopted by NHIS accredited facilities had been enforced. (NHIA Drug List 2014). At the health centers such antibiotics can be prescribed for noninsured clients and also insured clients who are willing to pay out of their pockets for those antibiotics prescribed provided such antibiotics are available at the facility.

5.2 Comparing the prescriptions of insured and noninsured clients

From the results of the survey (Table 4.3.1) majority of the people who access the public health facilities in the Municipality are subscribers of the National Health Insurance Scheme (70.0 %), and quite an appreciable number (30.0 %) are noninsured. The average number of drugs per prescription or encounter for insured clients were higher (3.8) than the noninsured clients. This may be due to the cost of drugs being catered for by the NHIS irrespective of the number of drugs prescribed so far as there is a diagnosis to justify it. The noninsured clients had fewer drugs per prescription (3.4) this may be due to the cost consideration for the clients on the part of prescribers. Moreover, the insured clients had higher number of antibiotics prescribed for them (78.0 %). A study in rural China, has shown that health-system financing has influence on antibiotic prescribing both in frequency and type (Dong et al 1999a) and this reflects in the survey carried out in Mampong municipality. Also Physicians decided to prescribe more expensive antibiotics for insured patients than noninsured patients which implies that insured clients might have higher drug cost than uninsured clients. (Dong et al 1999b). Financial sustainability of the National Health

Insurance scheme is one of the biggest challenges facing the scheme management (NHIA Report 2011) thus a higher drug cost for insured clients would further worsen this challenge as the majority of those who access the facilities are insured clients.

5.3 Comparing the class of Antibiotics prescribed for insured and noninsured clients

From table 4.3.2 the insured clients had more of each class of antibiotics prescribed. Also they had greater access to newer and more expensive antibiotics such as Cephalosporins, Quinolones and Macrolides since NHIS bears the full cost of all medicines prescribed so far as they are covered. Higher profit margins on antibiotics may influenced prescribing of antibiotics and thus may compel prescribers to prescribe them inappropriately. (Dong et al 1999b) There are not restrictions on the selection and use of antibiotics for both insured and noninsured clients thus a prescriber's choice is paramount. Over use of the services as a result unrealistic expectations of the insured client especially in developing countries was one of the challenges identified in a study and to address this challenge the implementation of co-payment for medicines or other methods of payment must be exploited in line with evidence –based medicines coverage policies.
(Wagner and Ross-Degnan 2009).

5.4 Factors influencing Prescribers antibiotics prescribing

The municipality has majority of the prescriber being nurses and midwives who are the sole managers of the health centers (table 3.2) The study showed that all nurses and midwives at the health centers are automatically prescribers irrespective of their training and working experience.

Medicines are prescribed based on their clinical judgement in order to come out with a diagnosis. This is in line with the study carried out in Indonesia where prescribers who are not abreast with

current trends of prescribing antibiotics follow peer norms without basis or facts in the prescribing practices. (Ismail et al 1991). Moreover, acquisition of knowledge is vital for proper practice but that is not the criteria to effect change in antibiotics prescribing practices. The educational level and knowledge of prescribers may influence the prescribing practices of health care providers. (Okeke et al 1999)

Antibiotics were prescribed for various diagnosis such as Respiratory Tract Infections (RTI), Digestive system infections (DSI), Skin infections, Eye and Ear Infections and Urinary Tract Infections (UTI). The antibiotics prescribed were not based on laboratory findings but on the presenting complaints of the clients because with the exception of Mampong hospital which has a laboratory all the health centers do not have any equipped laboratory. This points out that the use of antibiotics on an empirical basis is high as was found in a Bangladesh study where 90% of antibiotics prescribed were on empirical basis as a result of inadequate facilities where microbiological test could be done. Unrealistic results obtained as well as various test outcomes from various laboratories were the challenges enumerated. (Rashid et al 1986). Only a few prescribers rely on microbiological reports for the basis of antibiotics prescribing. In a Malaysian study 80% of antibiotics prescriptions were written without reference to microbiological reports even though the prescribers had access to quality laboratory service. (Cheong 1993)

5.5 Prescribed antibiotics in conformity with guidelines

From 1983 Ministry of Health has taken the responsibility to publish a list of Essential drugs with Therapeutic guidelines to ensure rational use of medicines. The National drug policy has one of its objectives as ensuring the availability of and accessibility to affordable and good quality medicines

for all Ghanaians. This objective can be achieved through appropriate and thoughtful prescribing, dispensing and use of medicines and not only in the supply and distribution of medicines. The Standard Treatment Guidelines was compiled to assist and guide prescribers, pharmacist, dispensers and other health professionals to ensure quality care for patients.

The use of the Standard Treatment Guideline has been known to be cost-effective in ensuring that inefficiencies, fraud and poly-pharmacy associated with health insurance are minimized. This helps in providing quality standardized care at affordable cost. (STG 2010)

Furthermore, table 4.4.1 shows that 87.1% of the prescribed antibiotics conformed to the Standard Treatment Guidelines. Conformity with therapeutic guidelines helps in rational use of medicines and also ensures their cost-effectiveness. The standard Treatment Guidelines was seen as a very good tool for the prescribers to refer to in case of encountered challenges in prescribing. Healthcare professionals depend on the use of treatment guidelines for proper management of infections. CDC (Center for Disease Control) monitors resistance trends in *Neisseria gonorrhoeae* (the cause of gonorrhea) and *Mycobacterium tuberculosis* (the cause of tuberculosis) and publishes treatment guidelines to limit the progression of these diseases and the spread of bacteria. (CDC Report 2013). Table 4.4.2 show that there is polypharmacy and lots of drug diagnosis miss match when prescribers do not conform to the Standard Treatment Guidelines.

Moreover, the results in table 4.4.1 shows that prescribers conform to the NHIS drug list irrespective of being a subscriber of NHIS or not. With the 186 prescriptions with written antibiotics only one did not conform to the NHIS drug list. This shows that the prescribers are very

cautious to conform to the NHIS drug list and also stick to their level of prescribing for reimbursement to be effected to prevent deductions from their claims.

5.6 Frequency of antibiotics use in the municipality

Whenever antibiotics are used it provokes bacteria resistance development. The need for antibiotics to prevent and treat infections is very important. But from research 50% of antibiotics prescribed are either unnecessary or misused. (an example is when a patient is given the wrong dose). The harmful effects on the patient cannot be overlooked, since antibiotics are not without side effects and the possibility of interacting with other medicines. Thus the misuse of antibiotics enhances antibiotics resistance. (CDC Report 2013)

The rational use of drugs is a complex issue which was not studied in this research, but some of the indicators were used. The data of this study implied that there were problems in the rational use of antibiotics in the municipality. The prescribing of antibiotics in the municipality is high that is 62.0% (table 4.5.1) as compared to the National and WHO standards of 30.0% and 20.0% respectively. Moreover, the average number of drugs per encounter was also high that is 3.5 as compared to the National and WHO standards of 3.0 and 2.0 respectively.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATION

6.1 Conclusion

The method of health financing system appeared to have effect on the prescribing of antibiotics with most people in the Municipality taking advantage of the National Health Insurance to finance

their basic health care needs. The study showed that in out-patient clinical care, insured clients had access to all class of antibiotics irrespective of the cost, so far as they are covered in the Health Insurance drug list which prescribers conform to. The major limitation to prescribers in antibiotics prescribing was the level of health care facility which determines their prescribing level when dealing with insured clients. The frequency of antibiotics prescribing was high with insured clients receiving a higher number of drugs per prescription and thus a higher drug cost.

6.2 Recommendations

Service providers

- In the event of cutting down wastage and high drug reimbursement claims, conformity with the Standard Treatment Guidelines will help in rational prescribing.
- The drugs and therapeutics committee activities in the health facilities must be strengthened and enforced.
- In- service training for prescribers must be done quarterly at the health facilities and must be geared towards improving their antibiotics prescribing pattern.

Scheme managers

- A formidable clinical audit team must be set up at the district/municipal level to help scrutinize claims from facilities with irrational prescribing especially antibiotics.
- An electronic system of tracking and correcting irrational prescribing pattern of antibiotics must be implemented to monitor prescribers.

Government and Policy makers

- Rigorous study needs to be done to ascertain the sustainability of the scheme and the reduction of irrational prescribing when there is co-payment for drug bills at the facilities.

6.3 Limitations of the study

The study was not without limitations. For instance:

- The rational use of antibiotics was not considered in this study
- The study did not address price elasticity as a determinant of antibiotics prescribing pattern.
- The tendency of interviewees especially prescribers to provide expected answers in order to please the researcher was high.
- Selected prescribing indicators were assessed.

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APPENDICES

Appendix 1

Appendix 1.0 one way ANOVA for comparing means of subscribers and nonsubscribers of NHIS

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
insured and noninsured patients	Between Groups	.186	4	.047	.272	.895
	Within Groups	9.414	55	.171		
	Total	9.600	59			
Class of prescribed antibiotics	Between Groups	4.149	4	1.037	.258	.903
	Within Groups	152.549	38	4.014		
	Total	156.698	42			
Total number of antibiotics prescribed	Between Groups	.032	4	.008	.311	.869
	Within Groups	.944	37	.026		
	Total	.976	41			

Descriptives[a]

	Class of antibiotics prescribed			Statistic	Std. Error
insured and noninsured patients		Mean		1.18	.095
		95% Confidence Interval for Mean	Lower Bound	.97	
			Upper Bound	1.38	
		5% Trimmed Mean		1.14	
		Median		1.00	
		Variance		.154	
		Std. Deviation		.393	
		Minimum		1	
		Maximum		2	
		Range		1	
		Interquartile Range		0	
		Skewness		1.866	.550
		Kurtosis		1.665	1.063
	Penicillins	Mean		1.12	.069
		95% Confidence Interval for Mean	Lower Bound	.98	
			Upper Bound	1.27	
		5% Trimmed Mean		1.08	
		Median		1.00	
		Variance		.114	
		Std. Deviation		.338	
		Minimum		1	
		Maximum		2	
		Range		1	
		Interquartile Range		0	
		Skewness		2.422	.472
		Kurtosis		4.210	.918
	Cephalosporins	Mean		1.22	.147
		95% Confidence Interval for Mean	Lower Bound	.88	
			Upper Bound	1.56	
		5% Trimmed Mean		1.19	
		Median		1.00	
		Variance		.194	
		Std. Deviation		.441	
		Minimum		1	
		Maximum		2	
		Range		1	
		Interquartile Range		0	
		Skewness		1.620	.717
		Kurtosis		.735	1.400
	Quinolones	Mean		1.33	.211
		95% Confidence Interval for Mean	Lower Bound	.79	
			Upper Bound	1.88	
		5% Trimmed Mean		1.31	
		Median		1.00	
		Variance		.267	
		Std. Deviation		.516	
		Minimum		1	
		Maximum		2	
		Range		1	
		Interquartile Range		1	
		Skewness		.968	.845
		Kurtosis		-1.875	1.741
	Macrolides	Mean		1.67	.333
		95% Confidence Interval for Mean	Lower Bound	.23	
			Upper Bound	3.10	
		5% Trimmed Mean		.	
		Median		2.00	
		Variance		.333	
		Std. Deviation		.577	
		Minimum		1	
		Maximum		2	
		Range		1	
		Interquartile Range		.	
		Skewness		-1.732	1.225
		Kurtosis		.	.

a. insured and noninsured patients is constant when Class of antibiotics prescribed = Sulphonamides. It has been omitted.

Appendix 2

The prescribing indicators

1. Average number of medicines per encounter:

Purpose: to measure the degree of polypharmacy.

Calculations: Total number of medicines prescribed

Total number of encounters surveyed

2 Percentage of encounters with Antibiotics prescribed:

Purpose: to measure the overall level of overused and costly forms of medicines therapy.

Calculations: Number of patient encounters with antibiotic prescribed x100%

Total number of encounters surveyed

3 Percentage of medicines prescribed from NHIS medicines list:

Purpose: to measure the degree to which practices conform to national medicines policy.

Calculations: number of medicines prescribed which are listed on NHIS list x100

Total number of medicines prescribed

Appendix 3

SAMPLE QUESTIONNAIRE FOR OUT-PATIENTS

ANTIBIOTICS PRESCRIBING PATTERN IN MAMPONG MUNICIPALITY

Respondent's OPD number……..

1. **Demographic**

Sex Male [ ] Female [ ]

Age

[ ] < 1

[ ] 1-14

[ ] 15-34

[ ] 35-64

[ ] 65 and above

2. Employment status

Self- employed [ ] unemployed [ ] Civil servant [ ] Student [ ] Specify ……..

3. Education level

Up to JHS /MSLC [ ] Up to Secondary [ ] Tertiary [ ] No formal education [ ]

4. Subscribers and Non-subscribers of NHIS

Insured [ ] Non-insured [ ]

5. Reasons for seeking hospital care

Disease [ ] Injury [ ] Review [ ] Others [ ]

6. Diagnosis

Respiratory Tract Infection [ ] Digestive System Infection [ ] Skin infections [ ] Eye/Ear Infections [ ]

Urinary Tract Infection [ ] Others [ ]

7. Prescription Analysis

Total number of drugs on prescription ……

Are there any antibiotic(s) prescribed? Yes [ ] No [ ]

If yes total number of antibiotics prescribed. .....

What is/are the Antibiotic(s) dosage forms prescribed? Oral [ ] Injections [ ] Topical [ ] Eye/Ear preparations []

What class does the antibiotic(s) prescribed fall?

Penicillins [ ]

Aminoglycosides [ ]

Cephalosporins [ ]

Sulphonamides [ ]

Quinolones [ ]

Tetracyclines [ ]

Macrolides [ ]

Metronidazole/Tinidazole [ ]

Others (specify) …….

8. Conformity with Standard Treatment Guidelines

Is the prescribed antibiotic(s) included in the National Health Insurance drug list?

Yes [ ] No [ ]

Is the prescribed antibiotic(s) in line with the Standard Treatment Guideline used in Ghana?

Yes [ ] No [ ]

Appendix 4

QUESTIONNAIRE FOR PRESCRIBERS: PLEASE TICK APPROPIATELY PRESCRIBING

PATTERN OF ANTIBIOTICS IN MAMPONG MUNICIPALITY

Serial No …….

1. Demographic

Sex Male [ ] Female [ ]

Age < 25 [ ] 25-40 [ ] 41- 50 [ ] 51-60 [ ] 61 and above [ ]

2. Designation

Specialist [ ] Specify …… Medical officer [ ] Physician assistant [ ] Nurse/midwife [ ]

3. Duration of practice

How many years have you practiced in the above capacity?

<5 [ ] 5-10 [ ] 11-20 [ ] Above 20 years [ ]

4. Determinants of antibiotic prescribing

Which of the factors below determines your prescribing of **ANTIBIOTIC(S)** for your **OUT-PATIENTS?**

Diagnosis [ ] Laboratory findings [ ] Fear of bad out- come [ ] Routine practice [ ]

Patient demand [ ] Availability at the facilities pharmacy [ ] Pharmaceutical promotions [ ]

Health insurance subscribers [ ] Conformity to the Standard Treatment Guidelines [ ]