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SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

DEPARTMENT OF EPIDEMIOLOGY AND DISEASE CONTROL

AN EVALUATION OF THE PATTERN OF ANALGESICS AND ANTIBIOTICS PRESCRIPTIONS AMONG DENTAL PRACTITIONERS IN THE GREATER ACCRA REGION OF GHANA.

BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTERS OF PUBLIC HEALTH DEGREE

DECEMBER, 2019

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DECLARATION

I hereby declare that excluding precise references which have been duly acknowledged, this dissertation is my original work and that, to the best of my knowledge, it has not been presented for a degree in any other University.

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(STUDENT NAME)

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01/11/2021

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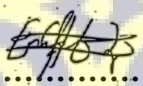

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17th November 2021

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DEDICATION

This research work is dedicated to my parents Mr. and Mrs. Bolfrey and to my siblings Dandylove and Anita for their prayers and support.

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My greatest appreciation goes to the Almighty God for the knowledge and strength He granted me to go through this program successfully. I am most grateful and to my supervisor Prof. Ernest Kenu for his patience, superb contribution and directions for making this work comes to fruition. The next gratitude goes to who Dr Paa Kwesi Blankson who inspired me so much and has supported me in getting to this level. I am also grateful to the lecturers and all the staff of the Epidemiology and Disease Control department of the School of Public Health for their support and inputs that have helped me with this work. The last but not the least appreciation goes all Medical Directors, Clinical Directors and Heads of Dental units in Facilities in which I carried out my study, God bless them all.

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ABSTRACT

Background: Antibiotics and analgesics are the two drugs frequently prescribed by dentist to manage patient condition therefore, their judicious use is necessary to ensure proper healthcare delivery to patient and to prevent negative effects due to wrong use of these medications.

Aim of study and objectives: To investigate the pattern of prescription among dentist using recommended guidelines by WHO and the Ghana national standard treatment guidelines and other protocols. Also, to determine clinical and non-clinical factors that influences prescription practice of dentist.

Methods: A cross-sectional, prospective, non-interventional quantitative study was employed to evaluate antibiotics and analgesics prescription pattern and factors that influences prescription pattern among dentist in Accra Sub metropolitan district. The study was conducted to include all dentists who were present at the four health facilities during the period of June and July 2019. Informed Consent was sought from the and study questionnaire was distributed to all participants present who agreed to participate. Data was collected using semi-structured questionnaires and a data form. Data was analyzed using STATA 15 and p-value<0.05 was considered be considered significant.

Results: a total of 36 out of 48 questionnaires were returned. 19 male respondents and 17 female respondents. GDP were majority of respondents 83.33%. Amoxicillin was the most prescribed antibiotics 20 (30.30%) followed closely behind by metronidazole 17(25.76%). Antibiotics were mostly prescribed as combination (polypharmacy) that is 27 (69%) of encounters with antibiotics prescribed. Concurrently, the most preferred first line antibiotics of choice indicated by dentists

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were amoxicillin and metronidazole accounting for 42.19% and 25.00% of response respectively. Antibiotics were mostly prescribed after dental extractions 64.1% and to patients who reported with localized abscess 51.28%. Paracetamol was the most prescribed (65.85%) and preferred analgesics (46.05%), followed by NSAIDS. Sex of dental prescribers was determined to be statistically significant factor on patient's knowledge on antibiotics and source of information on prescribed drugs, $p<0.05$.

Conclusion; In this study the preferred antibiotics and most prescribed antibiotics were amoxicillin and metronidazole, and were mostly prescribed together. These medications were mostly prescribed without evidence since culture and sensitivity reports was not requested which may lead to irrational use. Sex as a factor was proven to have influence on the source of knowledge on prescribed drugs and knowledge on some prescribed antibiotics, with most female respondents not indicating scientific publication as sources of information on prescribed medication and a greater proportion exhibiting poor knowledge on some prescribed antibiotics. Number of years of practice, age of dentist, specialty, and hospital facility did not have any influence on their prescription behavior. Patient demand and pharmaceutical promotion were also proven to have minimal effect on the prescribing behavior of dentist.

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ABBREVIATIONS AND ACRONYMS

AMR	-	Antimicrobial resistance
BNF	-	British National Formulary.
CDC	-	Center for Disease Control and Prevention.
DP	-	Dental Practitioners
GDP	-	General dental practitioners
H. officer	-	House officer
IE	-	Infective endocarditis
IQR	-	Inter quartile range
IV	-	Intravenous
MaxSurgeon	-	Maxillofacial surgeon
Med officer	-	Medical officer
MOS	-	Minor oral surgery
NSAIDS	-	Non-steroidal anti-inflammatory drugs
RCT	-	Root Canal Therapy
RMU	-	Rational Medicine Use
WHO	-	World Health Organization

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DEFINITION OF TERMS

Antibiotics: is a chemical substance produced by micro-organisms, which has the capacity to inhibit the growth of and even destroy bacteria or other micro-organisms.

Antimicrobial; is .an agent that kills or inhibits the growth of micro-organisms. It is a general term that refers to a group of drugs that includes antibiotics, antifungal, antiprotozoal, and antivirals

House officers; a qualified doctor who practice under supervision in hospital in the first year after graduation.

Medical officers: doctors who have completed their House-Manship training and are yet to specialize

Odontogenic infection; infections from tooth or structures that form the tooth.

Periodontium: supporting structures of the tooth

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND

In the clinical dental setting, most patient present with pain which mostly is a symptom of either an infection of the tooth or periodontium (tooth supporting structures) , which may influence the attending dentist to prescribe analgesics and or antibiotics as part of treatment regime for these patients (Keiser & Hargreaves, 2002). Most of these dental conditions can be managed conservatively by the use of routine dental surgical/ operative procedures such as simple restoration (filling), root canal treatment, extraction, scaling and polishing (tooth cleaning), incision and drainage, with the use of antimicrobials and analgesics as adjunct therapy when rationally indicated (Keiser & Hargreaves, 2002). Antibiotics and analgesics have been identified as the common essential prescribed drugs in dental care for patient management, hence warrant the judicious use of these drugs to ensure patients' safety and quality care. According to World Health Organization (WHO) rational drug use is "Rational use medicine requires that patients receive the appropriate medicines, in doses that meet their individual requirements for adequate period of time at the lowest cost to both them and their community" (WHO, 1995). From the above definition it can be inferred that any drug prescribed for a patient should be based on medical evidence (indicated) and be in accordance with established guidelines. The medicine prescribed should be safe, produce effective remedy for disease condition and be at a cost that is economically sound for the patient and patient's relatives. In order for a practitioner to be able to meet these requirements, the practitioner must have adequate knowledge on medicines and also a better understanding of patient's condition. However, studies conducted to evaluate medicine prescribing practice have reported on inappropriate use of medicines by prescribers in patient care. Situations in which medicines were considered to be used inappropriately included; errors in the required

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quantity of drugs, not following drug administration protocol, wrong writing of abbreviation or writing of generic name, inappropriate dosage or duration of use (Araghi, Sharifi, Ahmadi, Esfehani, & Rezaei, 2016). Irrational prescription has been proven to be one of the major challenges that leads to poor health care delivery as due to the fact that it increases the financial burden of treatment on patients, exposes the patient health to harm, drug resistance which arise due to this practice (Grant, Sullivan, & Dowell, 2013; Rothwell, et al., 2012; Calligaris, et al., 2009). In an attempt to curb this menace of irrational prescription, Practitioners from their diverse disciplines have developed a Standard treatment guideline and essential medicine list for use by these professionals in their respective fields (Prah, Kizzie- Hayford, Walker, & Ampofo-Asiamah, 2017). To ensure RMU WHO (1993) developed indicators that can be used to evaluate the trends in which medicines are utilized. These indicators are;

Prescribing indicators

- Number of drugs per encounter; where all drugs prescribed on a prescription sheet is considered as an encounter.
- %Medicines prescribed by generic name
- % Encounters with an antibiotic prescribed
- % Encounters with an injection prescribed
- % Medicines prescribed from essential medicines list or formulary

Patient Care Indicators:

- Average consultation time
- Average dispensing time
- % Medicines actually dispensed

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- % Medicines adequately labeled
- % Patients with knowledge of doses

Facility Indicators:

- Availability of essential medicines list or formulary to practitioners
- Availability of clinical guidelines
- % Key medicines available

Complementary Drug Use Indicators:

- Average medicine cost per encounter
- % Prescriptions in accordance with clinical guidelines.

Dental infections from the tooth or periodontium are polymicrobial in nature. This usually accounts for the use of broad-spectrum antibiotics for management of these dental infections. The progress of dental infections that leads to abscess formation in bone or pulp chamber may lead to pain which are sometimes managed with analgesics.

Analgesics and antibiotics prescription pattern have been outlined to arise from clinical and non-clinical influencers/factors. Some of these clinical factors such as wrong or no diagnosis, dentist inadequate knowledge on patients' conditions and non-clinical factors such as patients influence, influence from pharmaceutical companies, lack of knowledge and use of existing guidelines have been attributed to cause dentist to prescribe irrationally (Jayadev, et al., 2014; Gaballah et al, 2018; Kamulegeya et al., 2011). The inappropriate drug prescription pattern among dentist and health practitioners is mostly observed in developing countries with a study conducted in Uganda a developing African country, reported antibiotic irrational prescription by oral health care providers (Kamulegeya et al, 2011) and study conducted in Pakistan has provided proof of this menace (Hanif et al., 2016). In one of these studies only 26.1% and 27.5 percent of respondents exhibited

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adequate response to suicidal dose of paracetamol and side effects of NSAIDS respectively (Azodo & Umoh, 2013).

In studies conducted in Ghana to evaluate medicine prescription pattern by prescribers in health facilities at various level of care identified analgesics and antibiotics as the commonly prescribed medicines, with factors such as prescribing without diagnosis, increased antibiotics prescription rate, prescribing drugs by use of brand names associated with inappropriate medicine use also reported by the authors (Turkson, et al., 2017; Ahiaba et al., 2016; Prah et al., 2017). One of these studies stated dental cause as a third leading factor that resulted in antibiotics prescription (Prah et al., 2017).

1.1 Problem statement

The review of analgesics and antibiotics prescription pattern among dentists have revealed inappropriate use (Naveen et al., 2015; Şermet et al., 2012; Koyuncuoglu et al., 2017). This Irrational antibiotic and analgesic prescription have been associated with antibiotic resistance, experience of drug adverse effects, drug dependence and addiction especially with opioids (Buttar, Aleksejuniene et al., 2017). The effects of antibiotic resistance which can occur from over prescription or irrational prescription have been reported to include high cost of treatment which may arise from prolong hospital admission period due to delay in recovery or purchasing cost of alternate medication, with United States Center for Disease Prevention and Control (2013) appraising morbidity, deaths and cost as 2 million people, 23000 people and $20 billion respectively. Due to these effects, antibiotic resistance has been labelled as a global public health challenge by the World Health Organization (2014) and has advocated for judicious use of these medicines. Report from a study conducted in Ghana, suggested high prevalence of antimicrobial resistance with some prescribed antibiotics (Newman et al., 2011). Some studied have reported

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patients experience severe adverse effect with wrong use of analgesics (Thomas et al., 2007).

Although many studies have been conducted to evaluate prescribing behavior among Doctors/ Dentist world-wide, however there is limited studies and information on drug prescription pattern among Ghanaian dentist. This study aims to evaluate the pattern of analgesics and antibiotics prescription among dentists practicing in the Greater Accra region of Ghana

1.2 Justification of study

The increasing trends of antimicrobial resistance (AMR), experience of adverse drug reaction with antibiotics and/ or analgesics, and the high cost of patient care associated with these occurrences gives clear indication for monitoring and evaluation of analgesics and antibiotic use among DP. The inappropriate prescription and use of antibiotics may give rise to antimicrobial resistance and/ or adverse drug reaction that may also occur with analgesics abuse. Wrong prescription of analgesics may also give rise to addiction, especially with opioids. In order for policy makers to properly regulate the use of these drugs to prevent these problems, policy makers would have to know the current pattern of prescription of these medications, and factors influencing this pattern. The purpose of this study is to evaluate the pattern of antibiotics and analgesics use among DP and to identify clinical and non-clinical factors that influence the prescription of these drugs. This study would provide policy makers with this information to serve as a baseline to evaluate drug use among dentist.

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1.3 Conceptual framework

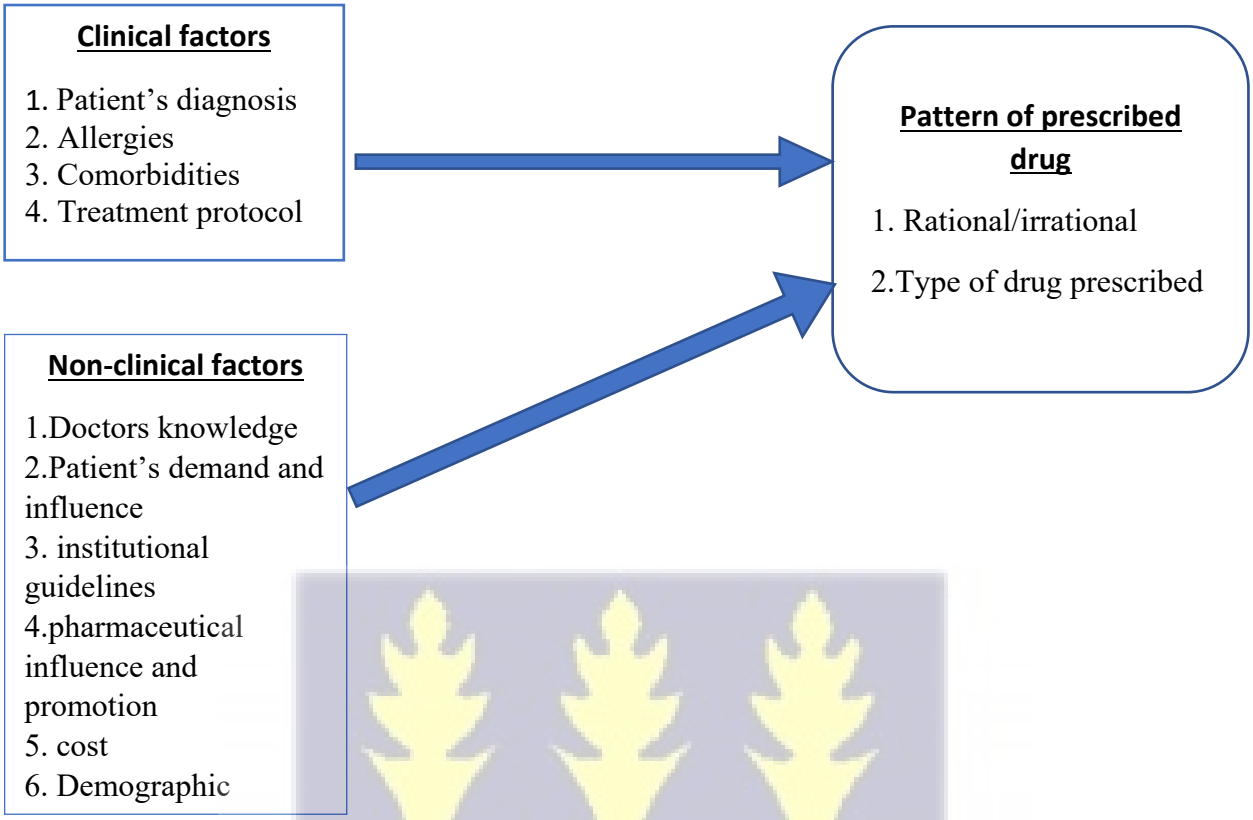

Figure 1: Conceptual framework

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Narrative

The practitioners prescribing behavior are influenced by clinical and non-clinical factors such as; knowledge acquired on drug prescription from training institution (Dental school), hospital protocol on drug use, standard treatment guidelines, affiliation or pressure from pharmacies/

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pharmaceutical agencies, patients demand and patient diagnosis. The dentist's clinical judgment of patient's situation that is making of proper diagnosis together with knowledge on other co – morbidities including allergies could ensure appropriate drug prescription. The dentist ability to overcome pressures from patient and been able to properly involve patient with treatment plan would lead to rational drug prescription. The choice of antibiotics or analgesics mainly depends on the preference of the prescriber after assessing the clinical situation and patients' social background. Dentist knowledge and understanding on drug use policies and guidelines on prescription is important to lead to rational prescription. The effect of prescribed drug may be desirable which could lead to improved health outcome in patients or undesirable which may lead to antimicrobial resistance or adverse drug reactions.

1.4 Research Questions

i. Which kind of analgesics and antibiotics are mostly prescribed by dentist?
ii. What is the irrational prescription pattern of analgesics and antibiotics among dentist in Ghana?
iii. What kinds of factors influence prescription behavior of dentists in Ghana?

1.5 General objective

To evaluate antibiotics and analgesics prescription pattern and factors that influence this practice among dental practitioners in Greater Accra region of Ghana.

1.5.1 Specific objectives

i. To describe the pattern of drug prescription by dentist who practice in the Greater Accra region of Ghana.
ii. To determine knowledge of dentist on prescribed analgesics and antibiotics.

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iii. To determine proportion of irrational prescriptions given by dental practitioners in Greater Accra region.

iv. To determine factors associated with irrational analgesics and antibiotics prescription by dentist in Greater Accra region.

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CHAPTER TWO

LITERATURE REVIEW.

2.1. Antibiotics

Antibiotics also referred to as antibacterial are type of antimicrobials medicines used in the management of bacterial infections, with the management been either therapeutic or preventive. The use of antibiotics in health care since their introduction had been of great benefits due to their effectiveness when used to manage bacterial infection. The effectiveness of some antibiotics to manage bacterial infections has been on the decline in recent years making conditions that were initially treated well with these antibiotics becoming difficult to treat as a result of microbial resistance. The development of antimicrobial resistance has led to high cost of treatment of infections with the use of alternate medicine and prolong hospital stay. The development of microbial resistance to antibiotics had been associated with several factors such as; over the counter purchase of antibiotics, poor compliance to prescribed medication, reuse of prescription or leftover medication and inappropriate prescriptions. Inappropriate prescription has been outlined as a major contributor to antimicrobial resistance in some studies. Many factors have been outlined to influence prescribing of antibiotics by practitioners with some factors leading to inappropriate / irrational prescription. Studies reporting on prescription pattern and factors influencing prescription are reviewed below to outline prescribing trends in these with respect to existing prescribing guidelines (WHO and Local).

2.1 .1. Antibiotics prescription pattern

In an interventional study conducted in the UK to assess the prescribing practice and knowledge of dentist on antibiotics, rational prescription had a significant increased from 30 percent to 52 percent after distribution of guidelines (Zahabiyoun et al, 2015). In a study to investigate the prescription behavior among Turkish dentist, it was established that most of them prescribed

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antibiotics routinely with more than 60 percent of respondents prescribing antibiotics for conditions such as dry socket and acute pulpitis which needed local surgical intervention for their management (Öcek, Sahin, Baksi, & Apaydin, 2008). A similar study done to evaluate knowledge, attitude and practices of dentist in the United Arab Emirates on prescribing antibiotics, showed the likely hood of dentist to overly prescribe antibiotics even when not indicated (Gaballah et al., 2018). Antibiotics were prescribed either as a single drug or in combination with other antibiotic (Kamulegeya et al., 2011; Zahabiyoun et al., 2015). Surveys have also provided evidence of dentist have tendencies to prescribe antibiotics to patients in wrong doses, wrong duration of use and also contraindicated for the patient's condition (Araghi et al., 2016; Kamulegeya et al., 2011). However, a study in Kuwait showed appropriate antibiotics prescription pattern among dentist (Salako, Rotimi, & Al-Mutawa, 2004). In this study it was outlined that a higher proportion of dentist (81%) did not prescribe antibiotics in irreversible pulpitis which is appropriately managed by root canal treatment (Salako, Rotimi, & Al-Mutawa, 2004).

Antibiotics with broad spectrum activity have been reported to be prescribed as empirical treatment for dental infections and/ or as prophylaxis (Gowri, Mehta, & Kannan, 2015). Penicillin based drugs predominantly amoxicillin and metronidazole have been reported as first line antibiotics of choice prescribed by many dentists across the globe (Gaballah et al., 2018; Gowri et al., 2015; Jayadev et al., 2014). Erythromycin, clindamycin, ciprofloxacin, gentamycin, minocycline and cephalosporins (cefuroxime, ceftriaxone) have been prescribed as alternative medicines in situations where these first line antibiotics cannot be used (Gaballah, Bahmani, Salami, & Hassan, 2018; Gowri, Mehta, & Kannan, 2015; Jayadev et al., 2014). A drug such as cotrimoxazole was also selected as an antibiotic of choice in a study done among oral health care providers in Uganda (Kamulegeya, William , & Rwenyonyi, 2011). Reports from a Belgium survey identified

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macrolides (57.1%) as the most prescribed drugs in patients who were allergic to penicillin, followed by clindamycin (16.3%) (Mainjot, Hoore, Vanheusden, & Nieuwenhuysen, 2009).

2.1.2. Factors influencing antibiotics prescription

Several factors have been outlined by studies to influence antibiotics prescription by dentist and other prescribing oral healthcare practitioners. These factors were either clinical or non-clinical, which ranges from culture results, patient's preference, patients' condition, pharmaceutical promotion, dentist education and training, treatment protocols, knowledge on existing guidelines and application, source of continuous professional development, payment methods, experience and specialty, and availability of resources (Jayadev, et al., 2014; Gaballah et al., 2018; Kamulegeya, William , & Rwenyonyi, 2011). Some of these factors have been implicated to cause dentist and other oral healthcare providers to prescribe irrationally.

2.1.2.1. Knowledge, attitude and perception of oral health care providers about antibiotics use and antibiotic resistance.

Prescribers' knowledge on existing guidelines regarding the use of antibiotics, antibiotics resistance and understanding of patient's condition has been reported to influence antibiotics prescription (Zahabiyoun, Sahabi, & Kharazifard, 2015). Dentist and other oral healthcare providers have been reported to prescribe antibiotics contrary to existing guidelines. These inappropriate uses included wrong doses, wrong duration of use and conditions which did not require use of antibiotics. Several studies have shown that some dental practitioners had no knowledge on existing guidelines. Inappropriate indication for antibiotics usage for prophylaxis were identified in some investigations conducted on dental practitioners. With regards to physiologic conditions such as pregnancy and lactation, a study done among some Dental practitioners in Africa reported that approximately 54.3 percent provided appropriate response for

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both conditions, whilst 35.7 percent and 21.4 percent gave inappropriate response for antibiotics use in pregnancy and lactation respectively (Kamulegeya et al., 2011).

2.1.2.2. Education Background and level of training/ specialty

A survey showed that about 61.25 percent of dentist prescribed antibiotics based on the knowledge and training they acquired from undergraduate and post-graduate school (Gaballah et al., 2018). With respect to specialty of the dental practitioner, this study provided evidence that a greater proportion of oral surgeons (79%) prescribed antibiotics based on upgrades of existing guidelines as compared to a relatively small proportion among periodontologist (24.3%), endodontist (39.5%) and General dental practitioners (19.04%) (Gaballah et al., 2018).

2.1.2.3. Doctor- patient's relationship and patient's influence

Patient's demands which led to prescription of antibiotics by dentists have been reported by studies. Some of these surveys proved more female practitioners been influenced to prescribe antibiotics by patients as compared to their male colleagues (Khaw et al, 2009; Jayadev, et al., 2014; Alkhabuli et al., 2016). A study also gave an associated between educational background of practitioner and patients ability to influence prescription of antibiotics (Kamulegeya, William , & Rwenyonyi, 2011). The fear of dentists or practitioners losing their patients has been reported as a major contributor of dentist prescribing based on patient's demand (Vardhan et al., 2017).

2.1.2.4. Patient's clinical factors

Patient's diagnosis, presence of other diseases, physiological state (such as pregnancy), age and allergies have been attributed to influence antibiotics prescriptions. Patients who reported with periapical abscess and periodontal abscess with or without fever were reported to receive antibiotics prescription Belgian survey. Some of these patients did not receive any form of localized treatment although it is most appropriate.

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2.1.2.5. Laboratory findings

Dentists were identified to prescribe antibiotics empirically without requesting for culture and sensitivity although culture and sensitivity has been outlined by WHO to provide scientific bases for treatment, although some dentists have indicated lack of culture and sensitivity as a cause for antimicrobial resistance in surveys (Alkhabuli et al., 2016; Kamulegeya et al., 2011; Gowri et al., 2015).

2.1.2.6. Pharmaceutical influence and drug promotion

Reports from surveys among dentists have proved that some dentists have been influenced to prescribe drugs-based advertisement from pharmaceutical company and education from drug promotion agents (Öcek et al., 2008). Also, it has been proven that some dentist only receive education from drug sale representatives through workshops and CPDs organized by their pharmaceutical companies (Kamulegeya, William , & Rwenyonyi, 2011).

2.1.3. Indications for antibiotics prescription in dentistry

Antibiotics use or prescription for treatment is properly indicated in spreading infection (cellulitis) and patient's showing signs and symptoms of systemic spread such as fever, malaise and lymphadenitis (Mainjot et al., 2009; Palmer, 2003). Antibiotics are indicated to be used as adjunct therapy to dental operative and surgical procedures (Jayadev, et al., 2014). Antibiotic are indicated to be prescribed as prophylaxis in patient who are at risk of developing infective endocarditis, immunocompromised patients and patients who have total joint replacement prosthesis (Gaballah et al, 2018).

2.2. Analgesics or Pain killers

Analgesics are prescribed mainly to abolish pain in patients. They are able to achieve this effect by acting either on the central nervous system (mostly opioids) or the peripheral nervous systems

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(non-opioids) (Kaushik & Kaushik, 2012; Jayadev, et al., 2014). The two main categories of analgesics are opioids and non-opioids. Non-opioid analgesics have been shown to be frequently prescribed by dentist (Jayadev, et al., 2014). Drug such as carbamazepine which is traditionally not an analgesic is occasionally prescribed to treat pain from facial neuralgias. Irrational prescription of analgesics had been reported by papers with several reasons stated. Below is a literature review on analgesic prescription and use in dentistry. Analgesics are also prescribed as anti-inflammatory drugs to reduce inflammation or used as antipyretic to manage fever (Şermet, Akgün, & Atamer-Şimşek, 2012).

2.2.1. Pattern of analgesic prescription

In a survey conducted in West Nepal to assess the pattern of analgesic prescriptions among dentist, periapical and pulpal diseases were conditions that received analgesics. In this study, analgesics were the second most prescribed drug after antimicrobials (Sarkar, Das, & Baral, 2004). In Alabama an investigation conducted to identify disparities in prescription of analgesics among dentists reported that non-steroidal anti-inflammatory drugs (NSAIDs) were prescribed in high doses. Also, analgesics were prescribed without considering patient's underlying medical conditions (comorbidities), other medications that the drugs may interact with and patient's allergies (Barasch et al., 2011). Irrational prescription pattern of analgesics was observed in a study conducted among Ethiopian dentist (Adamu et al., 2014).

Non-opioids analgesics which include paracetamol (acetaminophen) and NSAIDs were the analgesics mostly prescribed by dentists as reported by studies (Azodo & Umoh, 2013; Şermet, Akgün, & Atamer-Şimşek, 2012; Jayadev, et al., 2014). Opioids were mostly prescribed to patients in which NSAIDs were contraindicated (not recommended), and these were prescribed either as a single drug or in combination with paracetamol (Haas, 2002).

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2.2.2. Clinical and Non-clinical factors that influences analgesics prescription

Pain severity, age of patient, patient condition, comorbidities, cost, other medications, dentist's knowledge about analgesics and existing guidelines, patient's affluence, pharmaceutical and drugs promotion has been identified as factors influencing analgesics prescription by dentists (Jayadev, et al., 2014; Azodo & Umoh, 2013). NSAIDs such as ibuprofen, naproxen which are non-opioids analgesics and paracetamol were prescribed for mild to moderate pain (Hanif, Azmat, & Sadeeqa, 2016). The use opioids in combination with non-opioids to relief severe pain have been reported (Haas, 2002). Conditions such as gastrointestinal bleeding, asthma, respiratory depression, constipation, warfarin therapy and risk of Reyes syndrome have been reported to affect choice of analgesics (Azodo & Umoh, 2013).

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CHAPTER THREE (3)

METHODS

3.1. Study design.

This was a cross-sectional study employed to evaluate antibiotics and analgesics prescription pattern and to identify factors that influence these prescription patterns. A semi structured questionnaire was administered to all dentists who agreed to participate in the study to collect data on preferred medicines, source of knowledge on drug prescription, and factors that influence prescription. A data form was used to collect data on prescriptions issued to patients during the time of study to evaluate pattern of prescription. The study was conducted by adopting FGDP UK guidelines, WHO prescription indicators to assess rational medicine use, standard treatment guideline and other prescribing guidelines from literature centered on evidence-based medicine practice.

3.2. Study area

Study was conducted among dentist in Greater Accra region. Greater Accra region has the smallest land size area among the 10 regions in Ghana, occupying a total land surface area of 3245 square kilometers. It Is the second most populated region in Ghana with a population of 4,010,054 million, with Ashanti region been the most populated. The region has Accra as its Capital town which also doubles as the Capital city of Ghana. It is composed of Accra Metropolitan, Tema Metropolitan, Adenta Municipal, La Nkwantanang, Madina Municipal, Ashaiman Municipal, Ledzokuku-Krowor Municipal, Ga East Municipal, Ga West Municipal and Ga South Municipal district. Dentist practicing in this are distributed across facilities at various level of health care (primary, secondary and tertiary). This study was conducted among dentist practicing in Accra Metropolis. The Facilities where the study was conducted were, University of Ghana School of Medicine and

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Dentistry dental clinic located within Korle Bu Teaching Hospital, Greater Accra Regional Hospital formerly known as Ridge Hospital, La General Hospital, and University of Ghana Hospital, Legon. These facilities were selected because they serve as training institution for newly qualified dentist for their House-Manship.

3.3. Study population, Inclusion criteria.

Practicing dentist in the Greater Accra region, who are fully registered with the Medical and Dental Council, and in good standing with the council.

3.4. Study population, Exclusion criteria.

Dental practitioners who were not registered with the medical and dental council and also dentist who were not into active patient care.

3.5. Sampling

University of Ghana School of Medicine and Dentistry dental clinic located within Korle Bu Teaching Hospital, Greater Accra Regional Hospital formerly known as Ridge Hospital, La General Hospital, University of Ghana Hospital Legon were selected for the study through convenience sampling as a result of these facilities been used to train House-Officers. Convenient sampling was used to select dentist consecutively in the selected facilities during the day of study. Dentist practicing in these facilities who gave their consent after the study was explained to them were sampled and included in the study. A total of 48 questionnaires were distributed to dentists. Folders of patients who received prescription from dentists who took part in the study were sampled from the number of patients seen during the time of study and data collected using a data form.

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3.6. Variables

Dependent variable;

Drug prescription pattern

Independent variables;

I. Hospital treatment protocol/ existing treatment guidelines
II. Dentist knowledge about medication
III. Patient influence/ factors
IV. Dentist number of years of practice/ experience
V. Specialty
VI. Sex

Table 1: variables

Study Variable Operational	Operational Definition	Measurement scale	Data collection tool
Drug prescription pattern	*Types of drugs*; type of antibiotics and analgesics prescribed by dentists.	Nominal	Questionnaire
	Proportion of different type of analgesics and antibiotics prescribed	Nominal	Data form

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	Antibiotics prescription rate; % Antibiotic per encounter *Irrational prescription;* • Average drugs per encounter; normal< 2.5 • Prescription without diagnosis • %Prescription with generic name <100	Continuous Continuous Continuous	Data form Data form Data form
Dentist knowledge about prescribed medication	Dentist knowledge on the indications, adverse reactions and contraindications of prescribed drugs	Nominal	Questionnaire
Hospital protocol	Availability and utilization of existing facility treatment guidelines, including essential drug list	Nominal (binary) 1. yes 0. no	Questionnaire

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Treatment guidelines	Dentist knowledge and utilization of standard treatment guidelines	Nominal (binary) 1. yes 0. no	Questionnaire
Patient influence/ demand	Dentists who have prescribed medicine based on demand from patients	Nominal 1. yes 0. no	Questionnaire
Experience	Number of years of practice by dentist	Continuous	Questionnaire
Specialty	Whether the dentist is a trainee (house officer), dental officer (GDP), specialist or consultant	Ordinal 1.house officer 2.dental officer 3.specialist 4.consultant	Questionnaire
Pharmaceutical promotion	Whether dentist's prescription is influenced by pharmaceutical advertisement	Nominal (binary) 1. yes 0. no	Questionnaire
Sex	Sex of prescriber in this case dentists	Nominal (binary) 1. male 2. female	Questionnaire

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3.7. Data Collection

A questionnaire was used to collect data on demographics of respondents, antibiotic and analgesics utilization using clinical scenarios, dentist knowledge on prescribed medication and factors that influence antibiotics and analgesics prescription. The questionnaire was also used to gather data on the preferred analgesics and antibiotics by respondents to determine pattern of possible utilization of these medicines. A data extraction form was used to collect data on prescribed drugs by respondents to their patients. This data was used to determine antibiotic prescription rate, analgesics prescription rate, conditions that led to antibiotics and analgesics to be prescribed, formulation prescribed to determine percentage of prescriptions with IV medication and percentage of prescription with brand names.

3.8. Data management and analysis

The data collected were entered into Microsoft excel version 2016 using codes. Data were exported into STATA version 15 and analyzed. Demographic characteristics of respondents were described using tables. Categorical variables were presented using text, tables and graphs. Age of respondents was summarized as median due to skewness of data and also categorized into age groups as 26 years and below, 27 – 29 years, and 30 years and above. Number of years of practice was categorized as 1year and 2 years and above. Drug prescription pattern were described using tables and were represented by proportions.

New variables were generated from input variables and were used for calculation of percentage of prescription with antibiotics, average number of drugs per encounter. Proportions of other independent variables were described. Chi square test and fisher exact test were used to determine significant difference of between qualitative variables, with a p-value<0.05 accepted as significant.

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Poisson test was used to determine the association among categorical outcome of interest and relevant demographic and clinical variables.

3.9. Ethical consideration

Ethical approval for this study was given by Ethical Review Committee of the Ghana Health Service (GHS-ERC), with protocol identification number GHS-ERC045/04/19. Permission was sought from the administration of the various hospitals before study was conducted. The objectives of the study, the duration, procedure and importance of the study were explained to authorities and participants. As part of the consenting process, participants were informed on the potential risks and benefits of this study in language that they well understood and were allowed to ask questions. Participants were also given information on their voluntary participation and their ability to withdraw from the study at any point in time during the study. Data collected were kept confidentially and the only people granted access were those connected to the study. The anonymity of participants was ensured as participants were identified by abbreviation of their names and numbers on questionnaires and data form.

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CHAPTER FOUR (4)

RESULTS

4.1 Demographics and background characteristics

Out of the 48 questionnaires distributed, 36 were returned by the respondents (n=36). Male respondents were the majority 19 (52.8%) and female minority 17 (47.2%). General practitioners (GP) made up of House officers 23 (65.7%) and medical officers 7 (20.0%) made up majority of the respondents with few representations from specialists 5 (14.3%). Most respondents were from UGSMD/KBTH facility 22 (61.1%). The median age of respondents was 27 years with age range from 25 to 44 years and IQR of 3years. However, the mean age of respondents was 29.25 years with a standard deviation of 4.95 years. Majority of dentist 61.1% (22/36) had approximately one year working experience. Demographic characteristics are represented on table 4.1

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Table 4.1: Demographic characteristics of respondents (Dentist)

Demographic characteristics	Frequency N=36	Percentage %	Mean (SD)	Min(max)
Sex				
Male	19	52.8		
Female	17	47.2		
Age group			29.25(4.95)	25(44)
≤26	11	30.6		
27-29	16	44.4		
30+	9	25		
Specialty				
House officer	23	63.9		
Medical officer	7	19.4		
Maxillofacial surgeon	2	5.6		
Restorative	2	5.6		
Orthodontist	2	5.6		
Years at work			3.17(4.03)	1(16)
1 year	22	61.1		
2+years	14	38.9		
Hospital site				
Tertiary	22	61.1		
Other	14	38.9		

4.2a Pattern of prescribed antibiotics

A total of 45 prescriptions were collected using the data form from 21 dentists. The 45 prescriptions contained a total of 109 drugs prescribed, with antibiotics prescribed most 66 (61.1%) and analgesics been the least 42(38.9%). Amoxicillin was the most prescribed antibiotics 20 (30.3%) followed closely behind by metronidazole 17(25.8%). Antibiotics were mostly prescribed as combination (polypharmacy) that is 27 (69.0%) of encounters with antibiotics prescribed.

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Table 4.2: Pattern of prescribed antibiotics (N=39)

Antibiotics	n (%)
Amoxicillin	10(25.6)
Amoxicillin and metronidazole	10(25.6)
Amoxiclav and metronidazole	6 (15.4)
Amoxiclav and secnidazole	6 (15.4)
Clindamycin and ciprofloxacin	4 (10.3)
Amoxiclav	2 (5.1)
Cefuroxime and metronidazole	1 (2.6)

4.2b Pattern of preferred antibiotics

Concurrently, the most preferred first line antibiotics of choice indicated by dentists were amoxicillin and metronidazole accounting for 75.0% (27/36) and 44.0% (16/36) respectively. Clindamycin was the most preferred second line antibiotic accounting for 69.4% (25/23) of total response. The dentist preferred to prescribe these antibiotics as oral medication as indicated by all 36 respondents. Pattern of preferred antibiotics is shown in table 4.3.

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Table 4.3: Pattern of antibiotics choice as first-line, second-line and formulation.

Drug prescription	No=n(%)	Yes=n(%)	Total
First line antibiotic			
Amoxicillin	9(25.0)	27(75.0)	36
Metronidazole	20(55.6)	16(44.4)	36
Amoxiclav	26(72.2)	10(27.8)	36
Amoxyl/metronidazole	27(75.0)	9(25.0)	36
Cephalosporin	34(94.4)	2(5.6)	36
Clindamycin	35(97.2)	1(2.8)	36
Doxycycline	36(100)	0(0.0)	36
Second line of antibiotics			36
Clindamycin	11(30.6)	25(69.4)	36
Azithromycin	29(80.6)	7(19.4)	36
Doxycycline	35(97.2)	1(2.8)	36
Cefuroxime	35(97.2)	1(2.8)	36
Clindamycin & ciprofloxacin	35(97.2)	1(2.8)	36
Cefuroxime &gentamycin	35(97.2)	1(2.8)	36
Formulation of antibiotics			
Oral	0(0.0)	36(100)	36
Intravenous	18(50.0)	18(50.0)	36
Intramuscular	33(91.7)	3(8.3)	36
Topical	32(88.9)	4(11.1)	36

4.2C Analgesic pattern

Paracetamol was the most prescribed analgesics 65.85% (27/41) followed in descending order by diclofenac 12.19% (5/41), naclofen 9.76 (4/41), ibuprofen 7.32% (3/41), doreta 2.44% (1/41) and gebedol 2.44% (1/41). NSAIDS were the next prescribed drugs after paracetamol. The most preferred analgesics by respondents was paracetamol, followed by ibuprofen and diclofenac. Opioids were the least preferred analgesics. This preference was seen in the pattern of prescribed analgesics as shown in table 4.4.

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Table 4.4: Analgesic pattern for prescribed analgesics (N=41) and responses to preferred analgesics (N=36) for dental conditions

Analgesics	n (%)
Prescribed analgesic	
Paracetamol	27 (65.9)
Diclofenac	5 (12.2)
Naclofen	4 (9.8)
Ibuprofen	3 (7.3)
Doreta	1 (2.4)
Gebedol	1 (2.4)
Preferred analgesic	
Paracetamol	35 (97.2)
Ibuprofen	18 (50.0)
Diclofenac	17 (47.2)
Celebrex	2 (5.6)
Gebedol	1 (2.8)
Tramadol	1 (2.78)

4.2D treatment done and antibiotics prescribed

Extraction was the treatment that received the most prescribed antibiotics in this study with accounted for 64.10% of encounters with prescribed antibiotics. Approximately 18% of antibiotics were prescribed due to postponed treatment and 7.69% of encounters with antibiotics prescribed in patient who received no treatment and had no treatment appointment. This is shown in Fig 1

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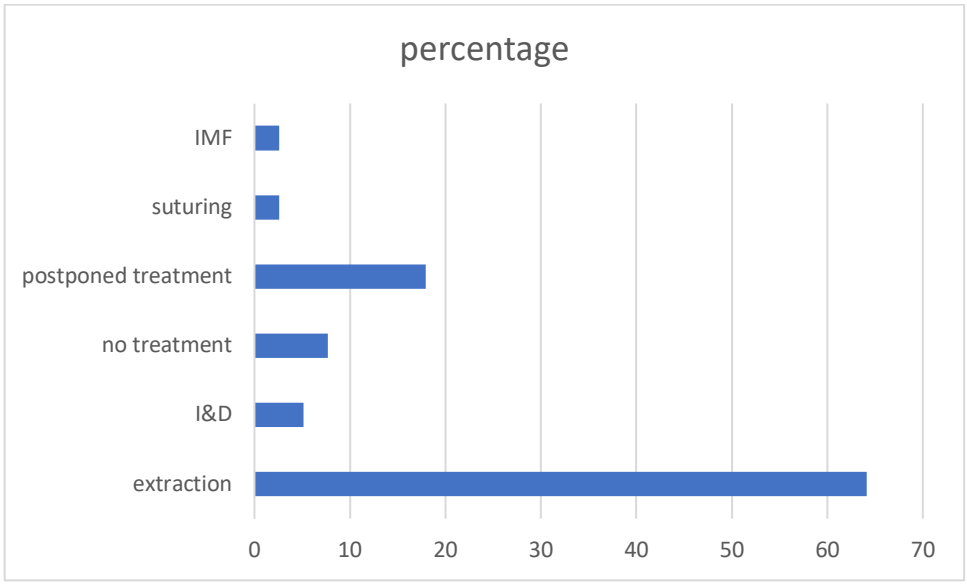

Figure 2: bar graph of treatments that had antibiotics prescribed (n=39)

4.2E. Diagnosis

Localized tooth abscess from pulpal abscess received the most prescribed antibiotics. About 91% of patients who reported with localized abscess from the tooth received antibiotics as part of management. All patient who reported with facial cellulitis were given antibiotics by dentist. Patients who presented with tumors did not receive any antibiotics. This result has been presented in Fig 2.

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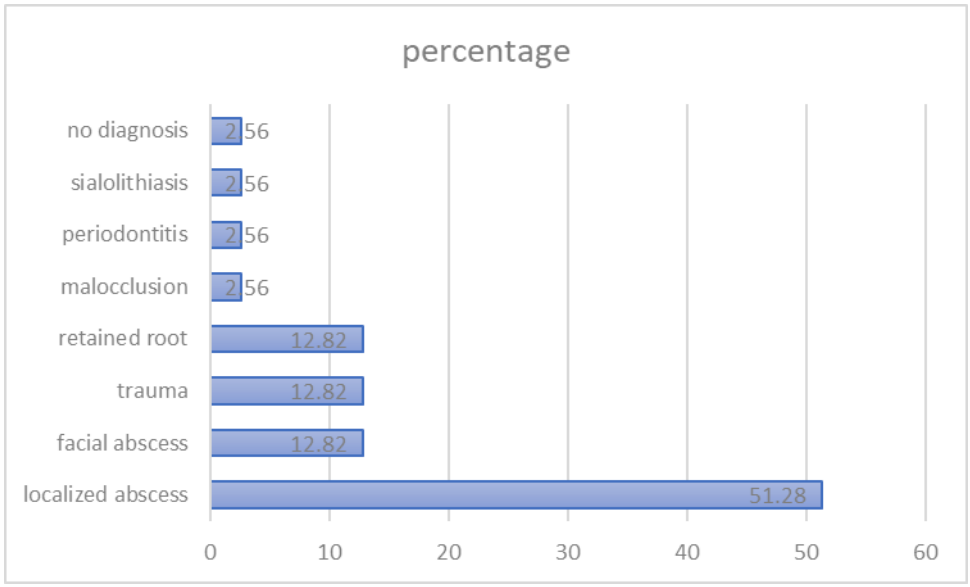

Figure 3: Bar graph of pattern dental conditions that had antibiotics prescribed as part of treatment (n=39).

4.2F General clinical consideration for antibiotic use.

Evidence of systemic spread of oral infections was the number one leading clinical indication for antibiotic use as indicated by 83.3% (30/36) respondents, this was followed by patients who have had minor oral surgical procedure 80.6% (29/36). The other indications selected by respondents in descending order were, presence of swelling 75.0% (27/36), presence of radiographic pathology 58.3% (21/36), dry socket 47.2% (17/36), use of laboratory investigation 41.7% (15/36), after root canal therapy 19.4% (7/36), pain 16.7% (6/36), uncertainty of diagnosis 11.1% (4/36) and after routine scaling and polishing 5.6% (2/36). These findings are shown in table 4.5.

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Table 4.5: clinical factors considered for antibiotics prescription by respondents

Variable	Frequency (n=36)	percentage
spreading infection	30	83.3
minor oral surgery/ extractions	29	80.6
swelling	27	75.0
radiological pathology	21	58.3
management of dry socket	17	47.2
laboratory investigation findings	15	41.7
After root canal therapy	7	19.4
Pain	6	16.7
Uncertainty of diagnosis	4	11.1
After routine scaling and polishing	2	5.6

4.3A Irrational medicine use assessment of prescribed medication

The average number of drugs per encounter which was calculated by dividing the total number of drugs prescribed by the total number of prescriptions issued was 2.4. Percentage of prescriptions with antibiotic was determined as 86.7%. Intravenous medication was prescribed on 2 encounters which represents 4.35% per encounter. Medicines were mostly prescribed as orals (95.6%). Percentage of encounters with brand names was determined to be 11.1%. These findings are presented in table 4.6. Only 65% of respondent were aware of their facility protocol and about 74% of this number prescribe from the protocol always.

Table 4.6: Indicators for rational medicine use distribution

Indicators	Value
Average number of drugs per encounter	2.4
% Encounter with antibiotic prescribed	86.7
%Encounter with injections prescribed	4.4
%Medicines prescribed by generic name	88.9

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4.3B Assessment of irrational prescription of drugs among dental practitioners in Greater Accra region.

On assessing irrational drug use among respondents 5.6% (2/36) of respondents indicated that they prescribe antibiotics based on patient demand whilst 16.7% (6/36) of respondent same reason as a factor they consider to prescribe analgesics. Respondents who were aware of their Facility prescription protocol for antibiotics were 63.9% (23/36) and 80.6% (29/36) responded that they prescribe from essential medicine list of their facility. Few respondents 13.9% (5/36) answered that they have prescribed antibiotics due to pharmaceutical promotion. Risk of infective endocarditis 97.2% (35/36), immunosuppression 75.0% (29/36) and total knee replacement surgery 58.3% (21/36) were the three-leading selected response by respondents for antibiotics prophylaxis in dentistry. Pain severity was considered by all 36 dentists as factors that influence their choice of analgesics prescribed to their patients. Other factors highly considered by respondents before prescribing analgesics were patient medical condition 72.2% (26/36) and age of patient 63.9% (23/36). Low proportion of respondents 13.9% (5/36) indicated that they prescribed analgesics due to uncertainty of patient diagnosis. This is represented in table 4.7

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Table 4.7: Descriptive characteristics of irrational prescription of drugs among dental practitioners in Greater Accra region

Irrational prescription of drugs	No	Yes	Total
	n(%)	n(%)	
Antibiotics			
Prescribed antibiotics due to increase workload and reschedule of patient's appointment	11(30.6)	25(69.4)	36
Prescribed antibiotics due to patients demand or request	34(94.4)	2(5.6)	36
Aware of your Hospital prescription protocol	13(36.1)	23(63.9)	36
Prescribe antibiotics according to your facility essential medicine list	7(19.4)	29(80.6)	36
Prescribed antibiotics due to influence from pharmaceutical promotion	31(86.1)	5(13.9)	36
Prophylaxis			36
Endocarditis	1(2.8)	35(97.2)	36
Knee replacement	15(41.7)	21(58.3)	36
AIDS	30(83.3)	6(16.7)	36
Diabetes	28(77.8)	8(22.2)	36
Septal defect	15(41.7)	21(58.3)	36
Immunosuppression	9(25.0)	27(75.0)	36
Pacemaker	16(44.4)	20(55.6)	36
Analgesic			36
Pain severity	0(0.0)	36(100)	36
Patient's medical condition	10(27.8)	26(72.2)	36
Age of patient	13(36.1)	23(63.9)	36
Uncertainty of diagnosis	31(86.1)	5(13.9)	36
Patient request	30(83.3)	6(16.7)	36
When treatment is postponed	20(55.6)	16(44.4)	36

4.3E irrational drug use

The average percentage scores on irrational medicine use among dentist showed a high irrational use of medicine in dental prophylaxis with a mean percentage of 2.7(1.4). The mean percentage of irrational use of antibiotics and analgesics were similar 1.4(0.73) and 1.4(1.2) respectively. Overall mean of irrational use of medicine was determined was 30.8% (11.1). There was no observable significant difference between age group, sex, specialty, number of years of practice and Hospital site. This is represented in table 4.8 and table 4.9.

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Table 4.8: Percentage average score assessment on irrational drug prescription

Irrational on the domains	Mean (SD)	95%CI
Antibiotics	1.4(0.73)	1.19-1.69
Prophylaxis	2.7(1.4)	2.2-3.2
Analgesic	1.4(1.2)	0.9-1.8
Overall	30.8(11.1)	27.1-34.6

Table 4.9: Mean difference of average percentage score assessment on irrational prescription of drugs among dental practitioners in Greater Accra region

Demographic characteristics	**Domains**							
	Antibiotics	F-test	Prophylaxis	F-test	Analgesic	F-test	Overall	F-test
Sex		0.04		0.16		1.82		0.16
Male	1.4(0.7)		2.6(1.5)		1.6(1.3)		31.5(11.9)	
Female	1.5(0.8)		2.8(1.4)		1.1(0.8)		30.1(10.6)	
Age group		1.32		0.26		0.03		0.51
≤26	1.7(0.6)		2.7(1.7)		1.5(1.5)		32.8(10.7)	
27-29	1.4(0.7)		2.9(1.1)		1.4(1.0)		31.2(11.6)	
30+	1.2(0.8)		2.4(1.6)		1.3(1.0)		27.7(11.4)	
Specialty		0.78		0.81		0.48		0.84
House officer	1.4(0.6)		2.7(1.4)		1.4(1.2)		30.9(10.7)	
Medical officer	1.8(0.9)		2.6(1.5)		1.4(0.9)		32.5(13.4)	
Maxillofacial surgeon	1.5(0.7)		1.5(0.7)		0.5(0.7)		19.4(3.9)	
Restorative	1.0(0)		3.0(1.4)		1.0(1.4)		27.8(15.7)	
Orthodontist	1.0(1.4)		4(1.4)		2.0(1.4)		38.8(7.8)	
Years at work		0.68		0.0		0.18		0.0
1 year	1.4(0.6)		2.7(1.4)		1.4(1.3)		30.8(10.9)	
2+years	1.6(0.9)		2.7(1.4)		1.3(0.9)		30.9(11.9)	
Hospital site		1.07		0.07		0.18		0.65
Tertiary	1.5(0.8)		1.6(1.3)		1.5(1.3)		32.0(11.6)	
Other	1.3(0.6)		1.1(0.8)		1.3(0.8)		29.0(10.5)	

4.4a Knowledge on analgesics and antibiotics

Evaluating respondents' knowledge on analgesics, 26(72%) of respondent knew the appropriate maximum daily dose of paracetamol, 34(94.4%) of respondent indicated paracetamol as preferred analgesics for asthmatic patients, 35(97.2%) answered rightly not to prescribe NSAIDS in patients

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with GI bleeding, and the contraindication of paracetamol in first trimester of pregnancy had correct response of 'no' from 32(89%) of respondents. In assessing respondent's knowledge on antibiotics 32 out of 36(88.9%) respondents answered correctly that penicillin does not stain teeth when given in pregnancy, 30 out of 32(93.8%) respondents also gave appropriate response that azithromycin has low bone penetration compared to clindamycin, and 27 out of 36(75%) respondents knew that crystalline penicillin as an intravenous formulation. Majority of dentist 32 out of 36(88.9%) indicated that antibiotics are best prescribed using the generic name. This is shown in table 4.10

Table 4.10: Individual knowledge assessment on prescribe drugs

Domains	Variable	Frequency	Percentage
Antibiotics	**Penicillin stains teeth when given in pregnancy and makes it unsafe**		
	No	32	88.9
	Yes	4	11.1
	Total	36	100.0
	Azithromycin has better bone penetration compared to clindamycin		
	No	30	93.8
	Yes	2	6.3
	Total	32	100.0
	How do you prefer to prescribe antibiotics by name		
	Generic	32	88.9
	Brand	4	11.1
	Total	36	100.0
	Crystalline penicillin is prescribed as		
	Oral	4	11.1
	Intravenous	27	75.0
	Intramuscular	3	8.3
	No answer	2	5.6
	Total	36	100.0

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Table 4.10: Individual knowledge assessment on prescribe drugs

Domain	Variable	Frequency	Percentage
	Paracetamol toxicity has been associated with hepatic injury		
	No	0	0.0
	Yes	36	100.0
	Total	36	100.0
	Which of these analgesics would you prescribe for an asthmatic with dental pain?		
	No	34	94.4
	Yes	2	5.6
Analgesics	Total	36	100.0
	Prescribe NSAID in patient who has been treated for gastro-intestinal bleeding?		
	No	35	97.2
	Yes	1	2.8
	Total	36	100.0
	Maximum dose of paracetamol for a normal healthy adult/ 24hours?		
	3g	7	19.4
	4g	26	72.2
	6g	3	8.3
	Total	36	100.0
	Paracetamol is contraindicated during first trimester of pregnancy?		
	No	32	88.9
	Yes	4	11.1
	Total	36	100.0
	Constipation is a known side effect of opioid analgesics		
	No	8	25.0
	Yes	24	75.0
	Total	32	100.0

4.4b Knowledge Assessment score of respondents

On assessing respondent's knowledge on antibiotics and analgesics, the average knowledge score on antibiotics was higher compared to that on analgesics with scores of 84.0% (18.1%) and 77.8% (7.5%) with overall average knowledge score on both drugs been 80.6% (9.9%). A Fischer exact test conducted at 95% confidence showed significant effect of sex, age of respondents and number of years of practice on the knowledge score of respondents on antibiotics and overall drug

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knowledge scores as male respondents, respondents aged above 26 years and respondents with more than a year work experience had a higher knowledge score respectively. These findings are presented in table 4.11 and 4.12.

Table 4.11: Percentage average score assessment on knowledge of prescribe drugs

Knowledge on the domains	Mean(SD)	95%CI
Antibiotics	84.0(18.1)	77.9-90.1
Analgesic	77.8(11.5)	73.9-81.7
Overall	80.6(9.7)	77.3-83.8

Table 4.12: Mean difference of average percentage score assessment on knowledge on prescribe drug

Demographic characteristics	Domains					
	Antibiotics Mean(SD)	F-test	Analgesic Mean(SD)	F-test	Overall Mean(SD)	F-test
Sex		3.96*		1.53		6.61**
Male	89.5(17.3)		80.0(11.5)		84.2(9.3)	
Female	77.9(17.4)		75.3(11.2)		76.5(8.7)	
Age group		3.23*		2.86		4.75**
≤26	75.0(19.4)		72.7(10.1)		73.8(9.0)	
27-29	84.4(17.9)		82.5(10.0)		83.4(9.1)	
30+	94.4(11.0)		75.5(13.3)		84.0(8.1)	
Specialty		0.78		1.33		2.21
House officer	80.4(18.4)		74.7(12.4)		77.3(9.7)	
Medical officer	89.3(19.7)		85.9(9.7)		87.3(7.7)	
Maxillofacial surgeon	100(0)		80.0(0.0)		88.9(0.0)	
Restorative	87.5(17.7)		80.0(0.0)		83.4(7.8)	
Orthodontist	87.5(17.7)		80.0(0.0)		83.4(7.8)	
Years at work		3.75*		0.85		5.18*
1 year	79.5(18.3)		76.4(10.0)		77.8(9.7)	
2+years	91.1(15.8)		80.0(13.6)		84.9(8.3)	
Hospital site		0.0		0.73		0.34
Tertiary	84.1(18.2)		79.1(9.7)		81.3(10.5)	
Other	83.9(18.6)		75.7(13.9)		79.4(8.6)	

*= significant code, *'<0.05' ** '<0.001'

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A Poisson model showed significant association of specialty type, number of years of practice and age of respondents with knowledge on antibiotics and overall knowledge of the two categories of medicines. this is illustrated on table 4.13.

Table 4.13: Poisson estimation showing factors influencing the domains on knowledge of prescribe drugs

Demographic characteristics	Domains		
	Antibiotics	Analgesic	Overall
	β[95%CI]	β[95%CI]	β[95%CI]
Sex			
Male	**Ref**	**Ref**	**Ref**
Female	-0.05[-0.21-0.12]	-0.06[-0.14-0.01]	-0.05[-0.13-0.02]
Age group			
≤26	**Ref**	**Ref**	**Ref**
27-29	0.11[-0.11-0.34]	0.09[-0.01-0.18]	0.10[0.01-0.19]*
30+	0.28[-0.01-0.57]	0.04[-0.09-0.18]	0.15[0.03-0.27]**
Specialty			
House officer	**Ref**	**Ref**	**Ref**
Medical officer	-0.02[-0.14-0.09]	0.74[0.66-0.81]***	0.30[0.24-0.35]***
Maxillofacial surgeon	0.05[-0.05-0.14]	0.66[0.60-0.72]***	0.29[0.25-0.34]***
Restorative	-0.15[-0.32-0.03]	0.72[0.64-0.79]***	0.23[0.16-0.29]***
Orthodontist	-0.20[-0.47-0.06]	0.68[0.60-0.77]***	0.19[0.07-0.30]***
Years at work			
1 year	**Ref**	**Ref**	**Ref**
2+years	0.03[-0.14-0.19]	-0.67[0.78--0.57]***	-0.26[-0.35--0.17]***
Hospital site			
Tertiary	**Ref**	**Ref**	**Ref**
Other	-0.07[-0.24-0.11]	-0.01[-0.09-0.07]	-0.04[-0.10-0.03]

*= significant code, * '<0.05' ** '<0.001' *** '<0.0001'

4.3f Factors associated with irrational prescription.

A Poisson model to estimate association of sex of respondent, specialty, age, number of years of practice and place of work with irrational prescription predicted that female dentists had an increase odd of 0.09(-0.22-0.39) to prescribe antibiotics irrationally with a unit increase in the

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number of patients seen and a statistically significant decrease odds of -0.63 (-1.27-0.01) to prescribe analgesics irrationally with each increase in patient count compared to male counterpart. Age was seen to have an inverse association with irrational prescription as increase in age was seen to have reduced risk of irrational antibiotics and analgesics prescription. Also, medical officers and specialists who are seniors to house officers were also found to have reduced odds of irrational antibiotics prescription with that of maxfacs surgeons and restorative specialist seen to be statistically significant. However, an increase in odds of irrational analgesic use was seen among the various specialty groups as compared to house officers with Maxfacs surgeons been the exception. Those who had practiced for 2years and above were seen to have an increase odd of prescribing antibiotics irrationally compared to those in their first year of practice, this finding was significant. Hospital facility had no significant association with irrational drug use. This is shown in table 4.14.

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Table 4.14: Poisson estimation showing factors influencing the domains on irrational prescription of drugs among dental practitioners in Greater Accra region

Demographic characteristics	Domains			
	Antibiotics	Prophylaxis	Analgesic	Overall
Sex				
Male	**Ref**	**Ref**	**Ref**	**Ref**
Female	0.09[-0.22-0.39]	0.05[-0.36-0.46]	-0.63[-1.27-0.01] *	-0.11[-0.36-0.15]
Age group				
≤26	**Ref**	**Ref**	**Ref**	**Ref**
27-29	-0.45[-0.78--0.12] **	0.04[-0.39-0.48]	-0.19[-0.92-0.53]	-0.13[0.41-0.14]
30+	-0.69[-1.47-0.09]	-0.76[-1.76-0.23]	-0.22[-1.06-0.62]	-0.56[-1.05--0.07]*
Specialty				
House officer	**Ref**	**Ref**	**Ref**	**Ref**
Medical officer	-0.36[-0.94-0.21]	-0.77[-1.78-0.32]	0.61[0.19-1.03]**	-0.29[-0.62-0.49]
Maxillofacial surgeon	-0.49[-1.38-0.38]	-1.14[-1.74-0.53]***	-0.59[-2.16-0.97]	-0.75[-1.01-0.49]***
Restorative	-0.81[-1.08--0.54]***	0.003[-0.5-0.51]	0.41[-1.34-2.17]	-0.11[-0.74-0.53]
Orthodontist	-0.84[-2.28-0.59]	0.35[-0.13-0.83]	0.93[0.03-1.81]*	0.20[-0.11-0.50]
Years at work				
1 year	**Ref**	**Ref**	**Ref**	**Ref**
2+years	1.03[0.33-1.72]**	0.85[-0.07-1.77]	-0.77[-1.44--0.09]*	0.46[0.05-0.87]*
Hospital site				
Tertiary	**Ref**	**Ref**	**Ref**	**Ref**
Other	-0.15[-0.46-0.16]	0.06[-0.26-0.38]	0.23[-0.31-0.78]	0.04[-0.18-0.27]

*= significant code, * '<0.05' ** '<0.001' *** '<0.0001'

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CHAPTER FIVE

DISCUSSION

5.1 Discussion

Common dental conditions managed at dental facilities are inflammatory in nature, with many due to infections. These conditions in some occasions lead to the prescription of antibiotics and / or analgesics. The prescriptions of these medicines in some scenarios have been observed by some studies as irrational.

From this study the most preferred first line antibiotics of choice by dentist were amoxicillin and metronidazole. The preference of these two antibiotics was shown in the pattern of drug prescription observed from practitioners as amoxicillin was the most prescribed followed by metronidazole. This observation is similar to reports from other studies among dental practitioners where amoxicillin and metronidazole were the most prescribed antibiotics in patients with no medical allergies receiving dental care (Maslamani & Sedeqi, 2018). A similar observation to that observed among Uganda oral healthcare providers which indicated that amoxicillin and metronidazole were prescribed together as observed in this study (Kamulegeya, William , & Rwenyonyi, 2011). Also, the combination of amoxicillin and metronidazole prescribed together for patients by dentists was considered the most prescribed pattern of antibiotics (30%) by another study (Pavan k. et al, 2013). This preference may be due to the polymicrobial nature of most dental infections and the broad-spectrum coverage of these medicines. Clindamycin was the preferred second-line antibiotic of choice in patients with known allergies followed by azithromycin which is a macrolide. The preference of clindamycin followed by macrolide as second line antibiotics of choice in dental care has also been reported (Mainjot et al., 2009). This finding is contrary to reports from other studies that indicated macrolides (azithromycin/erythromycin) as the preferred second line drugs (Naveen, et al., 2015; Pavan et al., 2013). However, clindamycin was indicated

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as a preferred second-line antibiotic of choice in patients who are allergic to penicillin drugs in some studies (Gaballah et al., 2018; Segura-Egea, et al., 2010). The choice of clindamycin as the second line antibiotic can be attributed to the fact that most respondent (93.75%) in this study were aware of the bone penetrative effect of this medicine as compared to azithromycin. Antibiotics were prescribed mostly in patients who were diagnosed with localized dental abscess 51% and patients who had their teeth extracted 64% which is consistent with other studies (Kamulegeya, William , & Rwenyonyi, 2011;Salako, Rotimi, & Al-Mutawa, 2004; Naveen, et al., 2015).

On assessing RMU with respect using the WHO prescriber indicators; the average number of drugs per encounter was 2.4 greater than the less than 2.0 recommended by WHO. This average number of drugs per encounter indicate the prescription practice of polypharmacy that is associated with irrational drug use. Howbeit this average is lower than that seen in other Ghanaian studies. Percentage of encounters with antibiotics was 86.67%, this high antibiotic prescription rate is a clear indication for irrational medicine use. These were prescribed mostly after tooth extractions and patients who presented with periapical abscesses. This finding of high rate of antibiotics prescribed after dental procedures and patients who presented with dental infections have been observed in other studies (Kamulegeya, William , & Rwenyonyi, 2011). Most of the antibiotics were prescribed using their generic name (89.13%), and was consistent with the preference of dentist to prescribe drugs using generic name (88.89%), although the proportion was below the ideal WHO recommendation of 100% it is higher than that observed by many studies conducted among dentist. A study conducted by Gowri, Mehta, & Kannan (2015) showed that malority of dentist preferred to prescribe antibiotics by brand name 64.2% which is contrary to observations made in this study. All antibiotics were prescribed without laboratory investigation to identify which medications were sensitive to the causative microorganisms. The lack of culture and

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sensitivity report in prescribing antibiotics is a clear indication of irrational medicine use. Some patients received antibiotics with no stated diagnosis, postponed treatment and no intended treatment.

Clinical conditions that the respondents considered before prescribing medication in descending order were, evidence of systemic spread, after MOS, swellings, presence of radiographic apical pathology, pain, uncertainty about diagnosis and after routine scaling and polishing. Although a greater number of proportion indicated that they would prescribe antibiotics in patients with evidence of systemic spread and after MOS which have been accepted as indications for antibiotics use in dentistry and by extension an indication of RMU, the fairly high number of respondents indicating to prescribe antibiotics when there is swelling 74.29% and 60.00% in presence of apical pathology on radiographic findings is worrying since some of these conditions may not be infections and would lead to irrational drug use. The indication by some respondent to prescribe after routine scaling and polishing, after endodontic treatment and when uncertainty about diagnosis which do not need antibiotics also gave a clear indication of the tendency of these prescribers to prescribe antibiotics irrationally, however only a few respondents cited these as reasons to prescribe. Although there were differences observed in the responses based on clinical factors that influences antibiotics prescription with respect to sex, age group, specialty, it was not statistically significant. Nonscientific situations such as patient demand 5.36% of responses, uncertainty of diagnosis 4.46% of responses and postponed treatment 14.29% of responses which have led to antibiotic prescription in other jurisdiction were found to be low which is similar to findings reported by (Naveen, et al., 2015; Salako, Rotimi, & Al-Mutawa, 2004). This is a relevant positive outcome seen in this study since it is an indication that inappropriate use of antibiotics related to these factors is low.

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Knowledge gained from training institution and uses of STG were the two leading non clinical factors that respondents stated that influenced their prescription. Although the use of STG would lead to RMU, assessing the pattern of prescription observed in this study the use of knowledge gained from training institution to prescribe may not be a good source of rational prescription of antibiotics. Facility protocol/ essential drug list had little influence on prescribers in this study. This was evidently displayed by few respondents having knowledge on the existence of hospital protocol and about half of these numbers actually stating that they always prescribe by using theses protocols. Over fifty percent of respondent also indicated to prescribe antibiotic due to increasing workload and rescheduling of appointment which is inappropriate. Patient demand and pharmaceutical drug promotion had little influence on prescribing behavior of respondent with no observed statistical significance difference with respect to age group, specialty sex. Although these factors are inappropriate the low response is a positive outcome on RMU with respect to these two factors. On antibiotics prophylaxis 97% indicated risk of IE and 58% for total joint replacement surgery. Although these conditions have been outlined indication for antibiotics prophylaxis, about half of respondents did not know that patient with history of total joint replacement surgery is an indication for prophylaxis. Conditions such as septal defects and patients with pacemakers who according to AHA do not need antibiotic prophylaxis were cited by more than half of respondent as indication for antibiotics prophylaxis. Immunosuppression was also considered highly among respondents for antibiotics prophylaxis, this condition has also been considered by respondents in a study (Gowri, Mehta, & Kannan ,2015). Diabetes and AIDS were the least considered for antibiotics prophylaxis. It was observed that sex, number of years of practice and specialty have no statistically significant effect on conditions considered for antibiotics prophylaxis during dental care.

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Analgesics are used in dental care to manage pain and in some situations for their anti-inflammatory effects. The rational use of analgesics is likened to prescribing minimal number of antibiotics which would provide effective pain relief for patients at a cost that the patient can afford with no economic burden on patient or patient family. Some studies done to evaluate analgesic use in dental practice and healthcare have identified irrational prescribing among health care professionals. In this study the response given by respondents to prescribe analgesics in situations where they are uncertainty of diagnosis, based on patients demand and when treatment is postponed gives a clear indication of irrational analgesics. Considering factors that have been recognized to lead to rational prescription of analgesics, all respondents considered the severity of pain, 72% of cases considered the medical condition of patient which includes allergies and comorbidities and 63% of cases indicated the importance of age. In a study by Jayadev et al (2014) 18% of respondent considered medical state of patient and 10% considered patient's age. Although the observation for these two factors is high compared to what was reported by Jayadev et al (2014), dental practitioners in this study have to be trained to improve on their knowledge for rational prescription. Paracetamol was the most prescribed and also most preferred analgesic representing approximately 59% of all prescribed analgesics and 97% of cases respectively. This can be attributed to the safety attributed to this medication. However, this was contradictory to what was observed in study carried out in Western Nepal study report where ibuprofen was the most prescribed analgesic for dental conditions (Sarkar, Das, & Baral, Analgesic use in dentistry in a tertiary hospital in western Nepal, 2004) and other studies where diclofenac was the most prescribed analgesic (Jayadev, et al., 2014). Diclofenac and Ibuprofen which are NSAIDs were the next preferred analgesics after paracetamol, however from the observed diclofenac was the most prescribed NSAID followed by naclofen and then ibuprofen. The preference of NSAIDS can be

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associated with its efficacy in pain relief, anti-inflammatory effect and minimal side effects. Opioids were least preferred and least prescribed. This observation can be attributed to the wide range of side effects associated with opioid use such as constipation, nausea, respiratory depression, sedation and likely hood of addiction. This pattern of analgesic prescription and preference of non-opioid analgesics over opioids is similar to patterns observed by other studies (Azodo & Umoh, 2013; Şermet, Akgün, & Atamer-Şimşek, 2012; Jayadev, et al., 2014; Sarkar, Das, & Baral, 2004). Most of these analgesics were prescribed as oral formulations which concur with that of several studies. All respondent indicated that paracetamol toxicity would lead to hepatic toxicity. This finding showed that most respondents have good knowledge on paracetamol. This knowledge about paracetamol was further seen when most (92%) respondents indicated it as the appropriate analgesic of choice in asthmatics. However, a moderately high number of respondents of approximately 72% knew the maximum daily allowable dose of paracetamol in adult to be 4grams. This observation of correct responses on the toxic dose of paracetamol is high compared to what was reported in a Nigerian study where about 26% gave correct response on the toxic dose of paracetamol. With respect to adverse effect of analgesics approximately 97% of respondent indicated that NSAIDs are not safe in patients with GI bleeding conditions, 67% of respondent answered correctly that opioids analgesics have constipation as their side effect and 89% of respondents answered correctly that paracetamol is not contraindicated in pregnancy. Although the knowledge exhibited on opioids in this study is low compared to that of non-opioids it is higher compared to that reported by another African study (Azodo et al, 2013). This observation can be attributed to the low preference and prescription of opioids as compared to non-opioids as reported on by other studies and also seen in this study.

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Several factors have been associated with prescribing behavior of dental practitioners (Jayadev, et al., 2014; Azodo CC, Umoh AO., 2013). In one of such studies the female sex was associated with irrational medicine use due to their likelihood to prescribe medication when influenced by patient (Khaw, Lim, & JK, 2009; Jayadev, et al., 2014; Alkhabuli, Kowash, & Shah, 2016). Also, maxillofacial specialists were seen to have a positive association with rational medicine use. In this study a similar finding was seen as dentists in the field of maxillofacial surgery and restorative department had a significant reduced odds to prescribe antibiotics irrationally to their patients. Also, age of dentists was shown to have a positive association with rational medicine use. However, the female dentists were identified to have a reduced odds to prescribe analgesics irrationally to their patients. This finding of female dentists to prescribe irrationally is contrary to finding that have been reported by other studies.

5.2 Study limitation

This study was conducted at the hospital setting and therefore was unable to evaluate inappropriate drug use among patients. Also, the short duration of study lead to limited data on prescribing behavior of dentists

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CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

In this study the preferred antibiotics and most prescribed antibiotics were amoxicillin and metronidazole, and were mostly prescribed together. These medications were mostly prescribed without evidence since culture and sensitivity reports were not requested which may lead to irrational use. The pattern of antibiotics use in this study points to likely inappropriate use of antibiotics which is not satisfactory in healthcare delivery. On analgesics use non-opioids analgesics were preferred and prescribed the most. Majority of dentist had fairly good knowledge on the various analgesics that they mostly prescribe, however more education needs to be done to equip all prescribers with adequate knowledge on the antibiotics and analgesics that they prescribe. Sex as a factor was proven to have influence on the source of knowledge on prescribed drugs and knowledge on some prescribed antibiotics, with most female respondents not indicating scientific publication as sources of information on prescribed medication and a greater proportion exhibiting poor knowledge on some prescribed antibiotics. Number of years of practice, age of dentist, specialty, and hospital facility did not have any influence on their prescription behavior. Patient demand and pharmaceutical promotion were also proven to have minimal effect on the prescribing behavior of dentist.

6.2 Recommendation

The study provides the following recommendation;

6.2.1 Implication for Practice

1. Hospital facilities and Dental faculties should organize regular CPD sessions for dental practitioners to provide updates on rational medicine use.

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2. Provision of facility and unit essential drug list and/or make available hospital treatment protocol to all dental practitioners by Hospital facilities, to promote adherence to right prescribing practice.
3. Hospital facilities, Dental faculties and the GHS should conduct Surveillance on drug prescription from dental facilities to provide regular information on prescription practice to help improve healthcare delivery

6.2.2 Implication for policy makers

1. The Ghana Health Service and Health facilities should put in place strategies to improve availability and adherence to treatment guidelines should be put in place to foster RMU among dental prescribers.
2. The Medical and Dental council should be put in place policies that would make CPD sessions on RMU mandatory for all practicing dental professionals

6.2.3. Implication for research

1. Dentist and other relevant stakeholders should conduct household surveys should be conducted among patients who have received dental prescriptions to evaluate their compliance and also to gather data on any adverse events that occurred when they took the prescribed medication.
2. Prospective study should be conducted by dentists, public health officers and researchers to gather enough data on prescribing behavior of dentist in other jurisdictions of Ghana.

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APPENDIX I (INFORMED CONSENT FORM FOR RESPONDENTS)

TITLE- AN EVALUATION OF THE PATTERN OF DRUG PRESCRIPTIONS AMONG DENTAL PRACTITIONERS IN THE GREATER ACCRA REGION OF GHANA.

Principal investigator: Dennis Appiah Bolfrey.

Qualification: MPH Student.

Introduction: I am Dennis Appiah Bolfrey, a post- graduate student of the University of Ghana School of Public Health, undertaking a study on the above topic as partial fulfilment of my Master's in public health program.

Background and Purpose of study: Irrational use of antibiotics and analgesics among dentist has been identified among dentist. This pattern of prescription has been associated with both clinical and non-clinical factors. Antimicrobial resistance and adverse drug reaction have been identified to result from irrational use of these medicines. The purpose of this study is to evaluate antibiotic and analgesics prescription pattern among dental practitioners, and factors which influence practitioners to prescribe these medications. This is aimed at identifying inappropriate prescription practice and to provide information to relevant stakeholders to facilitate the delivery of quality healthcare to patients.

Nature of Research: This study seeks to interview dental practitioners practicing in selected facilities in Accra metropolis and also to extract data from patient records.

The information you will provide will be vital to establishing the objectives of this study and you are assured that your information will be treated with the uttermost confidentially. Your written consent in a form of your signature is required before the questionnaire can be administered, for

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any participant who can't sign for any reason a thumbprint option is available in the presence of a credible witness.

Potential Risks and Discomforts: In participating in this study, I will be asking you to share some personal views and experiences on antibiotics and analgesics prescription with me and you may feel uncomfortable talking about some of the topics due to past events. You do not have to answer every question or take part in the research if you don't wish to do so.

Voluntary Participation: Participation in this study is voluntary and you can choose to partake, you are at liberty to withdraw from the study at any time, however your participation and cooperation is encouraged since it's vital for the study.

Additional Costs and Compensation: You will not have to spend money in partaking in this study and you will not be compensated for participating. If you voluntarily accept to participate in the study, you will be asked to fill the questionnaires and information on prescription from folders of client you have attended to would be collected during working hours when convenient. You will only have to spare 20-30 minutes of your time to answer the questions I will ask.

Confidentiality: No information shared with me will be disclosed to any of your community members or to anyone who is not part of the study team. The information that I will collect from this study will be used only for academic purposes and the purpose for which this information is been solicited.

Provision of information sheet and consent form: A copy of the information sheet will be given to you after you have read, understood and signed or thumb printed to take home.

Contacts for Additional Information: If you have any questions about this research, you can ask them now or later. If you wish to ask questions later, you may contact me, Dennis Appiah Bolfrrey,

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School of Public Health, College of Health Sciences, University of Ghana, Legon, on the following number 0247112360 or via email:dabolfrey@yahoo.com. You can also contact the Ghana Health Service-Ethical Review Committee Administrator, Madam Hannah Frimpong, on 0507041223 for any clarifications on ethical issues and your right as participant.

PARTICIPANTS' STATEMENT.

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). I fully understand the contents and any potential implications as well as my right to change my mind (ie 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……

INVESTIGATOR STATEMENT AND SIGNATURE

Brief statement or declaration that investigator has given enough information to participants to make informed decisions.

Example: 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…….

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APPENDIX II (QUESTIONNAIRE)

Title: An Evaluation of The Pattern Analgesics and Antibiotics Prescriptions Among Dental Practitioners in The Greater Accra Region of Ghana

Participant Identification Number [_____]

Location Data		Response option	Code
1	Name of Hospital	UGSMD Dental clinic/KBTH 1 Ridge Hospital 2 Legon Hospital 3 La General Hospital 4 Police Hospital 5	L 1
2	Interviewer ID		L2
3	Date of Completion of the instrument	_____/_____/_____	L3
4	Consent has been read and Obtained	Yes 1 No 2 **If no end**	Q1
5	Interview Language (Insert Language)	English ---------- ----------	Q2
6	Time of Interview	H_____ Min_____	Q3
7	Contact Number (If Possible)		Q4
Section 1: Demographic Characteristics			

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	Questions	**Response**	**Code**
1	Age of last birthday (years)	_____Yrs.	C1
2	Sex of Respondent	Male 1 Female 2	C2
3	What is your specialty	House Officer 1 Medical Officer 2 Maxillofacial surgeon 3 Periodontist 4 Pedodontics 5 Restorative 6 Oral Medicine/Pathology 7 Orthodontics 8 Refused 88	C3
4	Number of years of practice	_____	C4
Section 2: Evaluation of antibiotics and analgesics prescription pattern			
5	Antibiotics are important medicines for treating infections, however their wrong use leads to resistance and	Fever, evidence of systemic spread 1 Swelling 2	D1

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	adverse reactions. Which of these situations will you prescribe antibiotics (most commonly), according to, clinical symptoms and general considerations? Tick as applicable	Pain 3 Uncertainty about diagnosis 4 After extraction / minor oral surgery 5 Presence of periapical pathology in radiographs 6 Routine scaling and polishing 7 After endodontic therapy 8	
6	Do you consider the report of laboratory investigations before prescribing antibiotics	Yes 1 No 2	D2
7	Do you consider antibiotics useful in management of dry socket?	Yes 1 No 2	D3
8	What is your preferred first line antibiotic/ antibiotics of choice with no medical allergies for management of most dental infection? (tick as applicable)	Amoxicillin 1 Metronidazole 2 Amoxiclav 3 Amoxicillin / metronidazole 4 Cephalosporin 5 Clindamycin 6 Doxycycline 7 Other _____ 8	D4

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		(Specify) Others_____ 9 (specify)	
9	What is your second line antibiotic of choice in cases of penicillin allergy? (select one)	Clindamycin 1 azithromycin 2 Doxycycline 3 Cefuroxime 4 Gentamycin 5 Other _____ 6 (Specify) Others_____ 7 (specify)	D5
10	Penicillin stains teeth when given in pregnancy and makes it unsafe	Yes 1 No 0	D6
11	Azithromycin has better bone penetration compared to clindamycin	Yes 1 No 0	D7
12	How do you prefer to prescribe antibiotics by name?	Generic name 1 Brand name 2	D8
13	Crystalline penicillin is prescribed as? _____ (select one)	Oral 1 Intravenous 2	D9

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		Intramuscular 3 Topical 4	
14	Have you prescribed antibiotics due to increase workload and reschedule of patient's appointment?	Yes 1 No 0	D10a
15	Have you prescribed antibiotics due to patients demand or request?	Yes 1 No 0	D10b
16	Have your training institution influence your antibiotics prescription behavior?	Yes 1 No 0	D10c
17	Are you aware of your Hospital prescription protocol?	Yes 1 No 0 if **no skip to D10f**	D10d
18	Do you always prescribe antibiotics according to your facility essential medicine list?	Yes 1 No 0	D10e
19	Have you prescribed antibiotics based on knowledge obtained from standard treatment guidelines or journal publication	Yes 1 No 0	D10f
20	What formulation of antibiotics do you prescribe?	Oral 1 Intravenous 2 Intramuscular 3 Topical 4	D11

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21	Have you ever prescribed antibiotics due to influence from pharmaceutical promotion	Yes 1 No 0			D12
22	Which of these medical scenarios would you give antibiotic prophylaxis? A. Risk infective endocarditis/ infective endocarditis B. Total knee joint replacement surgery C. AIDS D. Diabetes E. Ventricular septal defect F. Patient on immunosuppressant G. Pacemakers		Yes	No	D13
		Endocarditis	1	0	A
		Knee replacement	1	0	B
		AIDS	1	0	C
		Diabetes	1	0	D
		Septal defect	1	0	E
		Immunosuppression	1	0	F
		Pacemaker	1	0	G
23	What factors influence your choice of analgesics? Tick as many as applicable	Pain severity	1		D14
		Patient's medical condition	2		
		Age of patient	3		
		Uncertainty of diagnosis	4		
		Patient request	5		
		When treatment is postponed	6		
24	Which of these analgesics do you mostly prescribe? tick as applicable	Paracetamol	1		D15
		Ibuprofen	2		

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		Diclofenac 3 Tramadol 4 Others _____ 5 (specify)	
25	Paracetamol toxicity has been associated with hepatic injury	Yes 1 No 0	D16
26	Which of these analgesics would you prescribe for an asthmatic with dental pain? Select most appropriate	Paracetamol 1 Diclofenac 2 Tramadol 3 Ibuprofen 4	D17
27	It is safer to prescribe NSAID in patient who has been treated for gastro-intestinal bleeding?	Yes 1 No 0	D18
28	What is the maximum dose of paracetamol for a normal healthy adult/ 24hours? Select most appropriate	3 grams 1 4 grams 2 5grams 3 6grams 4	D19
29	Constipation is a known side effect of opioid analgesics	Yes 1 No 0	D20
30	It is safer to prescribe NSAID in patient who has been treated for gastro-intestinal bleeding?	Yes 1 No 0	D21

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31	Paracetamol is contraindicated during first trimester of pregnancy?	Yes 1 No 0	D22
32	What formulation do you usually prescribe analgesics?	Oral 1 Intravenous 2 Intramuscular 3 Suppository 4	D23
33	By what means do you remain information on current drug prescription protocol? Select as applicable	Colleagues/senior faculty members 1 CPD programs organized by hospital 2 Pharmaceutical presentations 3 Scientific publications 4 Standard treatment guidelines 5	D24
34	Do you know of your facility prescription protocol?	Yes 1 No 0	D25
35	Are you aware of your facility adopted essential drug list?	Yes 1 No 0	D26

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APPENDIX III (DATA FORM FOR PATIENT)

Form number……

A. Demographics	
Name of patient (initials)	‘ ……
Folder number	……
Age (last birthday)	_____
Sex:	1.male ☐ 2. female ☐
B. Clinical data	
Presenting complaint.	
Past medical history (disease)	
Drug allergies	
Diagnosis	
Treatment done	
Prescribed medication	

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APPENDIX IV (ETHICAL APPROVAL)

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com

MyRef. GHS/RDD/ERC/Admin/App/19/333
Your Ref. No.

19th July, 2019

Dennis Appiah Bolfery
P.O. Box 142
Kasoa

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 045/04/19**
Project Title	An Evaluation of the Pattern of Analgesics and Antibiotics Prescriptions among Dental Practitioners in the Greater Accra Region of Ghana
Approval Date	19th July,2019
Expiry Date	18th July, 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

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