UNIVERSITY OF GHANA

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COLLEGE OF HEALTH SCIENCES

PATTERN OF ANTIBIOTIC PRESCRIPTION BY CLINICIANS FOR THE TREATMENT OF ACUTE PHARYNGO-TONSILLITIS AMONGST CHILDREN ATTENDING PRINCESS MARIE LOUISE CHILDREN HOSPITAL IN ACCRA

BY

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JULY, 2019

DECLARATION

I hereby declare that apart from specific references which have been duly acknowledged, this dissertation is my own work put together under supervision. I also declare that this research work has not been presented elsewhere, either in part or in whole for another degree.

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SIGNATURE…….

DATE……..

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DATE……

DEDICATION

This research work is dedicated to my brother, Bobby Quaye and my husband, Jonathan Insaidoo for all their support towards my work.

ACKNOWLEDGMENT

Glory be to God almighty for giving me the strength, sagacity and grace to complete my dissertation. My sincere appreciation goes to my supervisor Dr Bismark Sarfo for his guidance, inspiration and support, May God reward you abundantly. My gratitude goes to my family for their financial support and care. I appreciate the warm reception from the health workers at the Princess Marie Louis Childrens Hospital. I am very grateful for giving me the opportunity to use your facilities for this study. To my family and friends, thank you for being there for me. May God bless you. This research would have been impossible to undertake without your support.

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LIST OF ABBREVIATION

AMR	-Antimicrobial Resistance
ATB	- Antibiotics
BNF	-British National Formulary
DTC	-Drug and Therapeutic Committee
EDL	- Essential Drug List
GHS	-Ghana Health Service
MCA	-Medicine Counter Assistant
MOH	-Ministry of Health
NHIS	-National Health Insurance
OPD	-Out-Patient Department
PML	-Princess Marie Louis
PT	-Pharyngo-tonsillitis
RTI	-Respiratory Tract Infections
RUD	-Rational Use of Drugs
STG	-Standard Treatment Guidelines
URTI	-Upper Respiratory Tract Infections
WHO	- World Health Organization

ABSTRACT

Background: Antimicrobial resistance (AMR) resulting from the misuse and overuse of antibiotics remains a serious public health concern, with majority of clinicians prescription of antibiotics related to reported cases of acute respiratory infections such as pharyngo-tonsillitis.

Objective: The objective of the study is to assess the pattern of antibiotic prescription by clinicians for treatment of acute pharyngo-tonsillitis and factors associated with prescribing antibiotics for the diagnosed cases among children attending Princess Marie Louise Children's hospital in Accra.

Methods: The study employed a descriptive cross-sectional design with quantitative approach to data collection. Questionnaire was used as method of data collection. The study consecutively sampled 422 children and their medical records for analysis. Descriptive analysis included percentages, frequencies, means and standard deviations of major variables. Test of association using chi-square test and Fisher's exact was performed. A multiple logistic regression was used to determine significant predictors of antibiotic prescription with significant level set at $p<0.05$.

Results: The mean age of children was 2.7 years ± 1.6 SD and majority of the children were females (70.6%). The mean age of caregivers was 27.3 years with nearly 39% who had up to senior high school/vocational/technical education and more than half of the respondents were traders (56.7%). Also, more than half of the children were fully immunized (58.9%). Bacterial throat swab was requested for 10% of the children diagnosed by clinicians. Of 81 caregivers who had no knowledge of respiratory tract infection, 88.7% where prescribed with antibiotics for their children. Prevalence of antibiotic prescription for the treatment of acute PT was 78% (p = 0.78; 95% CI = 0.74 – 0.82). Temperature of a child (aOR = 2.04; 95% CI

= 1.44 – 2.90; p <0.001), Family size (aOR = 1.41; 95% CI = 1.09 – 1.83; p = 0.009) and no knowledge of respiratory infections (aOR = 2.59; 95% CI = 1.20 – 5.59; p = 0.015) were found to be significant predictors of antibiotic prescription for treatment.

Conclusion: The prevalence of antibiotics prescription is high for the treatment of acute PT among children at Princess Marie Louis Children Hospital. Factors such as temperature of the child, family size and no knowledge of respiratory tract infections were found to be significantly associated with the prescription of antibiotics for the treatment of acute pharyngo-tonsillitis. There should be a comprehensive policy on Antimicrobial Resistance (AMR) that will guide clinicians in the rational use of antibiotics for treatment and to strengthen surveillance in healthcare institutions to ensure sustainable investment in countering AMR by relevant stakeholders in the Ministry of Health.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Acute pharyngo-tonsillitis remains a serious public health concern among populations in general, and children in particular. Evidence available suggests that Group A β-Haemolytic Streptococcus is a bacterium that causes a range of human infections, including pharyngo-tonsillitis manifesting as the most common infection, mostly occurring in children between 5 and 15 years of age (Ezeonwu et al, 2014; Regoli et al 2011). The clinical presentation includes sudden onset of fever, sore throat, headache, abdominal pain, nausea, and vomiting, along with the development of pharyngeal erythema with or without exudates, petechiae on the palate and cervical lymphadenopathy (Llor & Bjerrum, 2014). Bacteria are important etiologic agents and when identified properly, may be treated with antibiotics resulting in decreased local symptoms and prevention of serious sequelae.

Most cases of acute pharyngo-tonsillitis are viral in etiology and involve the pharynx, tonsils as well as other portions of the respiratory tract as manifestations of the common cold, influenza, or croup (Prah et al. 2018; Newman, 2011). Examples of the viruses include the rhinoviruses, coronaviruses, adenovirus, influenza A and B, and the parainfluenza viruses which account for the vast majority of cases and these are usually self-limited. Viral infections are the most common cause of acute pharyngo-tonsillitis in infants and school children. (Moloi, 2015; Morais et al. 2012). Therefore, children presenting with signs and symptoms consistent with viral infection do not need to undergo diagnostic testing or be treated with antibiotics. However, because there is a degree of overlap in the presentation of viral versus bacterial pharyngo-tonsillitis, clinical judgment alone often is not accurate in

diagnosing Group A β-Haemolytic Streptococcus infections and often leads to overtreatment with antimicrobial therapy.

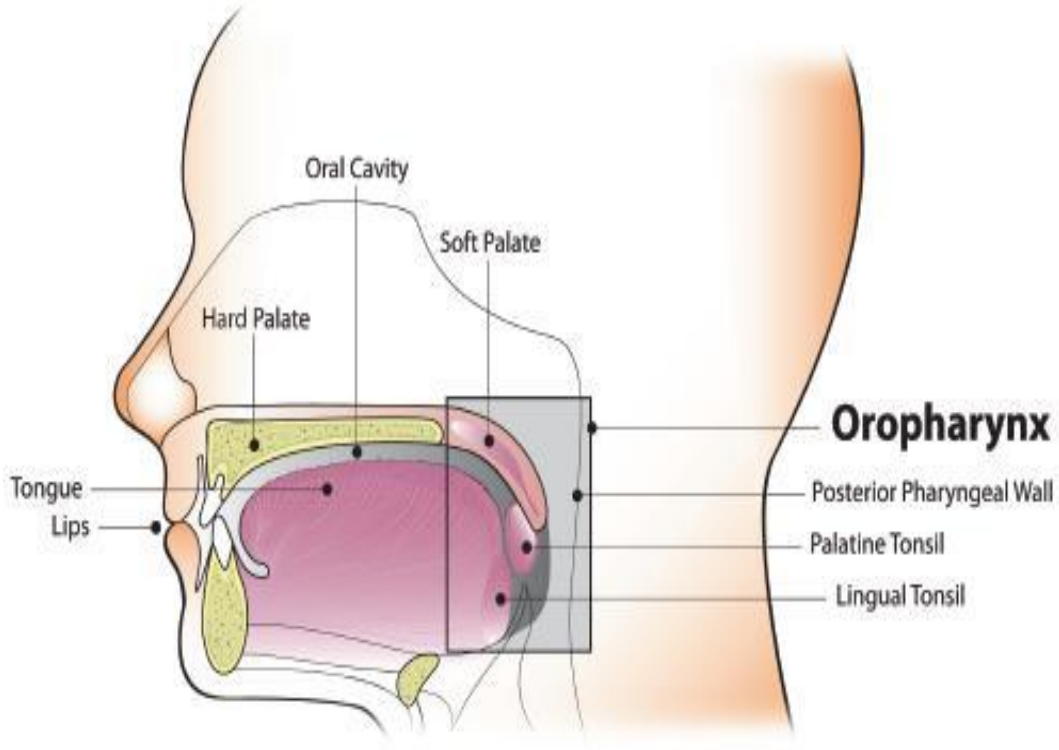

Figure 1: Showing the Tonsils and Pharynx

According to the World Health Organization (2018) report on the state of child health, acute respiratory infections under which acute pharyngo-tonsillitis falls is a leading cause of mortality in postnatal children. Global estimate of pharyngitis is 600 million cases annually, with over 550 million of these occurring in less developed countries (Bizno et al. 2002). Acute Pharyngo-tonsillitis is inflammation of the pharynx and tonsils. The inflammation usually extends to the adenoid further leading to global burdens such as tonsillar abscess, lower respiratory infection, skin infection, meningitis, arthritis and scarlet fever with rheumatic heart diseases, resulting as a sequelae disease (Nasirian et al. 2014; Ghada, 2011).

Most infectious causes of pharyngitis are transmitted by close contact via respiratory secretions, and children serve as the major reservoir of infection (Moloi, 2015; Morais et al.

2012). Additionally, spread of illness among family members is a frequent occurrence and family illness is an important detail to elicit in the history.

Globally, complicated cases cause 349,000 deaths annually from 15 million incidents. Of 2.4 million affected children residing in developing countries, 1 million live in sub-Saharan Africa (Moloi, 2015), and in Ghana where respiratory tract infection is a leading cause of postnatal deaths (Ministry of Health, 2004).

1.2 Statement of the Problem

Evidence available suggests that 80-90% of reported cases of Pharyngo-tonsillitis among children is of viral origin, while 5-20% are bacterial related (Kunda et al. 2015; Mazur, 2010). However, it is established that clinicians over prescribe antibiotics for reported cases of acute pharyngo-tonsillitis among children, although antibiotics has no effect on viral infections thereby contributing to the rise in antimicrobial resistance (AMR) in Ghana and elsewhere (Prah et al. 2018; Newman, 2011; Newman, 1997). The consequences of AMR can be devastating as infections caused by resistant microorganisms often fail to respond to standard treatment, resulting in prolonged illness, higher health care expenditures, and a greater risk of death (Kumi, 2014). According to WHO report in 2015, death rate for patients with serious infections caused by common bacteria treated in hospitals can be about twice that of patients with infections caused by the same non-resistant bacteria. This presents a serious public health concern which is recognized by relevant bodies including the World Health Organization (2018) and the Ministry of Health of Ghana (2017).

This study aims to assess the underlying factors that inform trends in clinicians' prescription of antibiotics to children aged 1 to 10 years, visiting the Children's hospital in Accra, Ghana.

1.3 Justification

This study is aimed at improving the use of antibiotics and preventing inappropriate prescription of antibiotics in children. Assessment of prescription practices and pattern would help reduce health care cost, duration of hospitalization hence improving health care delivery in general. Taking note of supply factors could help in the implementation of strategies for the effective prescription and use of antibiotics. Studies on drug utilization serve as a form of assessment for prescribers. Antibiotics are the most prescribed drug in the pediatrics, and it is important to ensure that children are given antibiotics when needed and if possible, with evidence of bacterial infection. Information provided by this study would serve as an assessment for prescribers and also a guide in the utilization of antibiotics in the pediatric population. This study will be filling the gap in the literature on factors that inform clinicians' prescription of antibiotic treatment to school-aged children suffering from acute pharyngo-tonsillitis in Ghana

1.4 Research questions

1. What is the proportion of children with acute pharyngo-tonsillitis treated with antibiotics in the Children's Hospital?
2. What is the pattern of antibiotic prescription for the treatment of acute pharyngo-tonsillitis?
3. What are the factors associated with prescribing antibiotics for the diagnosed cases?
4. What are caregivers knowledge on pharyngo-tonsillitis and antibiotic prescriptions?

1.5 Objectives

1.5.1 General objective

To assess the pattern of antibiotic prescription by clinicians for treatment of acute pharyngo-tonsillitis among children attending Princess Marie Louise Children's hospital in Accra

1.5.2 Specific Objectives

1. To determine the proportion of children with acute pharyngo-tonsillitis treated with antibiotics in the Children's hospital
2. To determine the patterns of antibiotic prescription for the treatment of acute pharyngo-tonsillitis
3. To determine the factors associated with prescribing antibiotics for the diagnosed cases
4. To assess caregivers knowledge on acute pharyngo-tonsillitis and antibiotic resistance

1.6 Conceptual Framework

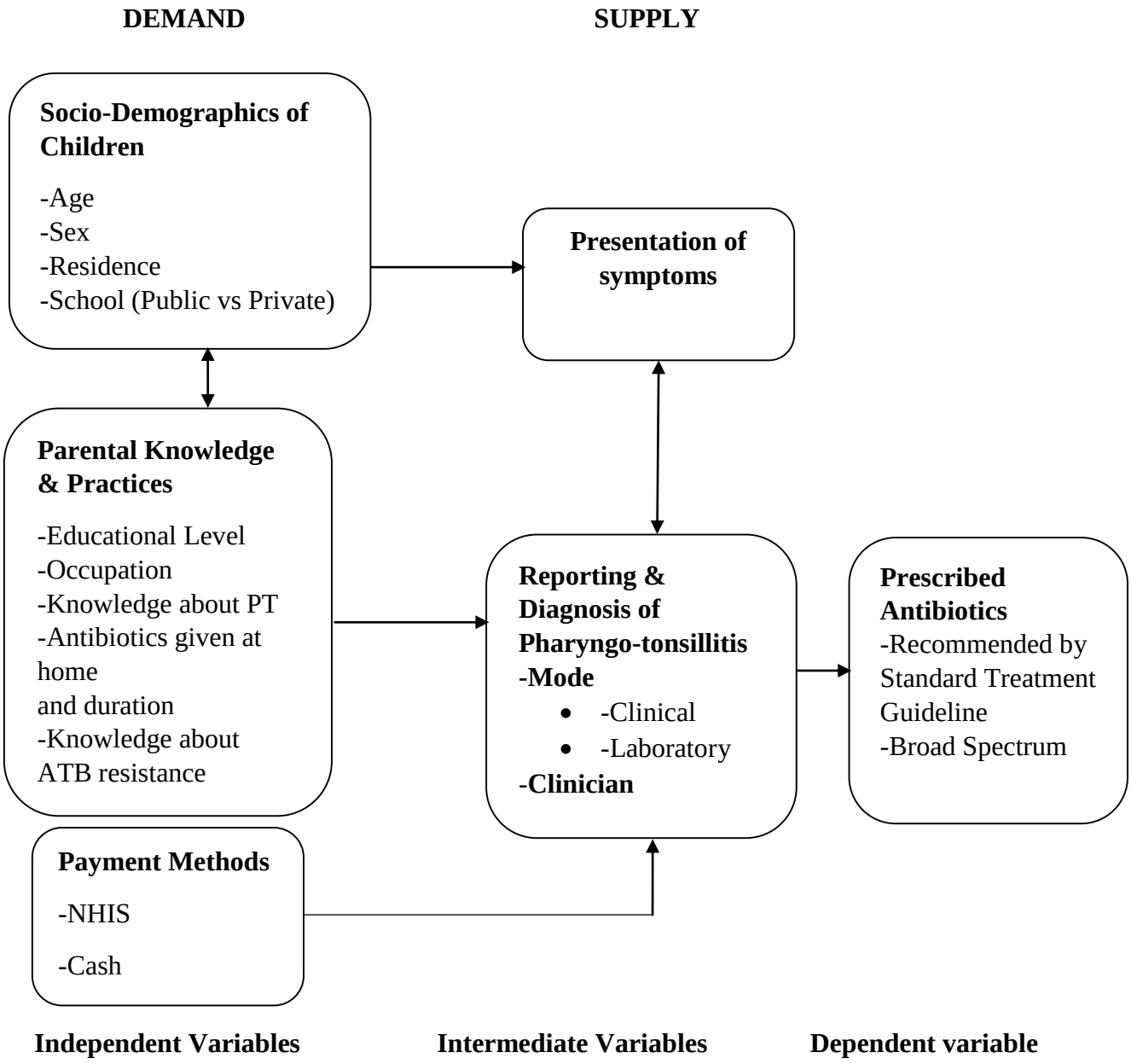

Figure 2: conceptual framework

Conceptual framework follows that these factors inform clinicians on antibiotic prescriptions for children with acute pharyngo-tonsillitis. This goes to show that the factors that influence antibiotic prescription by clinicians in relation to acute pharyngo-tonsillitis may be two sided: supply driven from the side of clinicians, and demand driven from the individual health conditions. Based on this premise the study proposes the application of Anderson's behavioural model of health service use which characterises the supply and demand side factors that influence health care in general.

The study builds on the Anderson's Behavioural Model of Health Service Use to group the factors that inform clinician's prescription of antibiotics on the demand side and supply side. The supply side include diagnosis and laboratory investigations informed from history taking, physical examination and payment methods.

The demand side works with the socio-demographic and economic background of mother and child which include age of the child, the kind of school the child is attending, location of school, residence, the number of siblings, mother's educational level, mother's occupation, antibiotics or medications given and durations given prior to presentation at the hospital.

These data obtained through questionnaire survey determine the factors associated with prescription of antibiotics in line with the objective of the study.

The factors from the supply side and demand side applied in subsequent discussions to explain the underpinnings of clinician's prescriptions of antibiotics in relation to acute PT.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter draws on secondary literature to address the second and third research questions: What is the pattern of antibiotic prescription for the treatment of acute pharyngo-tonsillitis (PT) and what are the factors associated with prescribing antibiotics for the diagnosed cases? The review does this by firstly discussing the Andersen's conceptual framework of Health service use, followed by an application of the framework to guide factors from the supply and demand side of primary health care which informs clinician's prescriptions of antibiotics and acute PT among children in Ghana and elsewhere.

2.2 Acute Pharyngo-tonsillitis: General overview

The pharynx is a tube formed by skeletal muscle and lined by mucous membrane that is continuous with that of the nasal cavities. The pharynx is divided into three major regions: the nasopharynx, the oropharynx, and the laryngopharynx.

Tonsils are lymphoid tissues located at the entrance to the upper respiratory and gastrointestinal tracts to protect the body from the entry of germs specifically located on the left and right sides of your palate **(**palatine tonsils**)** at the back of the throat (oropharynx). The tonsil on the posterior base of your tongue is the lingual tonsil as shown in figures 3 and 4 below.

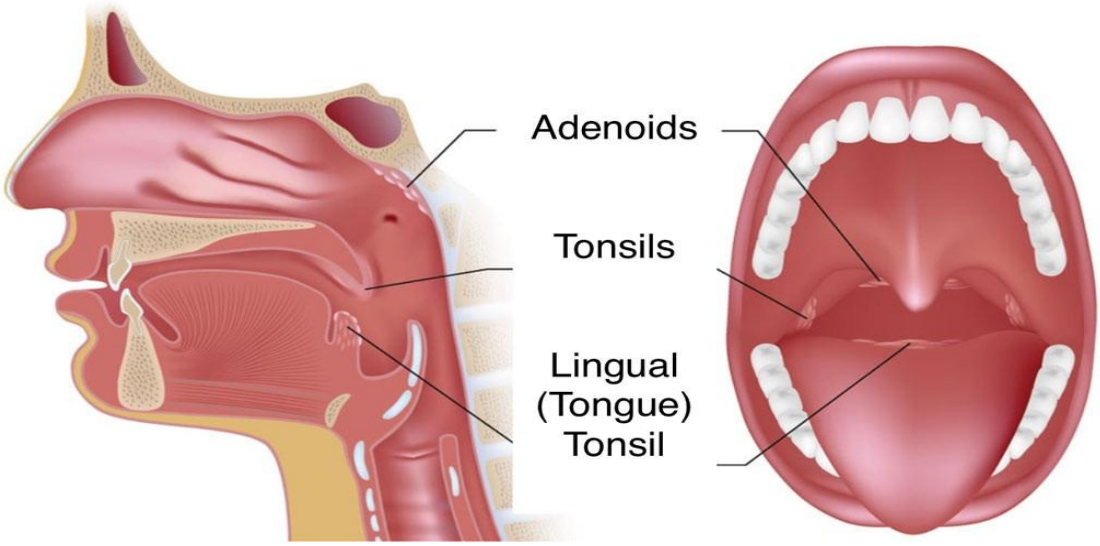

Figure 3: Showing Naso-Pharynx

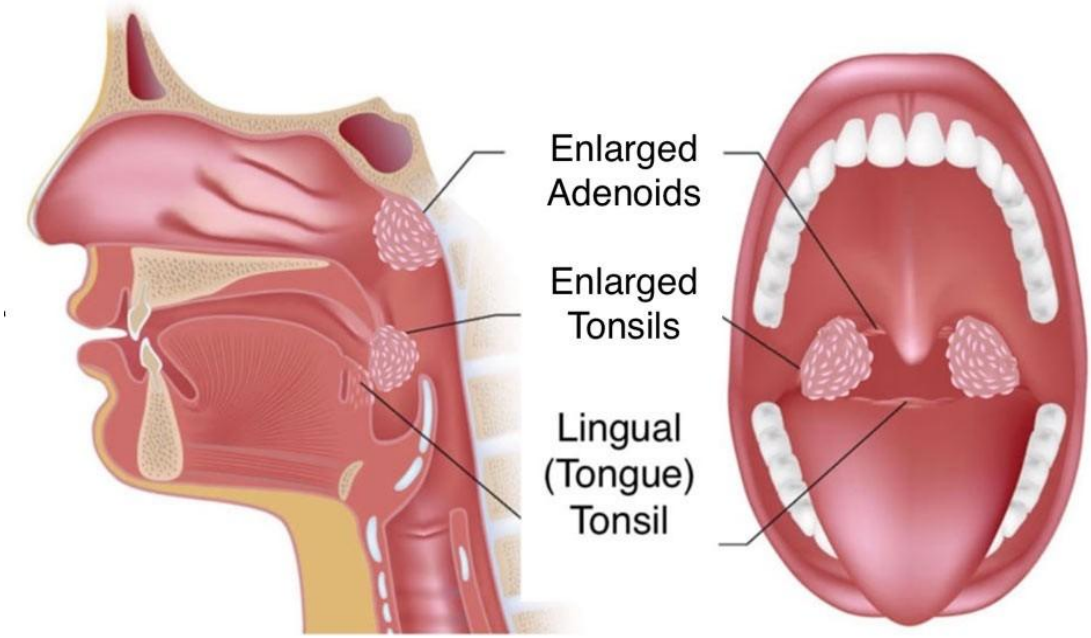

Figure 4: Naso-Pharynx Showing Enlarged Tonsils

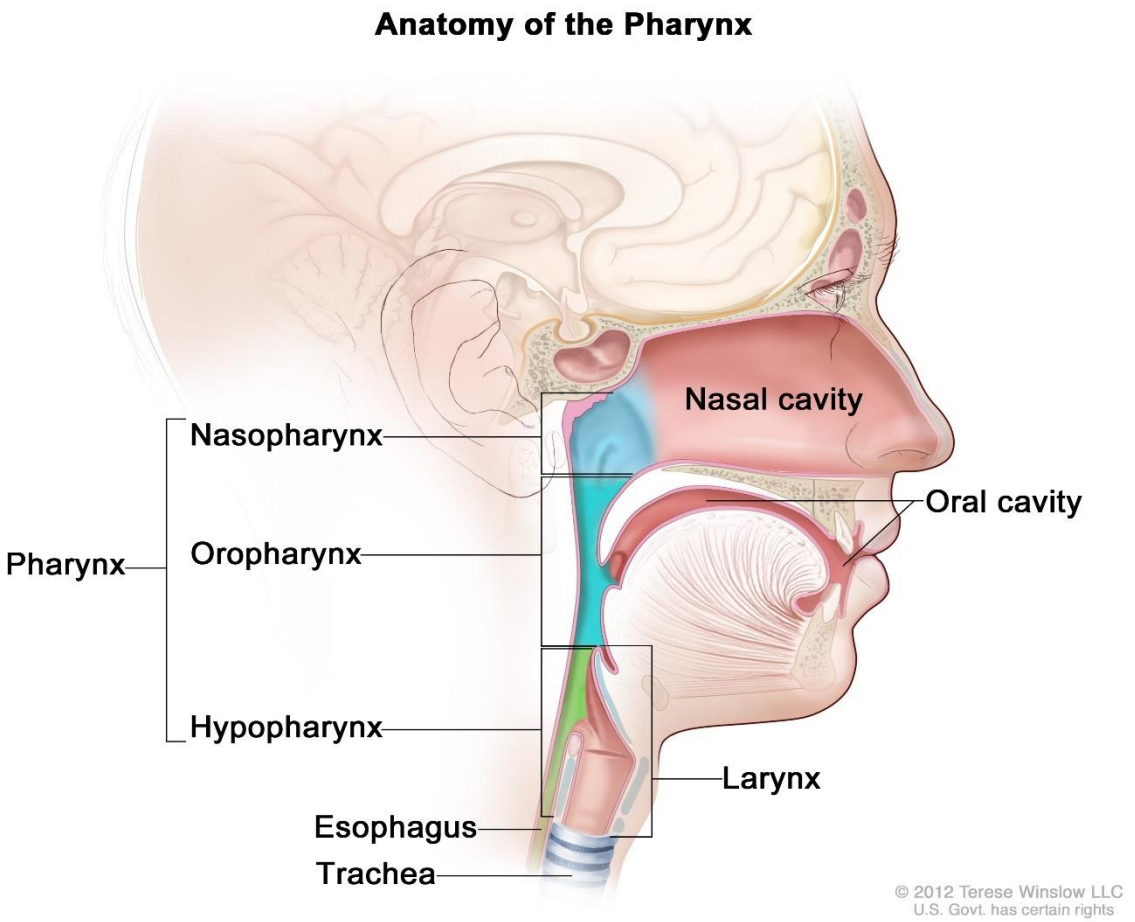

Figure 5: Anatomy of the Pharynx

The Health Library of the John Hopkins University tries to make a distinction between Pharyngitis and Tonsillitis. Accordingly: "Pharyngitis and Tonsillitis are infections that cause inflammation. If the tonsils are affected, it is called tonsillitis. If the throat is affected, it is called pharyngitis. If you have both, it's called Pharyngo-tonsillitis" (The John Hopkins University). The combination of these two ailments, subsumed under acute lower respiratory infections consists of one of the highest causes of mortality among children in Sub Sahara Africa (and by implication Ghana). The Global Data repository of the World Health Organization provides insights.

Table 1: Acute respiratory tract infections causes of deaths among children 0-59 months in Africa, Europe and the World 2003-2017

Year	Africa	Europe	World
2003	532356	19738	1276213
2008	476147	13567	1046325
2013	411000	10074	812823
2017	354974	7419	653444

Source: WHO, 2016

Table 1 above depicts the prevalence of the disease as a high percentage of acute respiratory infections in the world, further compared to the small percentage in Europe. In 2003, Africa alone accounted for 41.71% (532356) of all reported deaths from acute respiratory infections among children aged 0-59 months. The European region on the other hand accounted for just 1.54% (19738) of reported cases. The trend continues with Africa accounting for the highest number of deaths resulting from acute respiratory infections in 2008 (41.7%), 2013 (50.6%) and 2017 (54.3%). Although the figures represent a decrease in the number of deaths in Africa, as is the case worldwide, the highest number of deaths in Africa affirms the reasons attributed to the propagation of the disease.

Research shows that acute PT infections are 80-90% of viral origin, whereas 10 to 20 % are attributed to bacterial infections (Kunda et al. 2015; Mazur, 2010). Meanwhile, several studies in Ghana and elsewhere suggests that clinicians subscribe mainly to antibiotics as the main mode of combatting acute PT infections, despite the fact that antibiotics have no correlation with viral infections which make up a majority (up to 90%) of acute PT infections (WHO, 2018; Essack et al. 2017; Prah et al 2017; London School of Hygiene and Tropical Medicine, 2017).

The disease is spread mainly via respiratory secretions in environments which are overcrowded such as schools and day care centres (Moloi, 2015; Morais et al. 2012). Further, overcrowded social spaces such as schools indicates certain level of poor living conditions, and considering that poverty is prevalent in Africa (Donkin 20198; Worku, 2015). Additionally, spread of illness among siblings and other family members is a frequent occurrence and family illness is an important detail to elicit in the history as it serves as good guidance to understand the underpinnings of social determinants of health in acute respiratory infections such as acute PT which is shown in Table 1 above.

2.3 Approaches to combating Acute Phayngo-tonsilitis

The Anderson's behavioural model of health service use is used to describe the factors that lead up to clinicians' prescription of antibiotics for acute PT among children. The section proceeds according to the stratification outlined earlier in the conceptual framework in section 2.2: A discussion on the dependent variable which is antibiotic prescription versus resistance, followed by the independent variables that is factors from the supply side of health service and demand side, patient and surrounding socio-economic conditions that influence antibiotic prescription.

2.3.1 Antibiotic prescription versus resistance

The WHO (2019) defines Antimicrobial resistance (AMR) as "the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarial) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others". Antibiotics on the other hand are antimicrobials that are used in the prevention and treatment of bacterial infection (WHO, 2018; European Centre for Disease Prevention and Control, 2014).

Although antibiotics have contributed greatly to health care since the early 1940's (Prah et al. 2014), unethical practices, misguided antibiotic prescriptions by clinicians, and overuse and misuse have rendered many pathogens resistant to antibiotic treatment of bacterial infections (WHO, 2018). An example of such abuse is the over prescription of antibiotics for acute PT infections although such infections are mainly viral in origin. It is now established that globally, antibiotic prescriptions by clinicians in relation to respiratory tract infections form the highest trend, and bacterial infections associated with acute PT such as Group B Streptococcus forms major part of this constituency (Llor & Bjerrum, 2014).

Against this background, the World Health Organization (WHO) in its most recent factsheet on AMR recognizes AMR as the greatest threat to primary care (WHO, 2018). The WHO in response has initiated a global plan of action on antimicrobial resistance, including antibiotic resistance, endorsed at the World Health Assembly in May 2015. The global action plan aims to:

- To improve awareness and understanding of antimicrobial resistance.
- To strengthen surveillance and research.
- To reduce the incidence of infection.
- To optimize the use of antimicrobial medicines.
- To ensure sustainable investment in countering antimicrobial resistance (WHO, 2018).

Systematic reviews conducted on AMR in the WHO African region suggests lack of comprehensive policy, lack of AMR surveillance strategy, and a weak laboratory capacity on

AMR testing as the major challenges to combatting AMR (Essack et al. 2016; Ndihokubwayo et al. WHO).

In Ghana, the Ministry of Health developed an action plan with strategies aimed at raising public health awareness on the dangers of AMR. An essential drugs list in 2004 and 2010 coupled with suggestions for the need of evidence-based prescriptions of antibiotics in relation to communicable diseases such as Pharyngo-tonsillitis (Ministry of Health, 2010, 2004), however evidence such as studies from a cross sectional study in a Teaching Hospital in Cape Coast, Ghana suggests an over-prescription of antibiotics against standard policy guidelines (Prah et al. 2017). This goes to confirm findings at the regional level in Africa of poor surveillance strategy and lack of comprehensive policy.

Antibiotic over prescription in relation to acute PT is therefore a challenge in Ghana. Other research in Ghana shows bacterial resistant strains (Edoh & Alomatu 2008; Ohene, 1997; Newman, 1996; Newman, 1990), thereby suggesting an examination of factors that underpin clinician's prescriptions of antibiotics for acute PT infections.

2.4 Prevalence of antibiotic prescription for Viral Infections

Nearly half of physician visits for viral RTI condition resulted in prescription of antibiotics (Kozyrskyj et. al, 2004). Nadeem, Begum, Smith. Little and Windemuller (2010) conducted a retrospective case review study in randomly selected 1200 child care visits. Overall, the antibiotic prescription rate was 30% (Nadeem, Begum, Smith, Little & Windemuller, 2010). In another study, Antibiotics were prescribed during 21% of paediatric ambulatory visits; 50% were broad-spectrum, most commonly macrolides (Hersh, Shapiro, Pavia & Shah, 2011). Respiratory conditions accounted for 70% of visits in which both antibiotics and broad-spectrum antibiotics were prescribed. Twenty-three percent of the visits in which

antibiotics were prescribed for respiratory conditions for which antibiotics are not clearly indicated (Hersh, Shapiro, Pavia & Shah, 2011).

2.5 Factors that affect antibiotic prescription in Ghana

The Anderson's Behavioural of Health Service Use is used to examine the factors that inform clinician's prescription of antibiotics for children from the demand and supply side.

2.5.1 Demand side factors

2.5.1.1 Age

A number of studies suggested that older people had higher odds/risk of antibiotics prescription than younger people (Ladd, 2005; Cadieux, Tamblyn, Dauphinee, Libman, 2007; Cadieux, Abrahamowicz, Dauphinee, Tamblyn, 2011). However, others have suggested that younger people had higher odds of antibiotics prescription (Moro, Marchi, Gagliotti, Di Mario, Resi, et al., 2009; Akkerman, Kuyvenhoven, van der Wouden, Verheij, 2005).

2.5.1.2 Sex

Sex of a child has been assessed in a number of studies to have significant association with antibiotics prescription (Blondel-Hill, Fryters. 2012, Hersh, Jackson, & Hicks, 2013; Kenealy & Arroll, 2014; Moher, Liberati & Tetzlaff, 2009). In one study, a statistically significant association between male sex and higher odds of antibiotic prescription was found (Greer, Intralawan, Mukaka, et al., 2018)

2.5.1.3 Temperature

Fever in children has been stated as a reason for prescribing antibiotics for children. Aspinall (2009) reported that the odds of antibiotic prescription were 2.5 times as high per a unit (^{o}C)

increase in temperature. Finding of fever in children was also reported by Ahmed (2010) to significantly increase the odds of antibiotic prescription by 50%. In a study conducted by Elshout et al. (2012) on 443 children which recorded 36.3% prescription of antibiotics, a significant reduction in odds of antibiotic prescription was found for temperature. Temperature has long been known to affect bacterial growth in-vitro as well as modulate transfer of genomic material, including genes encoding (or conferring) antibiotic resistance (MacFadden, McGough, Fisman, Santillana, & Brownstein, 2018). Temperature >37.5°C was also reported to have significant association prescription of antibiotics (Greer, Intralawan, Mukaka et al., 2018)

2.5.1.4 Payment Methods

Private insurance was stated as a factor independently associated with broad-spectrum antibiotic prescribing included respiratory conditions for which antibiotics are not indicated (Hersh, Shapiro, Pavia & Shah, 2011). Individuals with public or no insurance were less likely than those with private insurance to receive a broad-spectrum antibiotic.

2.5.1.5 Crowding (Number in Class at School/ Family size)

Literature indicates that acute PT is a communicable disease and it is propagated in crowded spaces (WHO, 2019; WHO, 2018; Moloi, 2015). Arguably crowded spaces are a manifestation of poor living conditions such as crowded accommodation and crowded schools. These factors account for the high incidence of acute PT infections among children in Sub Saharan Africa and by implication Ghana. Although individual variables such as age play a huge role in the spread of the disease (Brook, 2008), poor living conditions account for a high incidence of the disease among children.

2.5.1.6 Educational Level

There is a well-established link between the literacy levels of mothers and the health of children (Watson, 2016; Green 2009). Correlatively, the higher the educational or literacy level of a mother, the higher the ability of the mother to identify symptoms associated with acute PT and take appropriate measures to remedy the disease before reporting to the hospital. It is also important to note that early identifications and treatment of acute PT infections is paramount to good diagnosis (WHO, 2018; Ministry of Health, 2017). The orientation of parents, especially mothers therefore plays a very important role in determining good treatment for acute PT. In sum, socio-economic factors such as poor living conditions and the literacy or educational level of parents are important factors in combatting acute PT infections among children.

2.5.1.7 Knowledge of Respiratory Tract Infection and Antibiotics

A study revealed that 83.9% of mothers had satisfactory level of knowledge regarding Acute Respiratory Infections (Gyawali, Pahari, Maharjan, & Khadka, 2016). It was concluded that mothers are the main caregivers of children and are usually in close contact them, hence any deviation in their health status are noticed by these knowledgeable mothers (Gyawali, Pahari, Maharjan, & Khadka, 2016)

A cross-sectional study conducted to assess knowledge and practices regarding use of antibiotics for paediatric infections among children in Trinidad and Tobago reported 60% as having high knowledge (Parimi, Pereira, & Prabhakar, 2004). It was also found in that study that caregivers with high knowledge were less likely to demand antibiotics or keep them at home. Caregivers with low antibiotic knowledge had wrong beliefs and do not appropriately use antibiotics (Parimi, Pereira, & Prabhakar, 2004)..

Knowledge about Respiratory tract infections may enhance patient-doctor communication with regards to antibiotics prescription. In a mixed method study conducted by Cabral *et al* (2019) on "*Understanding the influence of parent clinician communication on antibiotic prescribing for children with respiratory tract infections in primary care*", Parents communication indicated that they do not usually expect antibiotics, some clearly suggestive of a possible viral diagnosis. Clinicians often gave, or implied a viral diagnosis and mainly recommended non-antibiotic treatment strategies. In a few cases where parents' communication behaviours showed that they wanted antibiotic treatment, antibiotics were not usually prescribed (Cabral *et. al.*, 2019).

2.5.2 Supply side factors

A number of factors from the health service perspective inform clinicians' prescription of antibiotics for acute PT for children in Ghana. These factors include the orientation of clinicians and other external factors outside the purview and control of clinicians.

Laboratory investigation which is throat culture continues to be the gold standard for diagnosing acute PT of bacterial origin in children (Munck et al. 2018). The quality of the throat culture specimen is dependent on collection and inoculation. However, as already indicated, laboratory infrastructure remains a huge challenge in many African member states (Essack et al. 2017). This problem persists at the national level in Ghana with country reviews showing that clinicians are not compelled to request for culture of susceptibility tests because associated costs are not covered by health insurance (WHO, 2018; Newman et al. 2011). This then brings to question the payment methods associated with laboratory tests and acute PT.

The Ministry of Health (2010, 2004) developed standard treatment guidelines general drugs programme aimed at strengthening an essential medicines list. Evidence as presented by

Newman et al (2011) on the reluctance of clinicians to recommend laboratory tests due to associated costs puts to question the effectiveness of essential medicine list and adherence to standard treatment guidelines developed by the Ministry of Health in relation to diseases such as acute PT. The voluntary nature of laboratory tests associated with acute PT (Ministry of Health, 2004) is problematic in light of the overuse and misuse of antibiotics in the primary care system in Ghana.

Other factors such as symptoms presented, medications started at home by parents, history taking and physical examination require a comprehensive approach to thorough physical examination. Arguably, this cannot be attained in light of low human resource in health facilities as indicated through case studies on antibiotic resistance in six countries or fleeting encounters between clinicians and patients as indicated by other studies in Ghana (Prah et al. 2017).

By and large, limited laboratory infrastructure, costs associated with laboratory tests and drug prescription, low human resource and inadequate medical examination by clinicians prove to be some of the factors informing over prescription of antibiotics in relation to pharyngo-tonsillitis treatment in Ghana and elsewhere.

2.6 Conclusion

Discussions have shown the relevance of the Andersen's Behavioural Model of Health Service use in highlighting the public health concern of the irrational use of antibiotics and the factors that inform clinicians' subscription to antibiotics for acute PT infections. These factors are investigated using the research methods discussed in the next chapter in a children's hospital setting in Ghana.

CHAPTER THREE

METHODS

3.1 Study design

The study employed a descriptive cross-sectional study design to examine the clinician's practice of antibiotic for children with acute PT in a medical facility. A descriptive cross-sectional study to collect quantitative data from Parents /Caregivers. Quantitative data was collected on the socio-demographic information, environmental characteristics of the child, types of antibiotic prescribed, payment mode and caregivers' practices and knowledge of acute PT and ATB.

3.2 Study Setting

The study was conducted at the Princess Marie Louis Hospital. Princess Marie Louis Hospital is a Ghana Health Service Children's Healthcare Institution located in Accra within the Ashiedu Keteke Sub Metro of the Greater Accra Region. It is an 82-bed facility that provides healthcare services to about 73,000 infants and children in the Accra Metropolis and beyond annually. It provides both primary and secondary care for pediatric patients under the age of 18 years, in accordance with the definition of a child in the Children's ACT Ghana, 1998. Thus; parents can bring their children to the hospital with or without a referral at any time. Referrals are also received from health centers, private clinics, government polyclinics and hospitals located in and around Accra. The hospital has a total of 273 staff with 6 permanent doctors and 147 nurses. The medical services of PML consist of an Out-patient Department (OPD), Emergency ward, Laboratory unit/Blood Bank, Pharmacy, Radiology Unit, Dietetics and Environmental Health Unit, Disease Control Unit, Family Planning and Reproductive and Child Health (RCH).

3.3 Study Population

The study population included children between the ages of 1 year to 10 years and their caregivers who visited the out-patient department (OPD) of the Princess Marie Louis Hospital and were managed for acute pharyngo-tonsillitis.

3.3.1 Inclusion criteria

All children from the age of 1 to 10 years who visited the Out- Patient Department of the Princess Marie Louis Hospital with acute Pharyngo-tonsillitis during the period.

3.3.2 Exclusion criteria

- All Chronic Respiratory Tract Infections
- Those who did not have the caregivers present.

3.4 Study variables

This section presents the variables, their definitions and scale of measurement in the study.

3.4.1 Dependent variable

Prescription pattern of antibiotics by clinicians for acute pharyngo-tonsillitis

3.4.2 Independent variables

The independent variables include the;

- Socio-demographic characteristics
- Environmental characteristics of the child
- Types of antibiotics prescribed

- Payment Mode -Access to healthcare

- Caregivers practices and knowledge of acute PT and ATB

Table 2: Variable Table

Variable	**Operational Definition**	**Scale of Measurement**
Child's age	The child's age in completed years	discrete
Child's sex	Male or female	nominal
Educational level of parent	Highest educational level attained No formal education Primary Secondary Tertiary	ordinal
Employment status of parent	Whether or not parent is employed Employed Unemployed	nominal
Parental knowledge of PT	Adequate or inadequate knowledge on acute pharyngo-tonsilitis	Ordinal
Parental knowledge of ATB resistance	Adequate or inadequate knowledge on antibiotics resistance	Ordinal
Payment methods	Mode of payment for hospital services for acute pharyngo-tonsilitis (NHIS or Out of pocket)	nominal
Mode of diagnosis	Clinical or laboratory diagnosis of acute pharyngo-tonsilitis	nominal

3.5 Sampling and sample size calculation

3.5.1 Sample Size

The sample size (n) was calculated using the formula

$$n = \frac{Z^2pq}{e^2}$$

Where n is the minimum sample size

Z is the standard deviation set at 1.96 corresponding to 95% confidence interval

p is the prevalence of antibiotic prescription among children in Europe set at 46% (Di Martino M, et al, 2014)

q = 1 – p

e is the margin of error or degree of accuracy is 5%

Therefore:

Where Z= 1.96,

e=0.05, (5%)

p= 0.46 and q= 1-p= 0.54

$$= \frac{(1.96)^2*0.46*0.54}{(0.05)^2}$$
$$=\frac{3.8412*0.2484}{0.0025}$$
$$=381.7$$

n=382

Adding 10% for non-response and incomplete data a sample size of 422 was obtained.

3.5.2 Sampling Method and Procedure

A consecutive sampling method was employed where participants were recruited at the OPD after they had been diagnosed of acute PT from the estimated 300 daily cases presented at OPD between 8am-5pm. Caregivers of children who were diagnosed with acute PT were approached with information sheets regarding participation in the study.This selection was done over a two-week period. Parents/Guardians of children who consented to take part in the study were administered questionnaires by the research assistant after the background, nature, intentions and relevance of the study was explained.

3.6 Data collection methods and tools

3.6.1 Data collection tools

A structured questionnaire with closed ended questions was used to collect quantitative data from participants in the descriptive survey. The structured questionnaire for quantitative data collection elicited responses on the child's age, child's sex, employment status of parent, educational level of parent, parental knowledge of acute PT, parental knowledge of ATB resistance, payment methods and mode of diagnosis. The questionnaire also collected data on antibiotic prescription for acute PT (number of ATB prescribed, the type, dose, dosage and total number of days for treatment).

3.6.2 Data collection procedure

Data was collected by one trained research assistant and three field investigators and the principal investigator. Face to face interviews were conducted in the local language of the community or in a language convenient to the participant. Data collection started from 8am

and ended at 5pm from Mondays to Fridays for two weeks. On each day participants were recruited at the OPD after they had been diagnosed of acute PT. Caregivers of children who were diagnosed with acute PT were approached with information sheets regarding participation in the study. Clinicians in consulting rooms alerted the principal investigator or research assistant about the case of acute PT post-diagnosis. Only parents who granted informed consent were recruited into the study. Questionnaires were administered after consent. Information on diagnosis and antibiotics prescribed were confirmed from folders of patients.

3.7 Quality control

The research assistants were recruited based on their experience in hospital setting, names of medicines and medical diagnosis. They were trained for two days on the use of the data collection tools, ethical considerations, questionnaire administration and extraction of information.

3.8 Pilot testing of Questionnaire

The questionnaires were pretested on thirty participants at the pediatric unit of the Missions Hospital at Bubuashie. The pretest helped to identify whether there was the need to modify the questions or to add more. It also helped to test for the appropriateness of the study tool for the study

3.9 Data Processing and Analysis

Quantitative data was coded and entered into Microsoft Excel and the data was imported from Excel to STATA version 15 which was used for all the statistical analysis.

Collected data were coded and entered into excel and subsequently exported into STATA (version 15.0) software for statistical analysis. Frequency distribution was done to compute proportions on demographic variables. Mean age and standard deviation were computed. Tests of significance on factors influencing the antibiotics prescription for acute PT were done using Chi Square, with statistical significance set at p-values ≤ 0.05 at 95% confidence interval. Multiple logistic regression analysis was used to assess the strength of association between antibiotic prescription for acute PT and each independent variable. This was done by first running a bivariate analysis on all independent variables and antibiotic prescriptions for acute PT. Independent variables with p-values ≤ 0.05 in bivariate analysis were fitted in the final multiple logistic regression model to assess the strength of association looking at Adjusted Odds Ratio (AOR) with 95% confidence interval (CI).

3.10 Ethical Considerations

Ethical Clearance

The proposal for this study was reviewed and approved by the Ethics Review Committee of the Ghana Health Service with approval number GHS-ERC 055/03/19 and permission was sought from the Medical Superintendent of the Princess Marie Louise hospital before commencement of the study.

Informed Consent

Participation in the study was based on willingness of the respondents as no one was coerced into participating in the study. Informed consents were obtained from participants before interviews were conducted. Parents/Caregivers gave consent on behalf of their wards.

Privacy and confidentiality

Information collected were treated as confidential and the identities of the respondents were not disclosed during analysis or writing of the report.

The study materials (questionnaires and inform consent forms) were labeled with unique identification numbers for each study participant.

All information obtained were kept in locked files by the principal investigator

Risks and Benefits

The objectives, potential risks and benefits of the study were explained to the participants in the language they understood. All questions were addressed appropriately after which parents/guardians signed the consent form as an indication of their acceptance to take part in the study.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of respondents

In all, 418 questionnaires were fully completed from 422 gathered resulting in a response rate of 98%. Socio-demographic characteristics of study respondents is shown in table 3. The mean age of children was 2.7 years ± 1.6 SD. Majority of the children of which 295 out of 418 was females (70.6%). Almost 214 of the children attended private schools (64.6%). Most of the children in school were in Kindergarten or Crèche (43.2%). About 246 children were fully immunized representing more than half (58.9%) with 172 children partially or not immunized (41.1%). The mean weight of the children was 15.5kg ± 7.5SD. The average temperature of the respondents was 37.1 ºC ± 0.8SD. Also, the mean number of children in a class was 26.5 ± 6.3SD. The mean age of caregivers was 27.3 years ± 4.9SD. Nearly 39% of caregivers had up to senior high school/vocational/technical education making approximately 162 of 418 respondents. More than half of the mothers/ respondents were traders making a total of 237 (56.7%). Only 58 children resided outside Accra (13.9%). Also, nearly 200 children (48%) lived in a compound house. The mean family size of respondents was 3.8 ± 1.1SD. Majority of respondents had an active NHIS status. However, nearly 237 of respondent (57%) paid for health services from out of pocket.

Table 3: Socio-demographic characteristics of respondents (n = 418)

Variables	Frequency	Percent (%)
Mean age in years (M ± SD)	2.7 ± 1.6	
Sex		
male	123	29.4
female	295	70.6
Child's school attended		
public	117	35.4
private	214	64.6
Child's class at school		
KG/Crèche	143	43.2
stage 1	75	22.7
stage 2	95	28.7
stage 3	15	4.5
stage 4	3	0.9
Birth order		
1	110	26.3
2	153	36.6
3	96	23.0
>4	59	14.1
Immunization status		
fully immunized	246	58.9
partially immunized	154	36.8
not immunized	18	4.3
Mean weight of children in kg (M ± SD)	15.5 ± 7.5	
Average temperature of children in ℃ (M ± SD)	37.1 ± 0.8	
Mean number of children in class (M ± SD)	26.5 ± 6.3	
Mean age of caregiver in years (M ± SD)	27.3 ± 4.9	
Caregiver's educational level		
no formal school	30	7.2
primary/junior high school	80	19.1
senior high school/vocational/technical	162	38.8

diploma/tertiary	146	34.9
Mother's occupation		
trader	237	56.7
vocational/professional	81	19.4
private employee	50	11.9
public employee	50	11.9
Residence		
Accra	360	86.1
outside Accra	58	13.9
Type of household		
compound house	200	47.9
self-contained	135	32.3
semi detached	31	7.4
others	52	12.4
Mean size of family (M ± SD)	3.8 ± 1.1	
NHIS status		
active	278	66.5
not active	87	20.8
don't have	53	12.7
Payment of health services		
NHIS	181	43.3
Out-of-pocket	237	56.7

4.2 Prevalence of antibiotics prescription for the treatment of acute PT

Out of the 418 respondents, 78% treated acute PT with prescribed antibiotics (p = 0.78; 95% CI = 0.74 – 0.82).

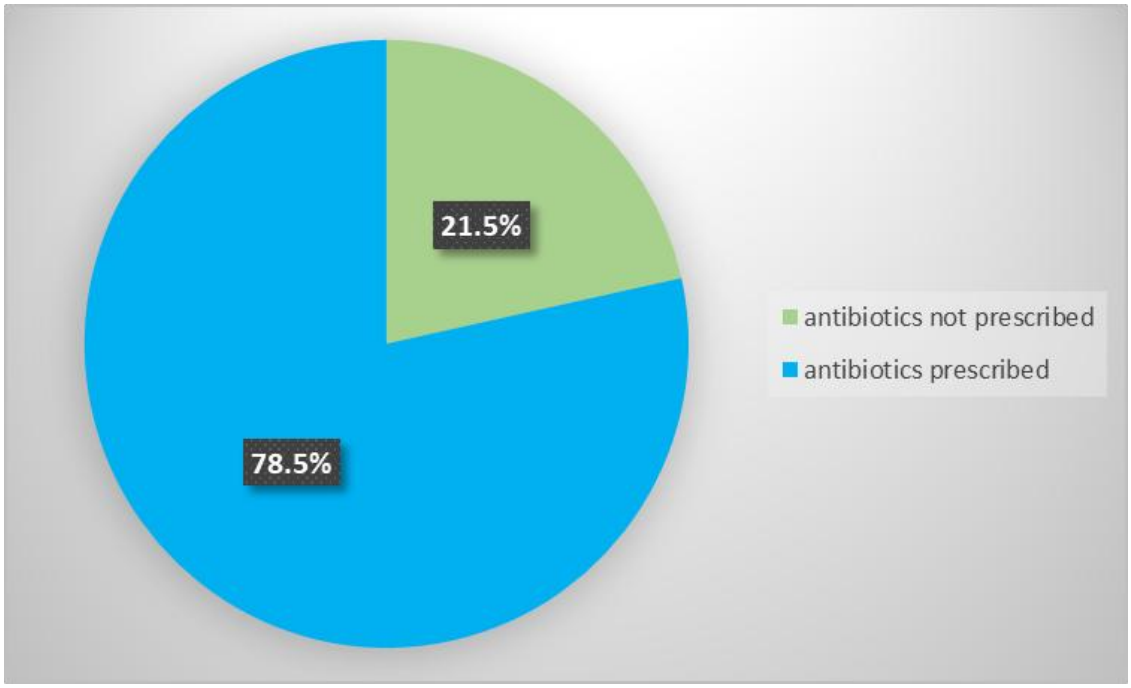

Figure 6: Proportion of acute PT treated with antibiotics

Table 4: Patterns of Antibiotics prescribed for the treatment of acute PT

Antibiotics Prescribed	**n (%)**
Penicillins	
Amoxicillin Suspension	279(66.8)
Amoxicillin+Clavulanic acid suspension	
Cephalosporins	
Cefuroxime Suspension	118(28.4)
Macrolides	
Azithromycin Suspension	21(4.8)
Erythromycin Suspension	

4.3 Socio-demographic characteristics (Demand factors) associated with antibiotics prescription

A one degree Celsius increase in temperature of a child with acute PT significantly increases the odds of antibiotic prescription by 82% (cOR = 1.82; 95% CI = 1.32 – 2.52; p = 0.00).

A unit increase in the number of persons in a family significantly increases the odds of antibiotic prescription by 37% (cOR = 1.37; 95% CI = 1.08 – 1.75; p = 0.011).

Table 5: Socio-demographic characteristics of respondents associated with antibiotics prescription

Variables	Antibiotics prescription		χ^2	cOR(95% CI)	p-value
	Prescribed (n=328)	Not prescribed (n=90)	p-value		
Mean age in years (M ± SD)	2.7 ± 1.7	2.4 ± 1.3		1.13(0.97 - 1.32)	0.13
Sex			0.69		
Male	95(77.2)	28(22.8)		1.00	
female	233(79.0)	62(21.0)		1.11(0.67 - 1.84)	0.69
Child's school attended			0.65		
Public	91(77.8)	26(22.2)		1.00	
private	171(76.9)	43(20.1)		1.14(0.66 - 1.97)	0.65
Child's class at school			0.27		
KG/Crèche	110(76.9)	33(23.1)		1.00	
stage 1	59(78.7)	16(21.3)		1.11(0.56 - 2.17)	0.77
stage 2	75(78.9)	20(21.1)		1.13(0.60 - 2.11)	0.71
stage 3	15(100.0)	0(0.0)		1	
stage 4	3(100.0)	0(0.0)		1	
Birth order			0.62		
1	88(80.0)	22(20.0)		1.00	
2	116(75.8)	37(24.2)		0.78(0.43 - 1.42)	0.42
3	79(82.3)	17(17.7)		1.16(0.58 - 2.34)	0.68
>4	45(76.3)	14(23.7)		0.80(0.38 - 1.72)	0.57
Immunization status			$^{+}$0.79		
fully immunized	195(79.3)	51(20.7)		1.00	
partially immunized	118(76.6)	36(23.4)		0.86(0.53 - 1.39)	0.53
not immunized	15(83.3)	3(16.7)		1.31(0.36 - 4.69)	0.68
Mean weight of children in kg (M ± SD)	15.8 ± 7.6	14.4 ± 6.8		1.03(0.99 - 1.06)	0.11
Average temperature of	37.2 ± 0.8	36.8 ± 0.7		**1.82(1.32 - 2.52)**	**0.00***

children in ^{o}C (M ± SD)					
Mean number of children in class (M ± SD)	26.7 ± 6.2	25.9 ± 7.1		1.02(0.98 - 1.06)	0.40
Mean age of caregiver in years (M ± SD)	27.3 ± 4.9	27.3 ± 4.9		1.003(0.96 - 1.05)	0.87
Caregiver's educational level			0.22		
no formal school	26(86.7)	4(13.3)		1.00	
primary/jhs	66(82.5)	14(17.5)		0.73(0.22 - 2.41)	0.60
shs/voc/tec	129(79.6)	33(20.4)		0.60(0.19 - 1.84)	0.37
diploma/tertiary	107(73.3)	39(26.7)		0.42(0.14 - 1.29)	0.13
Mother's occupation			0.51		
Trader	190(80.2)	47(19.8)		1.00	
vocational/professional	60(74.1)	21(25.9)		0.71(0.39 - 1.28)	0.25
private employee	37(74.0)	13(26.0)		0.70(0.35 - 1.43)	0.33
public employee	41(82.0)	9(18.0)		1.13(0.51 - 2.48)	0.77
Residence			0.87		
Accra	282(78.3)	78(21.7)		1.00	
outside Accra	46(79.3)	12(20.7)		1.06(0.54 - 2.09)	0.87
Type of household			0.64		
compound house	152(76.0)	48(24.0)		1.00	
self-contained	109(80.7)	26(19.3)		1.32(0.77 - 2.26)	0.31
semi detached	26(83.9)	5(16.1)		1.64(0.59 - 4.51)	0.34
Others	41(78.9)	11(21.1)		1.18(0.56 - 2.47)	0.67
Mean size of family (M ± SD)	3.9 ± 1.1	27.3 ± 0.9		**1.37(1.08 - 1.75)**	**0.011***
NHIS status			0.424		
Active	220(79.1)	58(20.9)		1.00	
not active	70(80.5)	17(19.5)		1.09(0.59 - 1.99)	0.79
don't have	38(71.7)	15(28.3)		0.67(0.34 - 1.29)	0.23
Payment of health services			0.47		
NHIS	139(76.8)	42(23.2)		1.00	
Out-of-pocket	189(79.8)	48(20.2)		1.19(0.74 - 1.90)	0.47

$^{+}$ (fisher's exact) *(statistically significant, p≤0.05)

4.4 Knowledge on ABT and PT associated with antibiotics prescription

The odds of antibiotics prescription for the treatment of acute PT among respondents who had no knowledge on respiratory infections was 2.53 times as high as compared to respondents who had some knowledge of respiratory infections (cOR = 2.53; 95% CI = 1.21 – 5.29; p = 0.013) (see table

Table 6: Knowledge on ABT and PT associated with antibiotics prescription

Variables	Antibiotics prescription		χ^2	cOR(95% CI)	p-value
	Prescribed (n=328)	not prescribed (n=90)	p-value		
Usage of antibiotic at home			0.83		
yes	200(78.1)	56(21.9)		1.00	
No	128(79.0)	34(21.0)		1.05(0.65 - 1.70)	0.83
Knowledge on respiratory infections			**0.011***		
yes	256(76.0)	81(24.0)		1.00	
No	72(88.9)	9(11.1)		**2.53(1.21 - 5.29)**	**0.013***
Knowledge on acute pharyngotonsillitis			0.51		
yes	195(77.4)	57(22.6)		1.00	
no	133(80.1)	33(19.9)		1.18(0.73 - 1.91)	0.51
Knowledge on antibiotics for treatment			0.42		
yes	170(76.9)	51(23.1)		1.00	
no	158(80.2)	39(19.8)		1.22(0.76 - 1.94)	0.42
Knowledge on antimicrobial resistance			0.08		
yes	201(81.4)	46(18.6)		1.00	
no	127(74.3)	44(25.7)		0.66(0.41 - 1.06)	0.08

[+] (fisher's exact) *(statistically significant, p≤0.05)

4.5 Clinical factors (Supply factors) associated with antibiotic prescription

None of the clinical factors showed statistically significant association with antibiotics prescription.

Table 7: Clinical factors (supply factors) associated with antibiotic prescription

Variables	Antibiotics prescription		χ^2	cOR(95% CI)	p-value
	Prescribed (n=328)	Not prescribed (n=90)	p-value		
Time interval from onset of symptoms to reporting to the hospital			[+]0.43		
within a week	220(76.7)	67(23.3)		1.00	
two-three weeks	91(82.7)	19(17.3)		1.46(0.83 - 2.57)	0.19
one month	17(80.9)	4(19.1)		1.29(0.42 - 3.98)	0.65
Diagnosis mode			0.92		
clinical	294(78.4)	81(21.6)		1.00	
laboratory	34(79.1)	9(20.9)		1.04(0.48 - 2.26)	0.92
Specific condition diagnosed			0.66		
acute pharyngitis	29(76.3)	9(23.7)		1.00	
acute tonsillitis	145(80.6)	35(19.4)		1.29(0.56 - 2.96)	0.56
acute PT	154(77.0)	46(23.0)		1.04(0.46 - 2.35)	0.93
Severity of PT			0.59		
bilateral tonsillitis	140(78.7)	38(21.3)		1.00	
tonsillitis with exudate	108(76.1)	34(23.9)		0.86(0.51 - 1.46)	0.58
bronchopneumonia	80(81.6)	18(18.4)		1.21(0.65 - 2.25)	0.56
Prescribed antibiotic recommended by STG			0.41		
yes	297(77.9)	84(22.1)		1.00	
no	31(83.8)	6(16.2)		1.46(0.59 - 3.62)	0.41
Broad spectrum			0.93		
yes	206(78.3)	57(21.7)		1.00	
no	122(78.7)	33(21.3)		1.02(0.63 - 1.66)	0.93

[+] (fisher's exact) *(statistically significant, p≤0.05)

4.6 Results from multiple logistic regression of factors associated with antibiotics prescription

The results from multiple logistic regression of factors associated with antibiotics prescription are shown in table 8

A one degree Celsius increase in temperature of a child with acute PT significantly increases the odds of antibiotic prescription by 82% (cOR = 1.82; 95% CI = 1.32 – 2.52; p = 0.005). However, after adjusting for all other variables, a one degree Celsius increase in temperature of a child with acute PT significantly increases the odds of antibiotic prescription by 2-folds and this association was still found to be statistically significant (aOR = 2.04; 95% CI = 1.44 – 2.90; p = 0.005).

A unit increase in the number of persons in a family significantly increases the odds of antibiotic prescription by 37% (cOR = 1.37; 95% CI = 1.08 – 1.75; p = 0.011). This association was still found to be statistically significant after adjusting for all other variables with 41% increase odds of antibiotic prescription (aOR = 1.41; 95% CI = 1.09 – 1.83; p = 0.009).

The odds of antibiotics prescription for the treatment of acute PT among respondents who had no knowledge on respiratory infections was significantly 2.53 times as high as compared to respondents who had some knowledge of respiratory infections (cOR = 2.53; 95% CI = 1.21 – 5.29; p = 0.013). After adjusting for all other variables, the odds of antibiotics prescription for the treatment of acute PT among respondents who had no knowledge on respiratory infections was 2.59 times as high as compared to respondents who had some knowledge of respiratory infections. This association was still found to be statistically significant (aOR = 2.59; 95% CI = 1.20 – 5.59; p = 0.015).

Table 8: Multiple logistic regression of factors associated with antibiotics prescription

Variables	cOR(95% CI)	p-value	aOR(95% CI)	p-value
Mean age in years (M ± SD)	1.13(0.97 - 1.32)	0.13	0.95(0.53 - 1.69)	0.86
Mean weight of children in kg (M ± SD)	1.03(0.99 - 1.06)	0.11	1.04(0.92 - 1.17)	0.52
Average temperature of children in ^{o}C (M ± SD)	**1.82(1.32 - 2.52)**	**0.00***	**2.04(1.44 - 2.90)**	**0.00***
Caregiver's educational level				
no formal school	1.00			
primary/jhs	0.73(0.22 - 2.41)	0.60	0.98(0.27 - 3.52)	0.97
shs/voc/tec	0.60(0.19 - 1.84)	0.37	0.94(0.28 - 3.18)	0.92
diploma/tertiary	0.42(0.14 - 1.29)	0.13	0.52(0.16 - 1.72)	0.28
Mean size of family (M ± SD)	**1.37(1.08 - 1.75)**	**0.011***	**1.41(1.09 - 1.83)**	**0.009***
Time interval from onset of symptoms to reporting to the hospital				
within a week	1.00			
two-three weeks	1.46(0.83 - 2.57)	0.19	1.43(0.78 - 2.62)	0.24
one month	1.29(0.42 - 3.98)	0.65	0.78(0.23 - 2.59)	0.68
Knowledge on respiratory infections				
Yes	1.00			
No	**2.53(1.21 - 5.29)**	**0.013***	**2.59(1.20 - 5.59)**	**0.015***
Knowledge on antimicrobial resistance				
Yes	1.00			
No	0.66(0.41 - 1.06)	0.08	0.60(0.36 - 1.003)	0.05

*(statistically significant, p≤0.05)

CHAPTER FIVE

DISCUSSION

5.0 Discussion

In this study, it was found that the mean age of children who reported with acute PT was 2.7 years. Majority of the children were females. Most of the children attended private schools. More than half of the children were fully immunized. The mean weight of the children was 15.5kg. The average temperature of the children was 37.1°C. Also, the mean number of children in a class was 26.5. The mean age of caregivers was 27.3 years. Nearly 39% of caregivers had up to senior high school/vocational/technical education. More than half of the respondents were traders (56.7%). Majority of respondents resided in Accra. Also, nearly 48% of respondents lived in a compound house. The mean family size of respondents was 3.8 ± 1.1SD. Majority of respondents had an active NHIS status. However, nearly 57% paid for health services from out of pocket.

Prevalence of Antibiotic prescription for acute PT

In this study, 78% of prescriptions for the treatment of acute PT were antibiotics. This finding is significantly higher than antibiotic prescription prevalence in children of 46% reported in Europe by Di Martino, et al (2014).The findings of this study also differ from what was reported in Canada by Kozyrskyj et al (2004). Nearly half of physician visits for viral RTI condition resulted in prescription of antibiotic (Kozyrskyj et al 2004). Overall antibiotic prescription rate was 30%. In another study conducted by Hersh, Shapiro, Pavia and Shah (2011) in the United States, Antibiotics were prescribed during 21% of paediatric ambulatory visits; 50% were broad-spectrum, most commonly macrolides. Respiratory conditions accounted for 70% of visits in which both antibiotics and broad-spectrum antibiotics were

prescribed. Twenty-three percent of the visits in which antibiotics were prescribed were for respiratory conditions for which antibiotics are not clearly indicated (Hersh, Shapiro, Pavia & Shah, 2011). Meanwhile in another study, clinicians gave viral diagnosis and mainly recommended non-antibiotic treatment strategies. In a few cases where parents' communication behaviours showed that they wanted antibiotic treatment, antibiotics were not usually prescribed (Cabral *et. al.,* 2019). The contrast in the findings between this study and the low prevalence recorded could result from the difference in geographical context as well as differences in the health systems of Ghana and the USA. Laboratory infrastructure remains a huge challenge in many African member states (Essack et al. 2017). This problem persists at the national level in Ghana with country reviews showing that clinicians are not compelled to request for culture of susceptibility tests because associated costs are not covered by health insurance (WHO, 2018; Newman et al. 2011). However, the high prevalence of antibiotics prescribed for a respiratory condition like acute PT for which antibiotics are not clearly indicated gives a cause to worry. There is a need for clinicians/prescribers to minimize the use of antibiotics for the treatment of acute PT and take steps to perhaps advocate for supply of more antivirals for the treatment of acute PT.

Demand Factors associated with antibiotics prescription for treatment of Acute PT.

Most of the demand factors, age, sex, and child's school attended, child's class at school, birth order, immunization status, weight of children, number of children in class, caregiver's educational level, number of children in class, mother's occupation, and NHIS status, were not found to significantly predict the use of antibiotics for the treatment of acute PT. However, temperature of the child was found in this study to be a significant predictor of antibiotic prescription for treatment. It was found that a one degree Celsius increase in

temperature of a child with acute PT significantly increases the odds of antibiotic prescription for the treatment of acute PT. This finding agrees with what was reported by Aspinall (2009) that the odds of antibiotic prescription was 2.5 times as high per a unit (^{o}C) increase in temperature. Finding of fever in children in United Kingdom was also reported by Ahmed (2010) to significantly increase the odds of antibiotic prescription by 50%. However others studies have reported reduced odds of antibiotic prescription with increasing temperature. Elshout et al. (2012) conducted a study on 443 children which recorded 36.3% prescription of antibiotics, and found significant reduction in odds of antibiotic prescription for temperature. Perhaps, temperature has long been known to affect bacterial growth in-vitro as well as modulate transfer of genomic material, including genes encoding (or conferring) antibiotic resistance (MacFadden, McGough, Fisman, Santillana, & Brownstein, 2018). Temperature >37.5°C was also reported to have significant association prescription of antibiotics (Greer, Intralawan, Mukaka et al., 2018).

In this study, a unit increase in the number of persons in a family was found to significantly increase the odds of antibiotic prescription by 37%. Literature indicates acute PT as a communicable disease which is propagated in crowded spaces (WHO, 2019; WHO, 2018; Moloi, 2015). Arguably crowded spaces are a manifestation of poor living conditions such as crowded accommodation and crowded schools as is experienced by children in schools. These factors account for the high incidence of acute PT infections among children in Sub Saharan Africa and by implication Ghana (Brook, 2008). Poor living conditions account for a high incidence of the disease among children hence the possibility of increased antibiotic prescription for the treatment of increased cases. There is a need for large families with children to perhaps be trained on infection prevention practices and proper ventilation to curb

the spread of disease thereby reducing incidence of acute PT and antibiotic prescription for its treatment.

Another finding in this study is an association between knowledge of respiratory infection and antibiotics prescription for the treatment of acute PT. The odds of antibiotics prescription for the treatment of acute PT among respondents who had no knowledge on respiratory infections were higher as compared to respondents who had some knowledge of respiratory infections. Nearly 80% of the caregivers with no knowledge of acute respiratory infections had antibiotics prescribed for the treatment of acute PT. Perhaps if they were knowledgeable, they may question or probe to influence the prescription of the Clinician. Caregivers with high knowledge of antibiotics were less likely to demand antibiotics or keep them at home (Parimi, Pereira, & Prabhakar, 2004). Caregivers with low antibiotic knowledge have wrong beliefs and do not appropriately use antibiotics (Parimi, Pereira, & Prabhakar, 2004). Mothers are the main caregivers of children and are usually in close contact with them, hence any deviation in their health status of children is noticed by these knowledgeable mothers (Gyawali, Pahari, Maharjan, & Khadka, 2016).

5.1 Limitations of the Study

The study encountered some limitations, which have to be stated to enable future researchers to see how they could address them. Associations found in this study could not be deemed to be causal since the study was cross-sectional. The study was susceptible to response bias since factors such as environmental characteristic of the child (family size, type of household, birth order, school attended, class size, caregivers' educational level and occupation) and caregivers knowledge on acute PT and ABT were measured by self-reporting. These notwithstanding, the antibiotic prescription, temperature, weight, sex, immunization history

and other variables were measured by extracting data from folders and road-to-health charts of the child.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Nearly 79% of children with acute PT were treated with antibiotics at Princess Marie Louis Hospital in Accra, Ghana.

Temperature of the child, family size and No knowledge of respiratory tract infections significantly predicted the prescription of antibiotics for the treatment of acute PT among children at PML.

None of the supply factors, time interval from onset of symptoms to reporting to the hospital, diagnosis mode, specific condition diagnosed, severity of PT, prescribed antibiotic recommended by STG, and whether or not the antibiotic was broad spectrum, showed any significant association with antibiotic prescription for treating acute PT

6.2 Recommendations

- There should be a comprehensive policy by the Ministry of Health on Antimicrobial Resistance (AMR) that will guide clinicians in the rational use of antibiotics for treatment in healthcare institutions.
- The laboratory capacity should be strengthened by the Ministry of Health to liaise with clinicians in hospitals to investigate underlying cause of increased temperature of children before prescribing antibiotics for the treatment of acute pharyngo-tonsillitis.
- Families where children are many should take infection prevention practices during antenatal and child welfare visits in the hospital to reduce the incidence of infections.

- A developed action plan must be enforced by the Medical and Dental Council and the Ministry of Health with strategies aimed at raising public health awareness on the dangers of AMR.
- Strengthening of surveillance and research by the Public Health Unit will ensure sustainable investment in countering AMR.

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APPENDIX A: QUESTIONNAIRE

TOPIC: PATTERN OF ANTIBIOTIC PRESCRIPTION BY CLINICIANS FOR THE TREATMENT OF ACUTE PHARYNGO-TONSILLITIS AMONGST CHILDREN ATTENDING PRINCESS MARIE LOUISE CHILDREN HOSPITAL IN ACCRA

Dear respondent,

Thank you for your acceptance to participate in this study. Your contributions help towards the success of this research project. Your responses are purely for academic purposes. You are assured of confidentiality and anonymity.

Form Number…… Date……/……/….

SECTION A: DEMOGRAPHIC INFORMATION

(*Kindly check the appropriate that corresponds to your response. Select only one unless your told otherwise*)

No.	Variables	Responses	Code
1	Age of child (at last birthday)	…….. (1-10years)	Ag
2	Sex (child)	1. Male [] 2. Female []	sex
3	School Attended (child)	1. Public [] 2. Private	Sch_att
4	Class at school (child)	1. KG/Creche [] 2. Stage 1 [] 3. Stage 2 [] 4. Stage 3 [] 5. Stage 4 [] 6. Others, specify	Sch_stage

5	Birth order	1. 1 2. 2 3. 3 4. >4	B_Ord
6	Immunization status (PENTA- 3 as proxy)	1. Fully immunized [] 2. Partially immunized [] 3. Not immunized []	Immun
7	Child's Anthro data, ***(Kindly provide the value next to the variable)***	1. Weight ……. 2. Height …….. 3. Temp……	Weig Heigh
8	Number of children in Class (child)	……	Clas_num
9	Caregiver's age (In years)	……	Care_ag
10	Caregiver's educational level	1. No formal school [] 2. Primary/JHS [] 3. SHS/Voc/Tec [] 4. Diploma/Tertiary []	Care_edu
11	Mother's occupation	1. Trader [] 2. Vocational/ Professional [] 3. Private employee [] 4. Public Employee []	Mo_occp
12	Residence	1. Accra [] 2. Outside Accra []	resi
13	Type of household	1. Compound House [] 2. Self-Contained [] 3. Semi Detached [] 4. Others, please specify…….	Hous_typ
14	How many are you in your family?	……	f_size
15	NHIS status	1. Active [] 2. Not Active [] 3. Don't have at all []	Sta_nhis

16	Payment of health services	1. NHIS [] 2. Out-of-pocket [] 3. 3. Others, specify…….	Pay_healt

Section B: Antibiotic prescription

(*Please check the appropriate box. Provide answer where options are not given*)

No.	Items	Responses	Code
1	Time interval from onset of symptoms to reporting to the hospital	1. Within a week [] 2. Two-Three weeks [] 3. One month [] 4. More than one []	Tim_interv
3.	Diagnosis Mode	1. Clinical 2. Laboratory []	Disg_mod
4.	Diagnosis procedure	1. Swab [] 2. culture tests []	Disg_pro
5.	Specific condition diagnosed	1. Acute pharyngitis [] 2. Acute tonsillitis [] 3. Acute PT []	Con_diag
3.	Severity of PT	1. Bilateral tonsillitis [] 2. Tonsillitis with exudate [] 3. Bronchopneumonia [] 4. Others, specify……..	Sevri
4.	Number of antibiotics prescribed	……..	Num_anti
5	Names of antibiotics prescribed (***check as many as apply***)	**Penicillins** Amoxicillin Suspension [] Amoxicillin+Clavulanic acid Suspension [] Flucloxacillin Suspension [] **Cephalosporins**	Nam_anti

		Cefuroxime Suspension [] **Macrolides** Azithromycin Suspension [] Erythromycin Suspension []	
6	Prescribed antibiotic recommended by STG	1. Yes [] 2. No []	Anti_reco
7	Broad Spectrum	1. Yes [] 2. No []	Broa_spec
8	Antibiotic available on first day of visit	1. Yes [] 2. No []	Anti_avai
9	Dosage form	1. Oral [] 2. IV []	Dosa_frm
10	Dose prescribed	1. Once a day [] 2. Two times a day [] 3. Three times a day []	Dos_presc
11	Frequency of administration per day	1. Once [] 2. Twice [] 3. Three [] 4. Others, specify….	Freg_adm
12	Total number of days on treatment	1. 1-3 days [] 2. 4-7 days [] 3. Two weeks [] 4. Others, please specify……..	Tot_days

Section C: Caregivers Knowledge on ABT and PT

No.	Items	Responses	Code
1	Did your use antibiotic at home before reporting to hospital?	1. Yes [] 2. No []	Antib_hom
2	If yes in above, how long was it used before reporting to hospital?	1. 1 week [] 2. 2 weeks [] 3. 3 weeks [] Others, specify…	Howlon_hom
3	Do you know about respiratory infections	1. Yes [] 2. No []	Kno_resp
4	Have your heard about Acute Pharyngotonsillitis	1. Yes [] 2. No []	Hea_APT
5	If yes in 4 above, where did you hear about?	1. Health facility [] 2. From friends/family [] 3. TV/Radio [] 4. Church/Community [] 5. Others, please specify…….	Hear_wher4
6	Do you know about antibiotics for treatment?	1. Yes [] 2. No []	Kno_antib
7	If yes, where did you hear about it?	1. Health facility [] 2. From friends/family [] 3. TV/Radio [] 4. Church/Community [] Others, please specify…….	Wher_antib
8	Do you know about antimicrobial resistance?	1. Yes [] 2. No []	Resis_anti

Thank you for your time

APPENDIX B: PARTICIANTS INFORMATION SHEET (CAREGIVER/MOTHER)

STUDY TITLE: PATTERN OF ANTIBIOTIC PRESCRIPTION BY CLINICIANS FOR THE TREATMENT OF ACUTE PHARYNGO-TONSILLITIS AMONGST CHILDREN ATTENDING PRINCESS MARIE LOUISE CHILDREN HOSPITAL IN ACCRA

Introduction:

I am Georgina Quaye, a post- graduate student of the University Of Ghana, School Of Public Health, Legon. I am conducting a study on the above topic as partial fulfillment of my Master's in Public Health program.

Background and Purpose of study:

Antibiotics are the most prescribed drugs in children with respiratory infections, and it is important to ensure that children are given antibiotics when needed and if possible, with evidence of bacterial infection. Antimicrobial resistance has been identified to result from irrational use of these medicines. This study is aimed at improving the use of antibiotics and preventing inappropriate prescription of antibiotics in children with acute pharyngo-tonsillitis.

Nature of research:

This study aims to assess the underlying factors that inform trends in clinicians' prescription of antibiotics for the treatment of pharyngo-tonsillitis to school children aged 1 to 10 years, visiting the Children's hospital in Accra, Ghana. Geographically the study will be delimited to Princess Marie Louis Children's Hospital. Contextually, the study will focus on 240 children diagnosed with Pharyngo-tonsillitis. You have been asked to take part in this study because your child is between 1 to 10 years and has been diagnosed with pharyngo-tonsillitis.

Participant Involvement:

Information will be taken from caregivers/mothers with children between ages 1-10 years seen by clinicians at the out-patient department and are diagnosed of acute pharyngo-tonsillitis. As well as all clinicians who attended the children. If you agree to be part of the study, a trained project staff, will ask you to fill a questionnaire alone or with assistance for approximately 15 - 20 minutes. The study will involve taking of clinical information of the children and answering questions on socio-demographic factors, and knowledge of pharyngo-tonsillitis and antibiotics. Duration for the study is two weeks. The information you provide will add to knowledge about the pattern of antibiotic prescription for the treatment of acute pharyngo-tonsillitis among children

Benefits:

There is no direct benefit to you for being in the study; however, findings from this study may lead to better understanding of antibiotic prescription pattern among children 1-10 years and this will inform policies that will support the fight against antimicrobial resistance due to the misuse of antibiotics.

Risk:

In participating in this study, I will be asking you to share some personal views and experiences concerning respiratory diseases and your self-care practices with me and you may feel uncomfortable talking about some of the topics. You do not have to answer every question or take part in the research if you don't wish to do so. I anticipate minimal or no risk to you.

Confidentiality

All data will be anonymous and will be kept private. Your identifiable data such as name or date of birth will not be used in documents, reports, or publications related to this research.

The information you are going to provide will be coded and when typing your survey responses into the computer, all data will be entered without any information that will make it possible for your identity to be known. The information you provide will be kept strictly confidential. Apart from the researcher and supervisor of this research, no one else will have access to information provided whether in part or whole. Your responses will not be shown to other participants. Data collected will be stored under lock and key then destroyed after a minimum of three years as per research protocol. However, clearance will be sought from the Ethics Review Board before any future use of stored samples can be used.

Voluntariness and Withdrawal

Your participation in this study is completely voluntary. You are free to answer part or the entire questionnaire. You can choose to withdraw from the study or stop the interview at any time you want. You can also choose not to answer any question(s) you find uncomfortable about. No one will be coerced to obtain response from participants, and you are at liberty to withdraw from the study at any time and it will not affect you in any way. Taking part in the study would not affect the quality of care you receive in any way.

Cost

It will not cost you any money to be in this study and there will be no financial loss to you for partaking in this study

Compensation:

There will be no monetary gifts for participating in this study**.**

Provision of Information sheet and Consent Forms:

A copy of the information sheet and consent forms will be given to you after it has been signed or thumb-printed to take home

Contacts

If you have any question(s) or further clarification concerning this study, conduct of this study, your welfare or your rights as a research participant or if you wish to ask questions, or need further explanations later, please do not hesitate to contact the following;

1. Dr. Georgina Quaye (Principal Investigation)

   Tel:0576522560

   Email: meetdoctorquaye@gmail.com

   or

2. Dr Bismark Sarfo (Supervisor)

   Tel:0269343169

   Email: sbismark@yahoo.com

If you have any concerns or need clarifications regarding ethical issues, please contact

Madam Hannah Frimpong (Administrator)

Ghana Health Service, Ethical Review Committee Secretariat, Accra

Tel: 0507041223

CONSENT FORM (CAREGIVER/MOTHER)

PATTERN OF ANTIBIOTIC PRESCRIPTION BY CLINICIANS FOR THE TREATMENT OF ACUTE PHARYNGO-TONSILLITIS AMONGST CHILDREN ATTENDING PRINCESS MARIE LOUISE CHILDREN HOSPITAL IN ACCRA

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (English [] , Twi [], Ga [], Ewe []). I fully understand the contents and any potential implications as well as my right to change my mind (that is withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant…… ID Code ……..

Participants' Signature ……OR Thumb Print……OR Mark (Please specify) ……

Date:…….

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (Twi [], Ga [], Ewe []) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter……..

Date:……

Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language, he/she understood (Twi [], Ga [], Ewe [])

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:……

Signature……. OR Thumb Print ……..... OR Mark (please specify)……..

Date:……

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name…….

Signature …….

Date…….

ETHICAL CLEARANCE

case of reply the
umber and date of this
etter should be quoted.

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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yRef. GHS/RDD/ERC/Admin/App/19/234
our Ref. No.

20th June, 2019

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chool of Public Health
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GHS-ERC Number	**GHS-ERC 055/03/19**
Project Title	Pattern of Antibiotic Prescription by Clinicians for the Treatment of Acute Pharyngo-Tonsillitis amongst Children Attending Princess Marie Louise Children Hospital in Accra
Approval Date	20th June, 2019
Expiry Date	19th June, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.
- Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra