Knowledge, Attitude and Practice of Self-medication with Antibiotics among General Public in Kathmandu Valley, Nepal: A Cross-sectional Survey

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Public Health Program in Public Health
College of Public Health Sciences
Chulalongkorn University
Academic Year 2017

ความรู้ ทัศนคติ และพฤติกรรมการใช้ยาปฏิชีวนะรักษาตนเองในประชาชนทั่วไปในหุบเขากาฐมาณฑุ ประเทศเนปาล: การวิจัยภาคตัดขวาง

นายพาริชาน ชเรสทรา

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2560

Thesis Title	Knowledge, Attitude and Practice of Self-medication with Antibiotics among General Public in Kathmandu Valley, Nepal: A Cross-sectional Survey
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Field of Study	Public Health
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Accepted by the College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

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พาริชาน ชเรสทรา : ความรู้ ทัศนคติ และพฤติกรรมการใช้ยาปฏิชีวนะรักษาตนเองในประชาชนทั่วไปในหุบเขากาฐมาณฑุ ประเทศเนปาล: การวิจัยภาคตัดขวาง (Knowledge, Attitude and Practice of Self-medication with Antibiotics among General Public in Kathmandu Valley, Nepal: A Cross-sectional Survey) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: พีระศักดิ์ จันทร์ประทีป, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: วันดี ศิริโชคชัชวาล, 157 หน้า.

ปัญหาการใช้ยาปฏิชีวนะที่ไม่เหมาะสมส่งผลให้เกิดการแพร่กระจายของเชื้อแบคทีเรีย อันเป็นเหตุให้มีผู้เสียชีวิตนับพันรายทุกปี ประเทศเนปาลเป็นหนึ่งในประเทศที่มีอัตราการใช้ยาปฏิชีวนะรักษาตนเองที่สูงขึ้น การวิจัยนี้จึงมีจุดมุ่งหมายที่จะศึกษาความรู้ ทัศนคติ และการปฏิบัติตนในการใช้ยาปฏิชีวนะของคนทั่วไป

งานวิจัยนี้เป็นการวิเคราะห์ตามขวางและเก็บข้อมูลจากการตอบแบบสอบถาม ซึ่งเก็บข้อมูลในเดือนพฤษภาคม ปี พ.ศ. 2561 ประชากรที่ใช้การวิจัยมีจำนวน437 คน อาศัยอยู่ที่ตำบล 16 เขตเทศบาลกาฐมาณฑุ ประเทศเนปาล การวิเคราะห์ข้อมูลประกอบด้วยการวิเคราะห์เชิงปริมาณ ซึ่งใช้สถิติเชิงพรรณนาเพื่ออธิบายลักษณะทั่วไป (ด้านประชากร ด้านเศรษฐกิจ และระยะทางจากสถานบริการทางสุขภาพที่ใกล้ที่สุด)และระดับความรู้ ทัศนคติ และการปฏิบัติ ส่วนการวิเคราะห์ข้อมูลเชิงคุณภาพใช้การวิเคราะห์เนื้อหาการทดสอบไคสแคว์ถูกนำมาใช้เพื่อหาค่าความสัมพันธ์ระหว่างลักษณะทั่วไปและระดับความรู้ ทัศนคติและการปฏิบัติ และการวิเคราะห์พหุตัวแปรถูกนำมาใช้เมื่อมีความจำเป็น (โลจิสติกส์พหุกลุ่ม)

ผลการวิจัยพบว่า จากจำนวนกลุ่มตัวอย่างทั้งหมด 437 คน ประชากรมีความรู้เกี่ยวกับยาปฏิชีวนะ

ในระดับต่ำมากมีจำนวนร้อยละ 31.1 ประชากรมีทัศนคติที่ไม่ดีต่อยาปฏิชีวนะมีจำนวนร้อยละ 16.2 ในขณะที่ประชากรใช้ยาปฏิชีวนะรักษาตนเองมีจำนวนร้อยละ 10 ระยะเวลาหนึ่งปี เพศ สถานภาพสมรส การศึกษา อาชีพและ รายได้มีความสัมพันธ์กับระดับความรู้ ขณะที่ อายุ สถานภาพสมรส การศึกษาและอาชีพมีความสัมพันธ์กับระดับทัศนคติที่ร้อยละ 95 ในขณะที่ไม่มีความสัมพันธ์กับระดับปฏิบัติ เพศชายที่มีการศึกษาระดับมัธยมศึกษาตอนปลายหรือต่ำกว่า ประกอบอาชีพอิสระและมีรายได้ต่ำกว่า 30,000 เนปาลรูปี เป็นกลุ่มคนที่มีความรู้น้อยมาก (P-Value<0.05) ขณะที่ผู้ที่มีการศึกษาระดับมัธยมศึกษาตอนปลายหรือต่ำกว่า ประกอบอาชีพบริษัทหรือประกอบอาชีพอิสระถูกพบว่าอยู่ในกลุ่มคนที่มีทัศนคติระดับต่ำ(P-value<0.05)

การวิจัยนี้แสดงให้เห็นว่า การใช้ยาปฏิชีวนะในระดับต่ำของการศึกษานี้แสดงว่าเป็นการปฏิบัติที่ดีซึ่งอาจเป็นผลมาจากการที่ประชากรอาศัยอยู่ในเมือง ความรู้เกี่ยวกับยาปฏิชีวนะที่อยู่ในระดับต่ำแสดงให้เห็นว่ารัฐบาลจำเป็นต้องให้การศึกษาเรื่องการใช้ยาปฏิชีวนะที่ถูกต้องให้แก่กลุ่มเป้าหมายทั้งประชากรในเขตเมืองและชนบท

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2560 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

6078849153 : MAJOR PUBLIC HEALTH
KEYWORDS: ANTIBIOTICS / SELF-MEDICATION / ANTIBIOTIC RESISTANCE / NEPAL

PARISHAN SHRESTHA: Knowledge, Attitude and Practice of Self-medication with Antibiotics among General Public in Kathmandu Valley, Nepal: A Cross-sectional Survey. ADVISOR: PROF. PEERASAK CHANTARAPRATEEP, D.V.M., M.Sci. Vet., CO-ADVISOR: WANDEE SIRICHOKCHATCHAWAN, Ph.D., 157 pp.

Background: The inappropriate use of antibiotics has led to development and spread of bacterial resistance globally resulting in thousands of deaths every year. In Nepal, the prevalence of self-medication with antibiotics is higher. This study is designed to determine the knowledge, attitude and practice of self-medication with antibiotics among the general public.

Methods: The study was a cross-sectional survey conducted during the month of May, 2018 among 437 general public of Ward number 16 of Kathmandu Metropolitan using standardized questionnaire which has been validated and reliability tested. Descriptive statistics were used to describe the general characteristics (socio-demographic, socio-economic and distance from nearest health facility) and level of knowledge, attitude and practice. Chi-square test was used to determine the association between general characteristics and level of knowledge, attitude and practice and multivariate analysis was used when needed (multinomial logistic regression).

Result: Out of 437 participants, 31.1% had poor knowledge on antibiotics, 16.2% had poor attitude while around 10.0% self-medicated with antibiotics within the last 1 year. Gender, marital status, education, occupation and income were associated with level of knowledge while age, marital status, education and occupation were associated with level of attitude at 95% confidence interval whereas none were associated with level of practice. Being male, single, education of high school or lower, and lower income were statistically significant with poor knowledge (p-value < 0.05) while being single, educational of high school or lower, with employment and in non-health related field were found to be independently associated with poor attitude (p-value < 0.05).

Conclusion: Although, low prevalence of self-medication with antibiotics in this study indicates good practice which could possibly be due to urban population, low knowledge on antibiotics underscore the need of educational interventions from the government on rational use of antibiotics targeting both rural and urban population.

Field of Study: Public Health
Academic Year: 2017

Student's Signature .....
Advisor's Signature .....
Co-Advisor's Signature .....

ACKNOWLEDGEMENTS

I would like to express my utmost gratitude to my advisor Professor Peerasak Chantaraprateep and co-advisor Dr. Wandee Sirichokchatchawan who have been continuously guiding me throughout my thesis. This study would not have been completed without their valuable advice and encouragement.

I would also like to take this opportunity to thank Mr. Shakil Shrestha, Mr. Prajwal Dixit and Ms. Ruchi Pathak for their invaluable time and support during my data collection stage. I am grateful to all those people who participated in this study.

I would also like to extend my thanks to the administrative staffs of College of Public Health Sciences (CPHS) for their support during my study at CPHS. A special thanks goes to all my friends at College of Public Health Sciences for their support and guidance for the past one year.

Lastly, I would like to thank my family for their unconditional love, support and encouragement.

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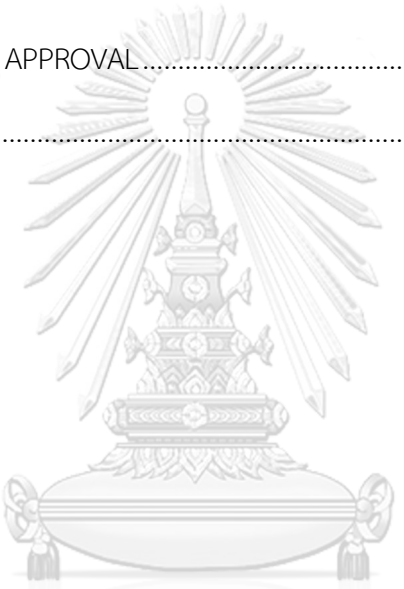

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LIST OF ACRONYMS

AMR - Antimicrobial Resistance

CDC - Centers for Disease Control and Prevention

IOC - Inter-Objective Validity

IPC - Infection Prevention and Control

KAP - Knowledge, Attitude and Practice

MDR - Multi-drug resistant

OTC - Over the counter

WHO - World Health Organization

CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Antibiotic Resistance is a situation that occurs when bacteria evolve or change in such a way that make drugs used to treat the infections they cause ineffective (World Health Organization, 2017e). The emergence and spread of bacterial resistance is a growing global public health concern as the rapid development of antibiotic resistance in bacteria have the potential to kill, spread globally, and impose huge costs to individuals and society (Awad & Aboud, 2015; World Health Organization, 2017e). Antibiotic Resistance has reached to an alarming level in most of the countries rendering only few treatments applicable for treatment of most of the common infectious diseases (World Health Organization, 2014). Furthermore, health expenditure is higher for the individuals who have resistant bacteria than for those who have not developed resistance. This is due to prolonged duration of illness, additional tests, and need of newer generation of antibiotics and more expensive drugs. According to the World Health Organization's (WHO) Antimicrobial Resistance Global Report on Surveillance, post-antibiotic era is a situation where common infections and minor illness has the potential to cause deaths (World Health Organization, 2014).

The crisis of antibiotic resistance, today, is a totally different and more dangerous situation compared to those that occurred in the past. The primary reason is due to the involvement of several different bacteria in causing resistance as studies have found (Rather, Kim, Bajpai, & Park, 2017). The situation is further aggravate as a result of lack of options in treatment due to very limited new discoveries of newer antibiotics in recent years (Bartlett, Gilbert, & Spellberg, 2013; Piddock, 2012). Drug manufacturers are not keen on investing in the discovery and development of newer and higher generations of antibiotic drugs owing to increasing cost of clinical development and change in focus of pharmaceutical companies to chronic diseases

(Bartlett et al., 2013; Golkar, Bagasra, & Pace, 2014; Gould & Bal, 2013; Piddock, 2012; Wright, 2014).

In the US alone, antibiotic resistance has resulted in more than two million illnesses of which around 23,000 patients die from the lack of treatment options and further complications caused by antibiotic resistant microbes that are difficult to diagnose; besides, health care expenditure for the treatment of antibiotic resistant infection being in the range of $21 to $34 billion dollars per year and 8 million additional days in hospital (U.S. Department of Health Services, 2013; World Health Organization, 2014). It has been estimated that by 2050, antibiotic resistance will lead to 10 million deaths all across the world (O'Neill, 2014).

Although antibiotic resistance occurs naturally over time as a result of genetic changes of the microbes, several other factors have been attributed to the emergence and development of resistance. Among them, self-medication which involves the use of medicines by oneself or on some other person's suggestion without consultation and prescription from a medical doctor, has been recognized as one of the cardinal reason contributing to development of antibiotic resistance (Rather et al., 2017). Therefore, the practice of self-medication has accelerated the process of development of resistance (World Health Organization, 2017b). Furthermore, following the success of use of antibiotics in humans, antibiotics have also been increasingly and indiscriminately used in the treatment and prevention of diseases in animals, fish and plants. Sub-therapeutic doses of antibiotics are used as feed supplement and/or growth promoters in animal rearing practices, especially in intensification of livestock industry due to its ability to lower the cost of production by enhancing the growth rates, reducing the morbidity and mortality rates from bacterial infections, and improving feed efficiency (Cars & Nordberg, 2005; Graham, Boland, & Silbergeld, 2007). The practices of self-medication with antibiotics and its excessive use in livestock has contributed to the emergence of "multi-drug resistant" (MDR) bacteria which are the resistance towards at least one agent in three or more antimicrobial category (Magiorakos et al., 2012). MDR bacteria are then transmitted from farm animals to humans via the food chain or through direct contact. The

spread of resistance in humans is further aggravated by travel of people across the globe, facilitating spread of antibiotic resistant bacteria to a greater number of people and from one location to another (World Health Organization, 2013).

Self-medication with antibiotics leads to its inappropriate and excessive use (Lv et al., 2014), and is highly prevalent in developing countries especially in the absence of proper regulatory system (Ramanan Laxminarayan & David L. Heymann, 2012). Studies have reported that about 81% of the world's population use over-the-counter (OTC) medicines, of which 50% of the antibiotics are purchased and used over the counter (Cars & Nordberg, 2005), indicating that antibiotics are the most commonly used drugs for self-medication.

Some of the inappropriate practices in self-medication include short duration of treatment, inadequate dose, sharing of medicines, and stopping of treatment upon improvement of disease symptoms (Skliros et al., 2010). Reasons behind inappropriate and excessive use of antibiotics arise from various factors such as knowledge and experience of the prescriber, uncertainty in diagnosis, perception of patients in relation to patient-prescriber interaction, and insufficient patient education by health care professionals. In addition, patient's knowledge, attitude towards antibiotics use, and patient's experience with the antibiotics also contribute to the practice of self-medication (Awad & Aboud, 2015; Davey, Pagliari, & Hayes, 2002; Franco, Martínez, Rodríguez, & Wertheimer, 2009; Hulscher, van der Meer, & Grol, 2010). Furthermore, since people are exposed to advertisements either on the television, radio, internet or other print media and advices from friends and family members, it becomes easy for people to start practicing self-medication without any consultation with a medical practitioner. Another reason attributed to individuals practicing self-medication is the expensive healthcare system. People, especially in low income countries are not economically strong and therefore cannot afford the cost of clinical care. There is also a belief among individuals that going to hospitals or other healthcare service providers is too much of a hassle which is another reason for the practice of self-medication (Rather et al., 2017). Governments in developing countries have also played a part in self-medication as they allow and encourage

people to treat minor illness by themselves so as to reduce the cost of treatment and save limited resources they have (Nathan & Cars, 2014a).

Self-medication with antibiotics is also associated with serious health hazards in addition to drug dependency, insufficient dose, misdiagnosis of an underlying condition, prolongation of illness, among others (World Health Organization, 2004b). Overdose of antibiotics can also cause various adverse drug reactions such as skin problems, allergies, and hypersensitivity (Bennadi, 2013). In most of the cases, adverse drug reactions are mild; however, life-threatening adverse effects have also been reported such as from *Clostridium difficile* associated diarrhea, hepatotoxicity due to amoxicillin and clavulanate (Chang & Schiano, 2007; Martin, Micek, & Wood, 2010). In the US, approximately 20% of all the drugs related emergency visits are due to antibiotics. Although almost 80% of such visits are due to allergic reactions, some of the cases have been found to range from gastrointestinal to neurologic and psychiatric abnormalities (Lode, 2010).

Compared to developed nations, the problem of self-medication is widespread and difficult to control in developing ones due to lack of proper knowledge and awareness regarding the use of antibiotics (Borg & Scicluna, 2002; Ramanan Laxminarayan & David L Heymann, 2012; Morgan, Okeke, Laxminarayan, Perencevich, & Weisenberg, 2011; Ocan et al., 2014). In addition, due to lack of monitoring and record keeping overall estimation and determinants of self-medication with antibiotics is difficult to measure, which further exacerbates the problem in resource limited low income countries (C. M. Hughes, McElnay, & Fleming, 2001).

A study conducted in Jordan found that out of 477 patients interview, 40% of the study participants administered antibiotics without a prescription (Sawair, Baqain, Abu Karaky, & Abu Eid, 2009). Purchasing antibiotics without prescription is a very common practice in self-medication. 64% of the people were found to purchase antibiotics without prescription in pharmacies, according to a study conducted in Yogyakarta City, Indonesia (Widayati, Suryawati, de Crespigny, & Hiller, 2011). Likewise, 18% of the customers who visited pharmacies (11) in Kerela State of India were

found to purchase antibiotics without a medical prescription (Saradamma, Higginbotham, & Nichter, 2000). Studies have also been conducted among university students, both medical and non-medical regarding self-medication. Around 47.6% of the non-medical students in 6 different non-medical universities in Karachi who participated in the study regarding self-medication with antibiotics reported to have self-medicated themselves with antibiotics (Shah et al., 2014). Similar higher percentage (39.3%) of the medical students were also found to self-medicate themselves with antibiotics in a study conducted among medical students in Kasturba Medical College, Mangalore, India (Kumar et al., 2013).

The scenario in Nepal is not much different either. Studies conducted in the two major valleys of Nepal, Pokhara and Kathmandu, have found high prevalence of self-medication, 59% and 56%, respectively (Basnet, Gautam, & Subedi, 2016; Shankar, Partha, & Shenoy, 2002). The problem of self-medication in Nepal is further exacerbated as medicines, including antibiotics, can be easily purchased from retail drug stores without prescription and the practice of unnecessary dispensing of antibiotics by retailers (Banerjee et al., 2016; Wachter, Joshi, & Rimal, 1999).

Understanding patterns of use of antibiotics and factors associated with self-medication with antibiotics are critical in controlling the inappropriate practices associated with it, especially in low income countries to lower the burden of antibiotic resistance. However, only a few studies have been conducted regarding antibiotic misuse in Nepal. Studies that have been conducted are amongst medical, dentistry, pharmacy and nursing students in universities in Nepal and reported self-medication with antibiotics at higher levels up to 46.2% (Banerjee et al., 2016; Bhattarai, Basyal, & Bhattarai, 2014; Pant, Sagtani, Pradhan, Bhattarai, & Sagtani, 2015; Sah, Jha, & Shah, 2016).

Thus, this study is aimed at studying the knowledge, attitude and practice of self-medication with antibiotics among the general population of Kathmandu valley. The study is believed to be first to be conducted among the general population of the 3 districts of Kathmandu valley, to the best of researcher's knowledge.

1.2 Research Questions

What are the general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) of the general public in Kathmandu Valley, Nepal?

What is the knowledge of general public in the Kathmandu Valley, Nepal regarding self-medication with antibiotics?

What is the attitude of general public in the Kathmandu Valley, Nepal towards self-medication with antibiotics?

What is the practice of general public in the Kathmandu Valley, Nepal regarding self-medication with antibiotics?

What is the association between general characteristics (socio-demographic, socio-economic, distance from nearest health facility and health status) and knowledge of, attitude towards and practice of self-medication with antibiotics among the general public in Kathmandu Valley, Nepal?

1.3 Research Objectives

General Objective

To study the knowledge, attitude and practice regarding self-medication with antibiotics among the general public in the Kathmandu Valley, Nepal.

Specific Objectives

1. To determine the general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) of the general public in the Kathmandu Valley, Nepal
2. To determine the association between general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) and knowledge of antibiotics among the general public in the Kathmandu Valley, Nepal.
3. To determine the association between general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) and

attitude towards self-medication with antibiotics among the general public in the Kathmandu Valley, Nepal.

4. To determine the association between general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) and practice of general public in Kathmandu Valley, Nepal regarding self-medication with antibiotics.

1.4 Research Hypotheses

Null Hypothesis

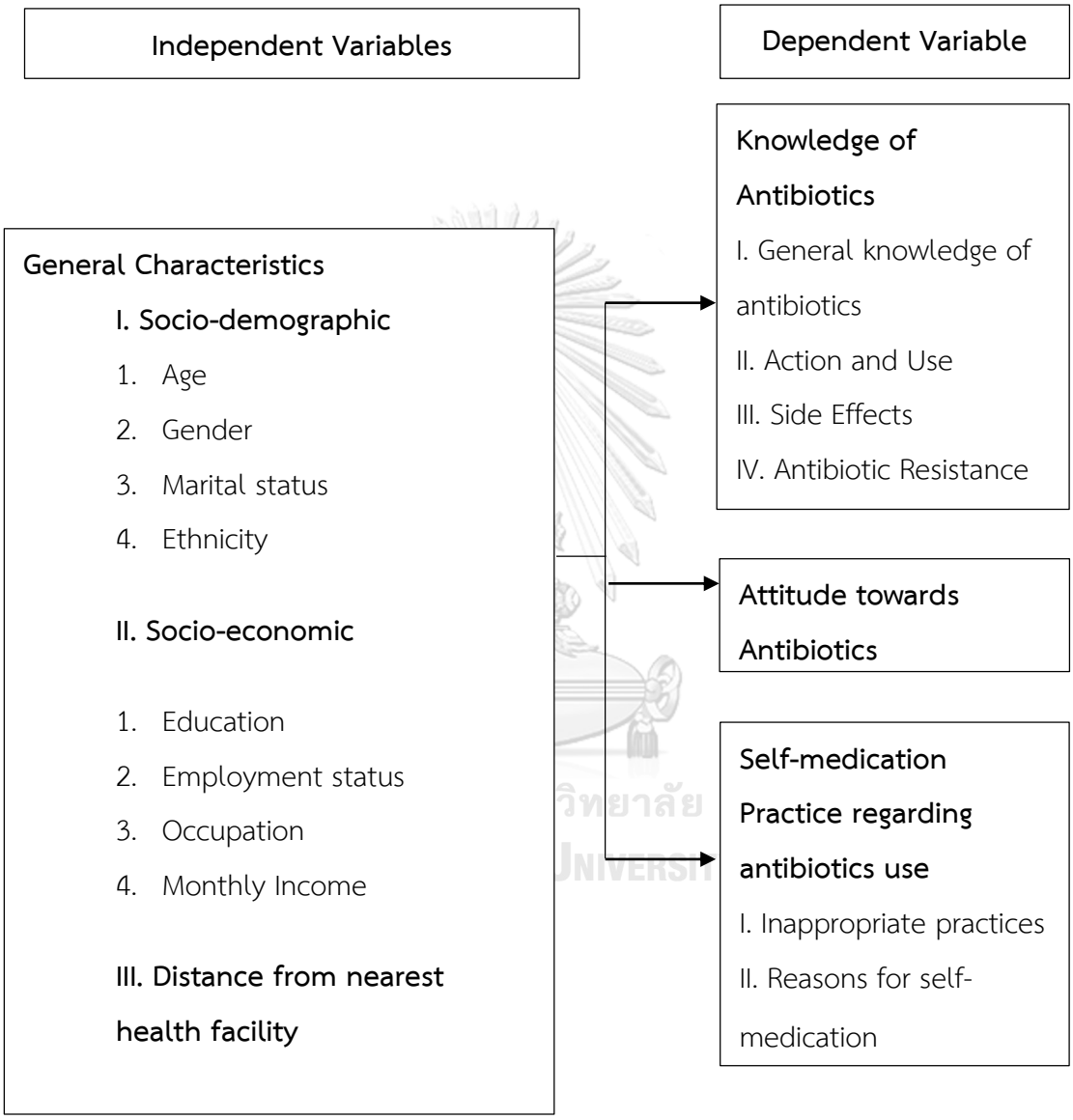
There is no association between general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) and knowledge, attitude and practice regarding self-medication with antibiotics among the general public in Kathmandu Valley, Nepal

Alternate hypothesis

There is an association between general characteristics (socio-demographic, socio-economic, and distance from nearest health facility) and knowledge, attitude and practice regarding self-medication with antibiotics among the general public in Kathmandu Valley, Nepal

1.5 Conceptual Framework

The below mentioned conceptual framework is developed based on the review of many different literatures on knowledge, attitude and practice of self-medication with antibiotics.



1.6 Operational definitions

Self-medication refers to the selection of medicines by oneself or on someone's recommendation, by an individual to treat self-recognized illness or symptoms.

Antibiotic resistance refers to the ability of bacteria to resist the effect of antibiotics.

Antibiotics refers to allopathic drugs that are used in treatment and prevention of infections caused by bacteria.

Doctor refers to an individual who is medically qualified to prescribe medications and includes practitioners of modern scientific (allopathic) medicine, including dentists.

Medical prescription refers to a prescription from a qualified medical doctor or a dentist given to an individual for their illness.

General public refers to residents of all the three districts of Kathmandu valley - Kathmandu, Lalitpur and Bhaktapur, who are living in the valley for at least 1 year.

Study Area refers to the specific location where the study is being conducted. In this research the study area is Ward number 16 of Kathmandu Metropolitan City.

General characteristics refers to socio-demographic, socio-economic characteristics and distance from the nearest health facility.

Socio-demographic characteristics refers to age, gender, marital status and ethnicity of general public.

Gender refers to the self-reported sex or observed sex of the study participant by the researcher at the time of face-to-face interview, and categorized as male, female or other.

Age refers to the self-reported age in years, that is, age of the study participant at the time of last birthday.

Marital status refers to whether an individual is married or not. It is categorized into 2 groups - 'Single' (includes 'Unmarried', 'Widowed', 'Separated' and 'Divorced') and 'Married'.

Ethnicity refers to the self-reported ethnic background of the study population and is divided into 4 groups - Brahmin, Chhetri, Newar, and Others (includes Hill/Mountain Janajait, Tarai Janajati, Tarai/Madhesi, Muslim, Dalit, and etc.)

Socio-economic characteristics refer to education, employment status, occupation and monthly income of the study participants

Education refers to the highest formal education which an individual has attained and successfully graduated. It is categorized into as – Up to Grade 8, High school (Grade 9-12), and Undergraduate and above.

Employment status refers to an economically activity or inactivity of the study participant with respect to their employment classified as with employment and Without Employment

Occupation refers to the profession of the study participant classified as employed (includes labor), self-employed, and unemployed (includes retired).

Monthly income refers to the amount of money a person receives on a regular basis for work or through investments. In this study the monthly income refers to the self-reported income in Nepalese Rupee (NRs.) earned by individuals per month.

Distance from nearest health facility refers to the time taken in minutes by an average person to walk the distance to reach the nearest health facility from the respondent's place of residence. It is represented as distance in minutes and classified in terms of 'less than 10 minutes', and '10-29 minutes and more'.

Health facility refers to a place where health care services are provided and specifically refers to pharmacies in this study.

Pharmacy refers to local pharmacy or drug store or medical store or hospital pharmacy in the study.

Knowledge regarding antibiotics refers to the understanding and ability of the study population to respond correctly to questions regarding the general knowledge of antibiotics, action and use of antibiotics, side effects and antibiotic resistance.

Adverse drug reaction refers to unintended and harmful response to an antibiotic drug occurring at a normal dose used either for prophylaxis, diagnosis, or treatment of a disease

Side effect refers to an unintended effect of an antibiotic drug used for preventive, diagnostic or therapeutic purpose.

Attitude towards use of antibiotics is the opinion and beliefs of the study participant's attitude towards antibiotic drugs in terms of completion of the course of antibiotic treatment as prescribed, obtaining antibiotics from family or friends, buy without medical prescription at a pharmacy, self-medication with antibiotics rather than see a doctor in minor illness, use to treat sore throat, cough and common cold, self-medication play an important role in increasing antibiotic resistance, incompletion of course of antibiotic treatment when feel better, instruction dose not enough to treat the illness, effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed, and expensive and new antibiotics are more effective

Practice regarding antibiotics refers to the inappropriate practices and reasons for self-medication with antibiotics. Inappropriate practices include and are listed in terms of purchase antibiotics without medical prescription at pharmacy, take prescribed antibiotics for an infection that occurred again, take prescribed antibiotic for another type of infection, use left-over antibiotics, switch to different antibiotic during the course of self-treatment, use new antibiotic when ill, change the dose of antibiotic treatment during the course of self-treatment, and self-medicate with an antibiotic to prevent an illness.

CHAPTER II

LITERATURE REVIEW

2.1 Antibiotics and Antibiotic Resistance

2.1.1 Antibiotics

According to the WHO, antibiotics are medicines that are used in prevention and treatment of infections caused by bacteria (World Health Organization, 2017b). In humans, antibiotics are considered as the last line or one of the very few treatments that are available in the treatment of serious bacterial infections (World Health Organization, 2017e). Antibiotics revolutionized the way we treat infectious diseases after the discovery of penicillin by Sir Alexander Fleming in 1928, and thus began the modern era of antibiotics (L. J. Piddock, 2012; Sengupta, Chattopadhyay, & Grossart, 2013). Therefore, antibiotics thereafter discovered and manufactured have transformed modern medicine and helped save millions of lives worldwide (Centres for Disease Control and Prevention, 2013; Gould & Bal, 2013; Ventola, 2015).

2.1.2 Antibiotic Resistance

Antibiotic resistance is the ability of bacteria to resist the effects of antibiotic drugs– that is, the bacteria are not killed, and their growth is not stopped" (Centers for Disease Control and Prevention, 2017a).

Antibiotics were first used in the treatment of serious infections caused by bacteria in 1940s and penicillin was widely used in the treating bacterial infections among World War II soldiers (Sengupta, Chattopadhyay, & Grossart, 2013). However, by 1950s, bacterial resistance to penicillin was identified and as a result all medical advances were in a jeopardy (Spellberg & Gilbert, 2014). As a result, new beta-lactam antibiotics were discovered, however, bacteria resistant to methicillin was identified in United Kingdom and United States in 1962 and 1968, respectively (Centres for Disease Control and Prevention, 2013; Sengupta et al., 2013). Unfortunately today, antibiotic resistance has been identified to almost all of the antibiotics that have been discovered and developed (Centres for Disease Control and Prevention, 2013).

2.1.2.1 Development and spread of antibiotic resistance

Antibiotic resistance occurs when bacteria undergo a change or modification in response to the use of such medicines. it is highly accelerated by the inappropriate use of antibiotics such as use in viral infections like cold or flu as well as sharing of antibiotic drugs, overuse, inadequate or lack of infection prevention and control (IPC) programmes, use of drugs of low quality, insufficient and poor laboratory capacity, inadequate surveillance and poor regulation or insufficient enforcement of regulations assuring timely access to standard quality of antibiotics and their rational use (French, 2010; Nathan & Cars, 2014b; Read & Woods, 2014; World Health Organization, 2015, 2017e).

Figure 2 describes the development of antibiotic resistance. When an antibiotic is taken by an individual or administered in animals, it not only kills the bacteria causing the illness but also naturally occurring ones that protect people from infections. There are also few bacteria that are resistant to antibiotics because of reasons such as mutations which then grow and multiply. In addition, some bacteria also pass on their resistance to another, exacerbating the problem of resistance.

Figure 3 shows an example of how antibiotic resistance spread. As shown in the figure, when antibiotics are administered in humans and animals, bacteria in the gut starts developing resistance. In animals, the drug resistant bacteria remain in the meat and will be transmitted to humans if consumed without properly cooking it. Likewise, fertilizers or water containing animal feces and drug resistant bacteria are used on food crops to protect them and enhance growth. Resistant bacteria in animal feces can remain in crops which if consumed by humans remain in the gut of for a longer period of time.

An individual who has a drug resistant bacteria in the gut can also spread resistant bacteria to other members of the community. Further, when the individual goes for treatment in the hospital, s/he can spread the pathogen directly to other patients or indirectly through uncleaned hands of healthcare workers. Resistant bacteria can also spread to other patients from surfaces within the healthcare facility.

The patient after being discharged from the hospital can spread the resistant bacteria in the community.

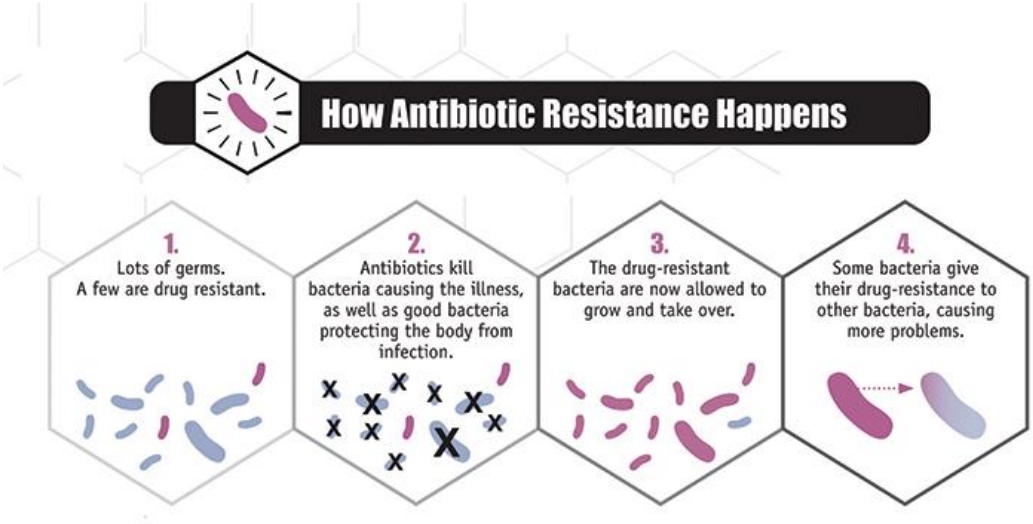


Figure 2: How antibiotic resistance happens, (Centers for Disease Control and Prevention, 2017a)

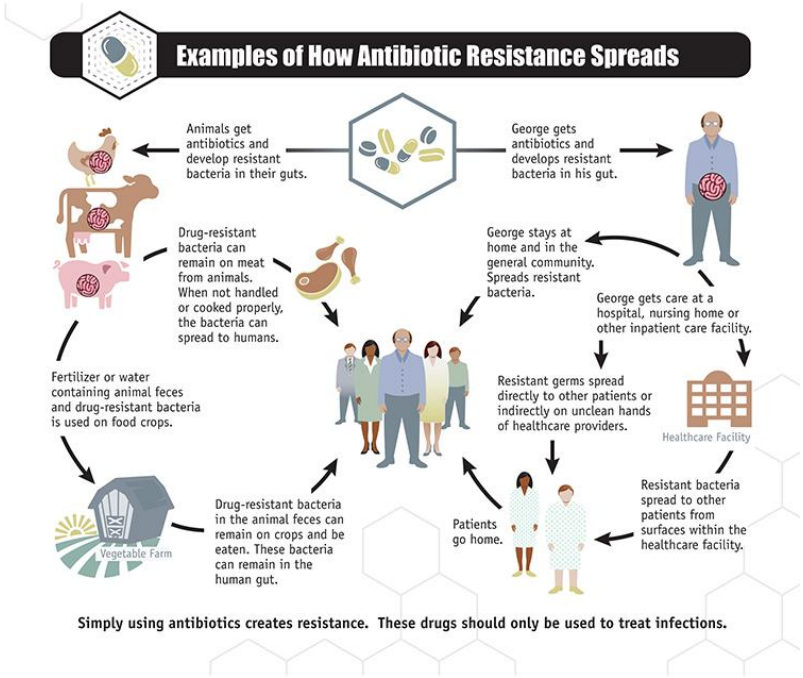


Figure 3: Spread of Antimicrobial Resistance, (Centers for Disease Control and Prevention, 2017a)

2.2 Antibiotic Resistance- A Serious Public Health Problem

The resistance of bacteria to antibiotic agents is escalating rapidly and has become a serious public health problem worldwide as resistant bacteria has the potential to kill and spread infections in addition to incurring huge costs on people and the society as a whole (World Health Organization, 2017e) . According to the report by OECD (The Organization for Economic Co-operation and Development) on Antimicrobial Resistance - Policy Insights, the trend of antibiotic resistance increased significantly in 2014 as compared to 2005. In Greece, resistance increased from 30% in 2005 to 45% in 2014, in Italy resistance almost doubled by 2014, in Slovak Republic antibiotic resistance increased from 10% in2005 to around 30% in 2014, in New Zealand resistance increased from 5% in 2005 to around 10% in 2014. Likewise, other OECD countries such as Spain, Hungary, France, Luxemburg, Sweden, Denmark, etc. also saw an increase in antibiotic resistance during the same period (The Organisation for Economic Co-operation and Development, 2016).

Furthermore, according to the CDC (Centers for Disease Control and Prevention) antibiotic resistance causes 25,000 deaths every year and 2.5 million extra hospital days in the European Union (Centers for Disease Control and Prevention, 2017c) while in the United States, resistant bacteria results in more than 28,000 deaths per year and over 2 million illness. Developing countries have also been greatly affected by the problem of antibiotic resistance. In Thailand, resistant bacteria result in over 38,000 deaths annually and 3.2 million hospital days. Likewise, in India, over 58,000 babies died in a single year due to infection with resistant bacteria which are passed on from their mothers. (Centers for Disease Control and Prevention, 2017b). In context of Nepal, due to the absence of nationally-representative surveillance on antibiotic resistance in Nepal is one of major hindrances in estimating the overall resistance in the country (Basnyat, Pokharel, Dixit, & Giri, 2015). However, various individual studies have reported resistance of bacteria towards most first-line and some second line antibiotics (Basnyat et al., 2015). A ten year surveillance of AMR pattern of *Streptococcus pneumoniae* in Nepal from 1999 to 2008 by Shakya and Adhikari (2012) in 934 isolates of the pathogen

found higher levels of resistance towards cotrimoxazole (56.6%). The study also reported an increase in resistance from 65% in 1999 to 74% in 2008, with variations in between. Similarly, this study also revealed an increase in resistance of *Streptococcus pneumoniae* to beta-lactam antibiotics, penicillin and ampicillin, during the same time period. In case of third-generation cephalosporins resistance was found to be 7% in 2007 (Shakya & Adhikari, 2012). Resistance to fluoroquinolones was reported between 2004 and 2008 with resistance to ciprofloxacin being the highest (8%) compared to ceftriaxone (4%) and ofloxacin (1%) in 2008 (Shakya & Adhikari, 2012).

In addition, antibiotic resistance has also resulted in only few treatments being applicable for treating common infections and minor illnesses (World Health Organization, 2014). Lack of proper antibiotics for the prevention and treatment of infections in organ transplantations, chemotherapy, diabetes management and surgeries (caesarean section or hip replacements) have also become a grave problem. Health expenditure is also higher for individuals who have developed resistance than for those who have not. The reason is due to prolonged duration of illness, need for additional tests, and necessity of more expensive drugs. In the US, treatment for infections due to resistant bacteria is estimated to be about $21 to $34 billion per year while the economic cost in the European region is around 1.5 billion Euro annually (World Health Organization, 2014) (European Commission, 2017).

2.3 Drivers of antibiotic resistance

Several studies have reported involvement of number of bacteria in the development of resistance today, due to which the current scenario is totally different as compared to resistance in the past (Rather et al., 2017). The development of antibiotic resistance is driven by various reasons such as insufficient new antibiotic drug discovery, use of antibiotics in animals and agriculture and self-medication.

2.3.1 Lack of newer antibiotic drug discovery

The problem of antibiotic resistance is enhanced due to lack of lack of new antibiotic discoveries (Piddock, 2012). According to the WHO's report on Antibacterial Agents In Clinical Development, there is insufficient research and development in new antibiotics to combat antibiotic resistance, particularly for *Mycobacterium tuberculosis* and Gram-negative carbapenem-resistant *Pseudomonas aeruginosa*, *Acinetobacter baumanni* and *Enterobacteriaceae*. Furthermore, most of the antibiotics that are under the pipeline are modifications of existing ones and are therefore only short-term solutions. The report also revealed that 51 antibiotics and 11 biologicals were in clinical pipeline as of May 2017 and stressed on the lack of of potential treatment options for critical priority bacteria, especially for multi-drug resistant (MDR) and extensively drug-resistant Gram-negative pathogens (World Health Organization, 2017a).

2.3.2 Use of antibiotics in animals and agriculture industry

The successful use of antibiotics in humans has paved way for its increasing and indiscriminate use in the treatment and prevention of diseases in animals, fish and plants. Sub-therapeutic doses of antibiotics are also used as feed supplement and/or growth promoters in animal rearing practices, especially in intensification of livestock industry due to its ability to lower the cost of production by enhancing the growth rates, reducing morbidity and mortality rates from bacterial infections, and improving feed efficiency (Cars & Nordberg, 2005; Graham et al., 2007).

According to a study by Van Boeckel et al. (2015) on global trends in antimicrobial use in food animals, the global consumption of antibiotics in food animal production was estimated to be around 63,151 tons in 2010 predicted the consumption to rise by 67% by 2030. Therefore, with an increasing demand for animal consumption as food, many farmers will be transitioning to intensive agriculture where use of antibiotics will be extensive to optimize production (Gelband et al., 2015).

2.3.3 Self-medication

Self-medication with antibiotics has been regarded as the most common and widely prevalent reason for development of bacterial resistance across the world (Michael, Dominey-Howes, & Labbate, 2014; Rather et al., 2017; World Health Organization, 2017b). Self-medication is defined as "the selection of medicines by an individual to treat self-recognized illness or symptoms" (World Health Organization, 2017c). It involves acquiring medicines without prescription from a medical doctor, sharing of medicines with friends and family, or using leftover medicines stored at home (World Health Organization, 2000).

A study by Cars and Nordberg (2005) reported that about 81% of the of the world's population use OTC medicines of which 50% of the antibiotics purchased and used are without doctor's prescription. Self-medication with antibiotics is dangerous especially in the absence of a monitoring and regulatory system as it leads to inappropriate and excessive use, particularly evinced in developing nations (Ramanan Laxminarayan & David L. Heymann, 2012; Lv et al., 2014).

There is however, marked differences on the rate of prevalence of self-medication with antibiotics from one country to another due to cultural differences, demographic trends, and out-out pocket expenditure (Cars & Nordberg, 2005; Technavio Research, 2016). According to a study conducted in 19 European countries among 15,548 individuals in 2003 regarding self-medication with antimicrobial drugs, the rate of self-medication per 1000 respondents was highest in Eastern Europe (Romania (198) and Lithuania (210)) followed by Southern Europe (Malta (56), Italy (62) and Spain (152)). The lowest rates were found to be in Northern and Western Europe . Similarly, self-medication was also reported to be high (74.6%) from a questionnaire based survey conducted among 323 individuals in Greece (Mitsi, Jelastopulu, Basiaris, Skoutelis, & Gogos, 2005). In the US, however, prevalence of self-medication was only 5% according to a study conducted in 2015 among 400 patients visiting three primary care clinics. In the study amoxicillin was the most widely used nonprescription antibiotic drug (10 out of 22 nonprescription use), followed by azithromycin (3 out of 22 nonprescription use, ciprofloxacin (3 out of 22

nonprescription use), ampicillin (2 out of 22 nonprescription use) and others. The major source of antibiotics used in self-medication was pharmacy (40%), followed by antibiotics obtained from another country (24%), relative or a friend (20%), and leftover antibiotics (12%) (Zoorob, Grigoryan, Nash, & Trautner, 2016). The inappropriate use of antibiotics in conditions such as sore throat, sinus infection, teeth or gum symptoms, urinary tract infection, stomach pain, bronchitis and infection in general, and sources of acquiring antibiotics such as purchase without prescription at a pharmacy, use of leftover antibiotics have contributed to higher prevalence of self-medication with antibiotics (Larissa Grigoryan et al., 2006; Mitsi et al., 2005; Zoorob et al., 2016).

A national population-based cross-sectional study conducted in three countries of Western and Central Asia- Yemen, Saudi Arabia, and Uzbekistan in 2012 among 400 general education teachers in each country found that 31% of participants who had treatment with antibiotics reported use of prescribed antibiotics while 69% reported nonprescription use of antibiotics on recommendation of a pharmacist or friend, on their own initiative or administering leftover medicine. The prevalence of non-prescription use of antibiotics was found to be highest in Yemen and Uzbekistan (78%) and 48% in Saudi Arabia where half of the participants preferred using antibiotics following prescription. However, respondents in Yemen (55.1%) and Uzbekistan (45.0%) obtained non-prescription antibiotics from pharmacies following pharmacist's recommendation which was the contributing factor for high prevalence in the two nations, followed by use of previous prescription. The study also found that 81% of the people reported using antibiotics in the previous three months and were mainly for cough, influenza, and gynecological inflammations (Belkina et al., 2014).

Another cross-sectional household study conducted in Northern Uganda in 2012 among 892 individuals found that majority the respondents (75.7%) reported to have self-medicated with antimicrobial drugs, including antibiotics. The antimicrobial drugs were mainly obtained from drug shops (68.4%), public health facilities (16.9%), medicines stored at home (16.7%), and private clinics (9.3%). Regarding the sources

of information on antimicrobial drugs used in self-medication, 28.9% reported self-medicating based on previous experience, old prescription (22.9%), friends or relatives (16.3%), advertisement (12.3%), drug leaflets (2.9%) and drug promotion (1.2%). The most commonly used antibiotics in self-medication were found to be amoxicillin (22.8%) (Ocan et al., 2014).

Similarly, study among 450 university attending students (undergraduate and postgraduate) pursuing various degrees in different colleges in Muscat and Sohar of Oman during October 2013 to January 2014 found that 94% of the respondents reported engaging in self-medication within the last six months, with almost 54% self-medicating with antimicrobials. The study participants reported prior experience with the drug was one of the major contributing factor while other reasons being knowledge about the drug, disease, and minor nature of the illness. Sources of information regarding self-medication were found to be recommendation from pharmacists, doctors, nurses, health workers, and advice from friends, family and neighbors (Flaiti, Badi, Hakami, & Khan, 2014).

Number of factors have led to individuals start engaging in self-medication. People are exposed to various advertisements on the television, radio, on internet or other print media. Furthermore, advices from friends and family members are also quite common. Both types of exposures have made it easy for people to start engaging in self-medication without consulting a medical doctor. Higher costs of healthcare services is another reason attributed to the practice of self-medication, and those who are mostly affected are those who are not financially strong and therefore are not able to afford the cost. People also believe that the process of clinical diagnosis is hassle and time consuming, which is another reason for self-medication (Rather et al., 2017). Higher prevalence of self-medication is also in part because of governments promoting and encouraging people to self-treat minor illness, particularly in developing countries due to limited resources as well as to reduce the cost of treatment (Nathan & Cars, 2014a). Other determinants include OTC availability of antibiotics resulting from lack or inadequate and poor regulatory mechanism as polices and laws exist only on paper or are not adequately

communicated to the stakeholders, therefore making if difficult to limit and control inappropriate sales and use of antibiotics (Byarugaba, 2004; Larissa Grigoryan et al., 2008).

It is also to be noted that self-medication is associated with various risks. Self-medication can lead to adverse drug reactions, drug interactions, drug resistance, prolongation of diseased condition, abuse and dependency of the drug, masking of the disease and even death (World Health Organization, 2004a). Overdose with antibiotics result in adverse effects ranging from mild to severe. Although in most of the cases adverse reactions are mild, life-threatening cases such as *Clostridium difficile* associated diarrhea, hepatotoxicity from amoxicillin and clavulanate (Chang & Schiano, 2007; Martin et al., 2010) have also been reported.

2.3.3.1 Self-Medication in Nepal

Number of studies have found high prevalence of self-medication in Nepal. According to a study by Shankar et al. (2002) conducted in Pokhara valley of Nepal regarding self-medication and non-doctor prescription practices, the prevalence of self-medication was found to be 59%. The study revealed that antimicrobials, including antibiotics were not commonly used for self-medication and were mostly used after doctor's prescription. In the study, 26% of the respondents stated that mild nature of illness which didn't require doctor's consultation was one of the reasons for self-medication while 19% reported previous experience of treating similar illness as the reason for self-medication.

Similar higher levels (56%) of nonprescription antibiotic was found in a study conducted by Basnet et al. (2016) on OTC buying and selling practices in Kathmandu valley. The study revealed that amoxicillin, azithromycin, cephalexin, ciprofloxacin, amoxicillin-clavulanate, norfloxacin, cefadroxil, cefpodoxime, and ampicloxacin to be the top ten antibiotics used in the valley. Furthermore, people were found to use antibiotics for wounds, chest pain, sinusitis, pneumonia, pharyngitis, bloody stools, stomach ache, and diarrhea. In addition, people also used antibiotics for common illness like fever, cough and common cold, indicating lack of knowledge regarding

rational use of antibiotics among the general public in the valley. The major source of information regarding use of antibiotics without prescription was identified to be drug dispenser in the pharmacy (40%), left-over medicine (12%), friends and family (4%) and newspaper (4%) (Basnet et al., 2016). The primary reason for using antibiotics without prescription were found to be previous experience with antibiotics (40%) while others included expensive medical consultation and faith upon pharmacist.

Since medicines, including antibiotics, can be easily obtained OTC without doctor's prescription, high prevalence of self-medication is common in Nepal (Banerjee et al., 2016). According to a study conducted in Pokhara city regarding pharmacy practice in 54 pharmacies, 83.3% of the respondents reported dispensing antibiotics without prescriptions to their customers (Gyawali et al., 2014). According to a study by Wachter et al. (1999) on dispensing of antibiotics by drug retailers in Kathmandu, out of 311 pharmacies, 97% of the retailers dispensed antibiotics in diarrhea which were unnecessary. A recent study by Ansari (2017) on evaluation of community pharmacies regarding dispensing practices of antibiotics in Bara and Parsa districts of central Nepal in 161 community pharmacies also reported that an increased number (66.5%) of drug stores and retail pharmacies had been dispensing antibiotics without a doctor's prescription and most importantly, and 91.4% of the staffs involved in dispensing were non-pharmacists. Replacing one brand of antibiotics with another (66%), dispensing incomplete courses of antibiotics (73%) and not providing information on antibiotic use (39%) or completion of full course of therapy (80%) was found to be quite common and high. This study indicated the lack of Good Pharmacy Practice in the two districts with irrational dispensing of antibiotics and lack of medically trained pharmacists in retail pharmacies.

The practice of self-medication has been found to be widespread among medical students in Nepal. According to a cross-sectional study conducted among 488 pre-clinical university students in Manipal College of Medical Sciences, Pokhara, Nepal between 2012 and 2014, 81.35% were found to practice self-medication. Antibiotics were the most commonly self-prescribed category of the drugs (26.2%)

with azithromycin (17.6%) being the most common antibiotic followed by amoxicillin (6.5%) and cefpodoxime (2%) (Banerjee et al., 2016).

Similarly, a KAP study regarding self-medication was carried out among 276 undergraduate medical students in the same medical college in 2015 by Sudesh Gyawali, P Ravi Shankar, Phanindra Prasad Poudel, and Archana Saha (2015). The study found that 81.9% of the respondents had self-medicated during the one-year period prior to the study. 54% of the students reported having self-medicated based on past experience with the medicine while other sources for self-medication were family (33.3%), text books (20.3%), local pharmacy (18.5%) and the internet (10.9%). Higher levels of antimicrobial drugs (56.2%) were found to be used for self-medication and 30.4% of the respondents had used antimicrobial agents more than 5 times a year.

Similar survey carried out among 330 nursing students in three nursing colleges of Nepal revealed that more than 50% of the students had practiced self-medication with antibiotics. Major reasons stated for self-medication were found to be good knowledge about antibiotics (46.2%), minor illness (32%) and to save time and money (21.3%). The study also found that amoxicillin was the most commonly used antibiotics (33.9%) followed by azithromycin (14.9%) and ciprofloxacin (13.7%) (Sah et al., 2016). Likewise, a descriptive study conducted among 168 dental students in Nepal Medical College Teaching Hospital, Kathmandu, Nepal reported that 81.5% of the participants had self-medicated themselves in past one-year prior to the study out of which 35.1% had self-medicated with antibiotics. 79.7% reported convenience to be the most common reason for self-medication with antibiotics and self-medication was most commonly used during fever (39%) followed by sore throat, cough, diarrhea and runny nose. Furthermore, more than 10% consumed antibiotics without prescription for toothache and swelling of oral cavity. 42.4% of the students used old prescription for purchase of antibiotics while 37.3% administered antibiotics prescribed by pharmacists, 25.4% used antibiotics on the basis of past experience and 18.7% following advice of friends and family members. Community pharmacy was the most common place for purchasing antibiotics for

self-medication by the students in the study (90%). Moreover, 25% of the respondents reported changing antibiotics deliberately without consultation of a medical doctor (Pant et al., 2015).

A study conducted by Bhattarai et al. (2014) among 175 undergraduate pharmacy students in Kathmandu valley found 97% of the respondents reported to have self-medicated, however, only 6.25% of the students practiced self-medication with antibiotics in contrast to the above mentioned studies conducted among health related university students. Community pharmacy was reported to be the common source for purchasing drugs for self-medication (80%), followed by leftover medicines (18.23%).

2.4 Review of relevant literature on Self-medication

2.4.1 General characteristics

The prevalence of self-medication is quite common in both developing as well as developed nations (Al-Azzam, Al-Husein, Alzoubi, Masadeh, & Al-Horani, 2007). However, it has been found that the trend is higher in case of developing countries compared to developed ones (Verma, Mohan, & Pandey, 2010). Socio-demographic factors like age, gender, and education, and economic factors such as lifestyle, readily availability of drugs and treatment, increasing cost of medical consultation, time consuming clinical processes, past experiences and ease of availability of OTC drugs have a major influence in people engaging in self-medication (Galato, Galafassi, Alano, & Trauthman, 2009).

2.4.1.1 Age

Age is a socio-demographic component which has shown marked influence in self-medication. A study conducted by Shankar et al. (2002) in Pokhara valley of Nepal among 142 respondents found that respondents greater number of respondents below the age of 40 years reported self-medication during the last six months prior to the study. In contrast, a study conducted among 276 second and

fourth semester undergraduate medical students in a medical school in Western Nepal found that there was not association between age and self-medication (*p*-value 0.309) (S. Gyawali, P. R. Shankar, P. P. Poudel, & A. Saha, 2015).

Similarly, Ocan et al. (2014) also found in their study conducted among 892 adult household members in northern Uganda that 30.4% of respondents in the age group of 18-26 years engaged in self-medication with antimicrobials, while 25.5% were in the age group of 27-35 years, 17.6% between 36-44 years of age and only 27% of the respondents who reported self-medication were 45 years and older.

Another study conducted by A. Al Rasheed et al. (2016) among 681 respondents found that age was a statistically signification factor ($p < 0.05$) in both univariate and multiple logistic regression. In contrast to the aforementioned studies, older respondents were more likely to self-prescribe antibiotics compared to younger respondents. The probability of self-medication with antibiotics among the age group of 31-44 years was found to be almost twice [odds ratio: 1.878 (95% CI: 1.223, 2.882)] than that of the reference group of 18-30 years. On the other hand, the probability of self-medication with antibiotics among age group 45 years and above was almost four times [odds ratio: 3.655 (95% CI: 2.195, 6.084)] greater than the reference group of 18-30 years.

Another study on self-medication with antibiotics among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey found 40-49 years of age group to be most common group to self-medicate (23%) with antibiotics and the group least self-medicating was 60-69 years of age (11.8%). In the study age was found to be associated with self-medication with antibiotics ($p < 0.05$) (Ilhan et al., 2009).

In contrast, study conducted in Riyadh City regarding prevalence and behavior of self-medication among 400 adolescents aged between 12-18 years of age found age not to be associated with self-medication ($p>0.05$) (Albatti, Alawwad, Aldueb, Alhoqail, & Almutairi, 2017b). Similarly, study conducted among 276 undergraduate medical students in second and fourth semester in a medical school in Wester Nepal found age was not statistically significant with knowledge, attitude and practice of

self-medication (p>0.05) (S. Gyawali et al., 2015). Study conducted in Lithuania regarding public knowledge, beliefs and behavior on use of antibiotics among 1005 respondents also found age not to be statistically significant variable (p>0.05) (Pavydė et al., 2015).

2.4.1.2 Gender

Gender is another socio-demographic variable that has been found to be a determinant of self-medication. Study conducted by Flaiti et al. (2014) among 450 university students in Oman found self-medication to be common among female students (40%) compared to male students (33.33%). In addition, female students self-medicated more with gastrointestinal medicines (64.2%) while use of antimicrobial drugs were common among males (45.1%). Another study on public knowledge and behaviors regarding use of antibiotics in Nancy, France conducted among 200 general public found that gender was associated with knowledge variable, that is, females were found to have significantly higher knowledge than male counterpart (Demoré, Mangin, Tebano, Pulcini, & Thilly, 2017). A birth cohort study in Pelotas, Brazil on self-medication among 4160 adolescents aged 18 years found that the point prevalence of self-medication was 26.7% (95% CI: 25.4, 28.1) and was higher was higher, 30.2% (95% CI: 28.3, 32.2) among female ($p < 0.001$) adolescents compared to males with 23.1% (95% CI: 21.2, 25.0) (Bertoldi et al., 2014)

On the contrary, study conducted in Riyadh City of Saudi Arabia regarding prevalence and predictors of self-medication with antibiotics among 681 people visiting Al Wazarat Health center found male respondents (89.1%) to self-medicate more with antibiotics compared to females (44.3%). Males were found to be 10.28 times (95% CI: 6.771, 15.601] more likely to self-medicate with antibiotics compared to the reference group of female respondents. Similarly, study conducted among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey on self-medication with antibiotics found male respondents self-medicating with antibiotics by 1.24 times [95% CI: 1.02,1.51] than female respondents (Ilhan et al., 2009). Ocan et al. (2014) also found in their study conducted among 892 adult

household members in northern Uganda that the proportion of female respondents self-medicating with antimicrobial drugs were higher (72%) compared to male counterparts (28%) and was found that gender was statistically significant ($p < 0.05$). Multivariate logistic regression result showed that males were twice as likely to self-medicate compared to the reference group of female participants [odd ratio: 2.03 (95% CI: 1.09, 3.04)] ($p < 0.0001$).

While study conducted in Lithuania regarding public knowledge, beliefs and behavior on use of antibiotics among 1005 respondents found gender to be not found to be a determinant of poor knowledge and self-medication with antibiotics (p= 0.384) (Pavydė et al., 2015). Similarly, a cross-sectional study regarding antibiotic knowledge and self-medication practices in two major cities of Lebanon, Beirut and Tripoli found that gender was not statistically significant and was not associated with self-medication with antibiotics (p = 0.568) (Jamhour, El-Kheir, Salameh, Hanna, & Mansour, 2017).

In contrast, Figueiras, Caamano, and Gestal-Otero (2000) reported in their study conducted among 20,311 people in Spain that the prevalence of self-medication to be higher among women (PR: 1.21; 95% CI: 1.10; 1.33) as compared to men. Another study conducted in Pakistan among 750 non-medical university students also found gender to be statistically significant with frequency of self-medication with antibiotics (p=0.008). Females in the study were found to self-medicate with antibiotics (57%) more than their counterparts (43%) (Gillani et al., 2017). A cross-sectional study conducted in the Riyadh, Saudi Arabia among adolescents aged between 13-18 years found gender to be not statistically significant with self-medication (p=0.43) (Albatti, Alawwad, Aldueb, Alhoqail, & Almutairi, 2017a)

2.4.1.3 Educational level

The trend of self-medication is also, however, growing rampantly among youths (Gutema et al., 2011) and frequent among students attending university (James, Handu, Al Khaja, Otoom, & Sequeira, 2006). Study conducted by Oztora, Nepesova, Caylan, and Dagdeviren (2017) among 1781 participants in 19 Family

Health Centers located in Edirne city center, Turkey, found that there were statistically differences between educational level and self-medication (Pearson χ^2 = 58.956, $p < 0.001$). In addition, the prevalence of self-medication was higher among individuals with postgraduate degree (60.3%) and least among primary school graduates (29.9%).

Likewise, study on self-medication with antibiotics among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey also found that respondents self-medication with antibiotics to be 1.43 times higher in case of respondents who have completed secondary level of education or higher [OR: 1.31; 95% CI: 1.01, 1.69; χ^2 = 10.98, $p < 0.05$] as compared to those with lower levels of education (Ilhan et al., 2009).

In contrast to the aforementioned studies, a cross-sectional study regarding antibiotic knowledge and self-medication practices in two major cities of Lebanon, Beirut and Tripoli found that respondents with educational level lower than grade 9 reported self-medication with antibiotics more as compared to those with higher educational level (p = 0.036) which is in contrast to studies (Jamhour et al., 2017). In addition, lower educational status was also found to be associated with lower knowledge on antibiotics as study conducted in Lithuania regarding public knowledge, beliefs and behavior on use of antibiotics among 1005 patients visiting16 community pharmacies located in 4 different regions of country found that educational level to be independently associated with poor level of knowledge regarding antibiotics. Participants with lower than university or college level of education [OR: 2.515; 95% CI: 1.464, 4.319; p value = 0.001] were less knowledgeable on antibiotics. In contrast, higher educational level was not found to be a risk factor for self-medication with antibiotics (p value = 0.142, 95% CI: 0.463, 1.116) (Pavydė et al., 2015). Furthermore, from a study in Braga, Portugal conducted among 349 students of 9th, 12th and first year university students showed that knowledge of antibiotic increased with increase in grade level, from school to university level. However, it was reported that higher scores were obtained by students who had

close similarity to the topic that was measured and their own field of study (Azevedo, Pinheiro, Yaphe, & Baltazar, 2009).

2.4.1.4 Occupation

Study conducted among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey on self-medication with antibiotics found that individuals who were unemployed were 1.38 (CI: 1.13,1.68) time more likely to self-medicate with antibiotics (χ^2 = 10.98, p <0.05) compared to people who were employed. However, multiple logistic regression analyses indicated that occupational status was not the factor influencing self-medication with antibiotics (Ilhan et al., 2009).

Another study conducted by Oztora et al. (2017) among 1781 participants in 19 Family Health Centers located in Edirne city center, Turkey, found that occupation was significantly associated with self-medication (χ^2 = 58.514, p <0.001).

In contrast, a study on public knowledge and behaviors regarding use of antibiotics in Nancy, France conducted among 200 general public found that occupation had not effect on behavior regarding self-medication (Demoré et al., 2017). Similarly, study conducted among 770 Kuwaiti public in 6 governorates of Kuwait found that occupational status was not associated with self-medication with antibiotics, however, it was found that those participants who work or study in healthcare related field had more positive attitude than those who did not work or study in a healthcare related field [OR: 2.05; CI: 1.30, 3.32; p value = 0.002] (Awad & Aboud, 2015). Likewise, A. Al Rasheed et al. (2016) also found work status was not associated with self-medication with antibiotics in their study conducted in Al Wazarat Health Center, Riyadh City of Saudi Arabia among 681 respondents visiting the health center.

2.4.1.5 Marital Status

Study conducted among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey reported that individuals who were married were 65% less likely to engage in self-medication with antibiotics compared to individuals who were single (χ^2 = 15.528, $p < 0.05$; OR: 0.65, 95% CI: 1.15, 1.78) (Ilhan et al., 2009).

On the contrary, , study conducted among 770 Kuwaiti public in 6 governorates of Kuwait found that marital status was not associated with self-medication with antibiotics (Awad & Aboud, 2015). Likewise, study conducted by Gillani et al. (2017) among 750 non-medical students in three different universities in Punjab, Pakistan also found marital status not to be statistically significant with frequency of self-medication with antibiotics (*p* value = 0.209).

2.4.1.6 Distance from nearest health facility

Distance from an individual's place of residence to the nearest health facility has also shown to determine the use of health facility, especially in the rural areas (Dhungel, 1983). A similar finding was reported by (Begashaw, Tessema, & Gesesew, 2016). According to study by Ocan et al. (2014) conducted among 892 adult household members in northern Uganda, long distance to the health facility was twice as likely to influence self-medication with antimicrobial agents (95% CI: 1.58, 3.41; $p < 0.0001$) compared to those living at relatively short distance to health facility. Similarly, a qualitative study by Chipwaza et al. (2014) consisting of 12 focus group discussion with members of communities and 14 in-depth interviews with health workers in Kilosa district, Tanzania also found that long distance to healthcare facility was one of the reasons for the study participants start engaging in self-medication.

2.4.1.7 Ethnicity

According to a study conducted by Dawood et al. (2017) among 888 respondents in Penang, Malaysia, the practice of self-medication was associated with

ethnicity. 64.4% of the Chinese respondents were significantly associated with self-medication as compared to Malays and Indians. Chinese participants were almost twice as likely to practice self-medicate as compared to Malays and Indians [OR: 1.90, 95% CI: 1.29, 2.80; *p* value = 0.001].

In contrast, a recent study conducted in the United States regarding non-prescription antimicrobial use among 400 individuals in 3 primary care clinics (2 public and 1 private) found that ethnic background was not associated with self-medication with antimicrobials (*p* value = 0.15) (Zoorob et al., 2016).

2.4.1.8 Income

Study conducted by Oztora et al. (2017) among 1781 participants in 19 Family Health Centers located in Edirne city center, Turkey, found significant differences between income and self-medication. Self-medication was found to be higher in case of higher income groups as compared to lower income groups (χ^2 = 8.018, *p* value = 0.005). Similarly, according to a study conducted by Dawood et al. (2017) done among 888 respondents in Penang, Malaysia, self-medication was found to be associated with monthly income of individuals ($p < 0.05$). Self-medication was reported to be higher among people with higher monthly income as compared to the reference group of people with monthly income less than MYR 1000. Self-medication was found to be almost double for individuals with monthly income greater than MYR 5000 [OR: 1.92, 95% CI: 1.00, 3.66; *p* value = 0.047] compared to the reference group.

Likewise, Study conducted among 2696 primary care attendants in 5 primary healthcare centers in Ankara, Turkey found income level to be statistically associated with self-medication with antibiotics (χ^2 = 15.82, $p < 0.05$). Self-medication with antibiotics increased with increase in income level. People with monthly income in the range of 1500-1999 YTL were almost twice as likely to self-medicate with antibiotics [OR: 1.73, 95% CI: 1.11, 2.70) compared to the reference group of less than 500 YTL while individuals with monthly income more than 2000 YTL were 1.55

time more likely to self-medication with antibiotics [OR: 1.55, 95% CI: 1.02, 2.36] compared to the reference group (Ilhan et al., 2009).

In contrast, recent study conducted in the United States regarding non-prescription antimicrobial use among 400 individuals in 3 primary care clinics (2 public and 1 private) found that income level was not associated with self-medication with antibiotics ($p > 0.05$) (Zoorob et al., 2016). Similarly, another cross-sectional study regarding antibiotic knowledge and self-medication practices in two major cities of Lebanon, Beirut and Tripoli among 400 participants also found no association between income and self-medication with antibiotics (p value = 0.127). Another cross-sectional household study conducted in Northern Uganda in 2012 among 892 individuals also reported no association between self-medication with antibiotics and income level ($p = 0.668$) (Ocan et al., 2014).

2.4.2 Knowledge of Antibiotics

While using antibiotic drug for a particular illness, it becomes very necessary and important to identify the type of microbe that caused the disease. This is because a study conducted by Eurobarometer in 2001 showed that around 60% of had wrong knowledge that antibiotics are effective against viruses. Similarly, L. Grigoryan et al. (2007) found in their study conducted in 12 countries among 1101 respondents that participants had low knowledge regarding the ineffectiveness of antibiotics on viruses, that is, on an average around 54% of them gave a wrong answer while on the other hand, 22% incorrectly answered for bacteria (L. Grigoryan et al., 2007). The findings are consistent with the study conducted in Kuwait regarding knowledge, attitude and practice towards antibiotics use among the 770 general public where respondents were less knowledgeable about the normal microbial flora, whether antibiotics were effective against coughs and colds, viruses or bacteria (Awad & Aboud, 2015). Around 46% of the respondents agreed that antibiotics are effective against viruses while 40% of the participants who agreed that antibiotics are effective against bacteria also agreed that antibiotics are effective against viruses (Awad & Aboud, 2015). A cross-sectional study conducted among 1005 individuals

visiting 16 community pharmacies in four different regions of Lithuania found only one-third of the respondents had good knowledge (10.3%) and 28.6% had average knowledge regarding antibiotics. About 50% of the participants incorrectly answered antibiotics being effective either in viral infection (26.0%) or both viral and bacterial infections (21.7%) and 41% indicated antibiotics to be used in common cold. On the other hand, 92.9% of the respondents were found to be aware that antibiotics can cause adverse drug reactions as per a study conducted in Lithuania regarding public knowledge, beliefs and behavior on use of antibiotics among 1005 patients visiting 16 community pharmacies located in 4 different regions of country found that (Pavydė et al., 2015). Similarly, study by Jamhour et al. (2017) conducted in 2 major cities of Lebanon, Beirut and Tripoli among 400 people reported that 60% of the people stated that antibiotics should be taken for sore throat while 61% answered antibiotics to be taken for common cold. At the same time, 51% of the respondents answered that antibiotics are effective against viruses. People across the world are also less knowledgeable regarding antibiotic resistance, however, one of the interesting findings of the study was that 83% of the respondents had knowledge that inappropriate antibiotic use could lead to development of resistance. Similarly, study by Lv et al. (2014) among 1000 university students in a Chinese university reported that majority (89.5%) of the students were knowledgeable on development of antibiotic resistance due to its overuse while less than half (42.1%) of them had knowledge that repeated noncompliance with antibiotics treatment course would increase bacterial resistance. Furthermore, only 45.1% of the students knew that antibiotics should only be purchased with doctor's prescription.

In contrast, study conducted in Kuwait by Awad and Aboud (2015) among 770 Kuwaiti public in 6 governorates found that more than half of the study participants didn’t agree to unnecessary use of antibiotics increases antibiotic resistance of bacteria while almost 78% of them disagreed that use of antibiotics in animals can reduce antibiotic effectiveness in humans in the knowledge section of the study. Similar to the Kuwait study, study conducted by Yu et al. (2014) among 933 primary

caregivers in rural China found that over 65% of the parents who participated in the study were found to have low level of knowledge regarding antibiotic resistance.

The level and type of education (medical or any other) attained also determines the level of knowledge of an individual regarding antibiotic and their use. Higher level of education was found to be related to higher knowledge among medical students as they progressed their study level as reported by Huang et al. (2013) in their study conducted among 2500 university students in Northeastern China. Also, medical students scored higher compared to non-medical students on knowledge regarding antibiotics ($\chi^2 = 191.88$, $p < 0.0001$). In contrast, a study conducted in Yemen, Saudi Arabia and Uzbekistan among 400 residents in each country by Belkina et al. (2014) found that participants in Yemen who had higher education were found to have low knowledge regarding bacterial resistance. The same study also revealed that people were less aware and knowledgeable regarding the importance of completion of the prescribed course of antibiotics which is one of the reasons for developing resistance.

There is a growing misconception regarding the application of antibiotic agents. A study in 1000 undergraduate students in a Chinese university found that knowledge regarding antibiotics was poor with a median score of 4 out of a maximum 10 (IQR: 3-10). There were also significant differences in the median score in terms of grades ($p < 0.001$) and colleges (medical *vs* non-medical, $p < 0.001$). Also, about 55% of the respondents had a misconception that skin infections can be prevented by pouring antibiotics onto the wound while 28% incorrectly answered that antibiotics are similar to anti-inflammatory drugs (Lv et al., 2014).

Knowledge on adverse drug reactions and side effects also play an important role in self-medication with antibiotics. Individuals with proper knowledge and awareness on adverse reactions and side effects were found more likely to take antibiotics after obtaining prescription from a doctor or a physician ($p < 0.001$) according to a study by Belkina et al. (2014) conducted among 400 residents from each three countries (Yemen, Saudi Arabia and Uzbekistan). Furthermore, respondents had higher knowledge regarding adverse effects associated with

antibiotics compared to other items of the knowledge section. Higher knowledge was found to be among respondents who were older had higher education groups in all of the three countries (p value = 0.001, $p < 0.001$). Individuals who used antibiotics with prescription were found to have a significantly higher knowledge about antibiotics as compared to those without prescription. Additionally, people who had higher knowledge about antibiotics scored higher on stopping them at the correct time compared to people who had lower knowledge (Jamhour et al., 2017).

2.4.3 Attitude towards antibiotics

Attitude towards the use of antibiotics have been found to be influenced by ethnic and cultural differences (L. Grigoryan et al., 2007). Furthermore, it important to understand the part cultural differences play on attitude and knowledge of people in order to develop and formulate effective intervention program. Studies have revealed that in general people have a positive attitude towards self-mediation (Ocan et al., 2014).

A telephonic interview based study by Pechere (2001) among 5379 participants in 9 countries (United Kingdom, Thailand, Morocco, Colombia, Spain, Turkey, France, Belgium and Italy) found 32% of respondents received their medication directly from pharmacist. Likewise, 34% of the mothers surveyed in the study thought they were better judge than their doctor regarding their illness and medicines. The study also revealed that the attitude of non-adherence to be 55.7% in Spain which was similar to the research conducted in European children regarding common respiratory infections (Ramalle-Gomara et al., 1999). This non-compliance has played a crucial role in the current issue of antimicrobial resistance as can be seen in MDR tuberculosis (Rao, 1998).

According to a cross-sectional study conducted among 770 general public in Kuwait, 41% of the respondents had attitude towards using and accessing antibiotics inappropriately (Awad & Aboud, 2015). The study reported the median (IOR) attitude score of the study participants to be 4 (3.0) out of a maximum score of 7 (positive attitude). It was found that around 34% gave 1 to 3 appropriate responses, 36.9%

gave 4 to 5 and 21.9% gave 6 to 7 appropriate attitude answers. More than 50% of the respondents showed positive attitude towards not to obtain antibiotics from friends or relatives without a prescription from a medical doctor (76.6%; CI: 73.2-79.7) while 66.6% expressed not to obtain antibiotics from a pharmacy without a prescription (CI: 62.9-70.1). 57.6% showed positive attitude towards not storing antibiotics at home (CI: 53.7-61.2). However, negative attitudes were regarding the administration of antibiotics in order to treat sore throat (73.4%; CI: 69.9-76.6) and cough (57.1%; CI: 53.2-60.8) (Awad & Aboud, 2015).

A household study conducted in 12 rural communities of Vietnam among 505 mothers in 1997 reported that a greater proportion (87.7%) of mothers who stores antibiotics in home reported knowing how to use antibiotics as compared to those who did not store such medications (Okumura, Wakai, & Umenai, 2002). 22.5% of the respondents had a positive attitude towards administering antibiotics stored at home when one has a fever (without having difficulty in breathing) while 18.8% had positive attitude towards using antibiotics during cough.

Face to face interview conducted in 12 countries (Austria, The Netherlands, Sweden, the United Kingdom, Belgium, Italy, Malta, Israel, Spain, Czech Republic, Lithuania and Croatia) between 2003- 2004 among 1101 respondents revealed that there were significant differences in levels of public attitudes regarding antibiotic use, self-medication and resistance to antibiotics. Study participants from Southern and Eastern nations had less appropriate attitudes. British participants had more positive attitude towards self-medication with antibiotics for bronchitis. Similarly, individuals in Lithuania and Czech Republic also demonstrated better positive attitude towards self-medication with antibiotics in bronchitis. The study also found that individuals in Southern and Eastern nations were found to hold stronger beliefs regarding need for antibiotics in case of minor ailments and hence, more positive attitudes towards use of antibiotics in various situations (L. Grigoryan et al., 2007).

A questionnaire survey among 1000 randomly selected undergraduate university students in a Chinese university believed that antibiotics should be used for common colds (10%). 48.7% of the students said that they could stop the

treatment 1 or 2 days after the signs or symptoms of the illness subsides. Around 60% of the students agreed on decreasing effectiveness of treatment when the full course of treatment is not completed and 79.1% believed that decreasing and controlling inappropriate use of antibiotics would play an important role in preventing antibiotic resistance (Lv et al., 2014).

Mean attitude scores according to semester of study and nationality was found to be statistically significant according to a study conducted by S. Gyawali et al. (2015) among 295 medical students in Manipal College of Medical Sciences, Pokhara, Nepal. The mean attitude score of fourth year students (68.1) was higher than second semester students (66.3) while the mean attitude score of Nepalese students (143.7) were significantly higher compared to Indian respondents (137.1). Post-hoc test revealed that mean attitude score of Nepalese students (68.3) was significantly higher ($p = 0.001$) than Indian students (65.1). Other studies have also found that beliefs in antibiotics for treatment of even small illness was high in a study conducted in Malta (L. Grigoryan et al., 2007). Similarly, a greater number of people also believed that scientists can always develop new antibiotics (Yu et al., 2014). The study also reported that around 55% of the respondents believed there was no need for medical visits in case of minor ailments.

2.4.4 Practice regarding self-medication with antibiotics

Inappropriate practices that have been found in case of non-prescription use of antibiotic drugs are: not completing dose, sharing of medication, stop administering drugs upon improvement of symptoms, alteration of the dose and inaccurate indication (Ocan et al., 2015).

A systematic review of household antimicrobial self-medication in developing countries reveled that antibacterial drugs were mostly used for treating viral infections in the Middle East and Asia and drugs that individuals mostly administered for treating symptoms of viral infections like flu included ampicillin, tetracycline, metronidazole, ceftriaxone, kanamycin and cotrimoxazole (Ocan et al., 2015).

Past experience has been found to be one of the key determinants among individuals for practicing self-medication. Study conducted in 11 countries around the world found that over 22% of respondents who took antibiotic drugs admitted to not completing the course of the treatment (Pechère, Hughes, Kardas, & Cornaglia, 2007).

Dose alteration has also been found to be another prevalent practice that is common. Over 43.3% of the respondents were found to alter the dose of the prescribed antibiotic medication (Zafar et al., 2008). Similar findings were made in sub-Saharan countries where insufficient dose of drugs were used in self-medication.

Individuals have also been found to practice short duration of treatment, less than 5 days, mostly in Asia (Zafar et al., 2008). Zafar et al. (2008) also reported that around 62% students in the study admitted to intentionally stopping medication when the symptoms or illness subsided against advice of the doctor. People spent only 4-7 days while self-medicating with antibacterial drugs during an illness (Al-Azzam et al., 2007) and participants in the studies by Deressa, Ali, and Enqusellassie (2003) and Sanjana et al. (2006) spent 1-3 days taking antimalarial drugs. Similarly, other studies by Widayati et al. (2011) and Sihavong et al. (2006) reported that study participants spent less than 5 days adhering to the course of non-prescription antibacterial medication during an illness. In contrast, patients who took antibiotics with prescription were found to adhere to the full course of treatment despite

improvement in their symptoms as compared to those without non-prescription (Jamhour et al., 2017).

People have also been found to not complete the dose of treatment which carries the potential risk of clinical failure. Studies conducted in children with mild pneumonia found that non-compliance to the treatment was the prime reason leading to treatment failure (I. S. Group, 2004; P. S. Group, 2002). Similarly, a patient survey in 11 countries found that about 23% of the patients receiving antibiotic treatment admitted to not completing the therapy (Belkina et al., 2014).

The use of multiple antibiotics is another wrong practice quite common among individuals who engage in self-medication (Ocan et al., 2015). This is an indication of uncertainty of the cause of illness and increases the risk of mistreatment, adverse drug reactions, development of antimicrobial resistance and also drug interactions (C. M. Hughes et al., 2001; Okeke et al., 2005; World Health Organization, 2009).

Storing of antibiotics is another common practice among people. Patients may store antibiotics remaining from uncompleted courses for the purpose of self-administration at a later date for self-diagnosed cases or even share them with family members and friends (Okeke & Lamikanra, 2003; Parimi, Pereira, & Prabhakar, 2002; Stratchounski et al., 2003). People also have the tendency to store antibiotics that were not completely used during their previous illness, even after the expiration dates, for later use or use them on family and friends (Parimi, Pereira & Prabhakar, 2002).

CHAPTER III

METHODOLOGY

The chapter constitutes of research design, study area, study population, sampling technique, sample size, measurement tools, ethical considerations, limitations, expected benefits and applications.

3.1 Research Design

The study on Knowledge, Attitude and Practice of self-medication with antibiotics among general population of Kathmandu Valley, Nepal was a cross-sectional survey study.

3.2 Study Area

The study was conducted in the Kathmandu valley of Nepal which comprises of three districts- Kathmandu, Lalitpur and Bhaktapur. As no previous studies have focused on antibiotic self-medication among the general population in the valley as per the researcher's knowledge, the valley has been selected. According to the World Bank, the population of Kathmandu valley is increasing at a rate of 4 percent annually and the valley is said to be the most rapidly growing metropolitan areas in South Asia. Also, the valley comprises about 10% of the total population as per the census of 2011 (National Planning Commission Secretariat, 2011; The Word Bank, 2013).

The designated study area, through multi-stage random selection, for this study was Ward number 16 of Kathmandu Metropolitan City as explained in the sampling flow chart (Figure 4).

3.3 Study Population

The total population of Kathmandu valley as per the 2011 census is around 2.5 million. Kathmandu district was randomly selected among the three districts of the valley using lottery method. The total population of Kathmandu district according to 2011 census is 1,744,240 with a total of 254,297 households. The district is further divided into 2 - 1.) Kathmandu Metropolitan City with a population of 975,453 and 2.) 10 municipalities with a total population of 723,836. The study area was Ward number 16 of Kathmandu Metropolitan City (selected through simple random selection), with total population of about 84,441 and 22,715 households (National Planning Commission Secretariat, 2011).

The total population of individuals of age 18 years and above in the Kathmandu valley was around 17,49,330 with a population of age 18 years and above in Kathmandu district being 12,14,913. Therefore, 58,816 number of individuals who are 18 years and above in Ward number 16 was calculated based on the total population of 18 years and above in Kathmandu District and its Ward, that is Ward number 16. Hence, 58,816 number of individuals in Ward number 16 of Kathmandu Metropolitan City was estimated to be the study population from which the sample was drawn for data collection.

Calculation explanation:

Out of total 1,744,240 population in Kathmandu District, the population of people age 18 years and above = 1,214,913

Therefore, out of total 84,441 population in Ward Number 16 of Kathmandu Metropolitan City, the population of people age 18 years and above = (1,744,240/1,214,913) * 84,441 = 58,816 individuals.

3.3.1 Inclusion Criteria

The people who were included in the study are:

1. General public of the Ward number 16 of Kathmandu Metropolitan City, Kathmandu district, of both sexes (male and female) who are 18 years and above.
2. General public of Ward number 16 of Kathmandu Metropolitan City, Kathmandu district, who are of all ethnic background, race and religion.
3. General public of Ward number 16 of Kathmandu Metropolitan City, Kathmandu district, who can understand either Nepali or English language or both.

3.3.2 Exclusion criteria

The people who were excluded from the study are:

1. General public of Ward number 16 of Kathmandu Metropolitan City, Kathmandu district, who have some form of disability like hearing or vision loss, or those who are severely ill and are in no position to answer the questions.
2. General public of Ward number 16 of Kathmandu Metropolitan City, Kathmandu district, who cannot give written informed consent (signature or thumb impression). For participants who were illiterate and cannot read or write, thumb impression was taken. To ensure that the information on the consent form is correct and is as explained by the research team, an individual who can read and write and is not from the research team was taken into consideration.

3.4 Sample Size

Sample size for this study was calculated based on the Taro Yamane (1967) with total population of individuals who are 18 years and above being around 58,816 with confidence interval of 95%.

$$n = \frac{N}{1+ (N* e^2)}$$

$$n = \frac{58{,}816}{1+ (N* 0.5^2)}$$

$$n = 397.29$$

Where, n = sample size

N = total population of individuals who are 18 and above in the study area

e = level of precision = 0.5

Taking into account the chance of refusal to participate in the study, dropout during the interview or missing information, consideration of additional 10% was made to the sample size. The total resulting sample size was therefore, 436.7 ~ 437.

3.5 Sampling Technique

Kathmandu Valley was purposively selected in this study. Sampling process in this study can be divided into two sections. Section one involves multi-stage sampling and the second is random walk sampling.

Section one: A multi-stage sampling technique was adopted in this study. Firstly, simple random sampling was performed to select study district from the Kathmandu valley. Using the lottery method, Kathmandu district was selected out of the three districts in the valley. As Kathmandu district consists of Kathmandu Metropolitan City and 10 other municipalities, simple random sampling was performed again to select one study area and Kathmandu Metropolitan City was selected.

Furthermore, Kathmandu Metropolitan City consists of 32 Wards in total. Out of the 32 Wards, one of the Wards was randomly selected and from random

selection using lottery method, Ward number 16 was selected. Only 1 Ward was selected because of resource and budget and time constraints.

Section two: A random walk sampling technique (Magnani, 1999; Wingfield-Digby, 2010) was employed in the resulting area, that is, Ward number 16. In this technique, a random but well define geographic location was selected as the starting point. After selection of the entry point, a direction of travel was selected by spinning a bottle on the ground. The direction that the head of the bottle pointed was selected. The nearest household closest to the selected geographic location was selected as the direction of travel. After the first household, the next nearest household was selected for interview and then the next nearest until the targeted sample size was met.

In cases when the desired sample size was reached at the edge of the area of Ward number 16 in the given direction, the bottle was spun again to select a direction at random and the survey process was proceeded as mentioned earlier until the sample size requirement was met.

Selection of individuals from randomly selected households: From the selected households, the first member of the household who voluntarily attends the research assistant was considered for the study if they fit the inclusion criteria and voluntarily agreed to participate in the study. However, when there were multiple household members who agreed to participate in the study, only one of the member was selected based on the month in which they were born. The individual member whose month of birth comes first was selected for the study.

When the household member(s) did not fit the inclusion criteria, next closest household was selected. This approach was performed until the study sample size was obtained. The estimated time taken for data collection was around 30-40 days.

3.5.1 Sampling Flow Chart

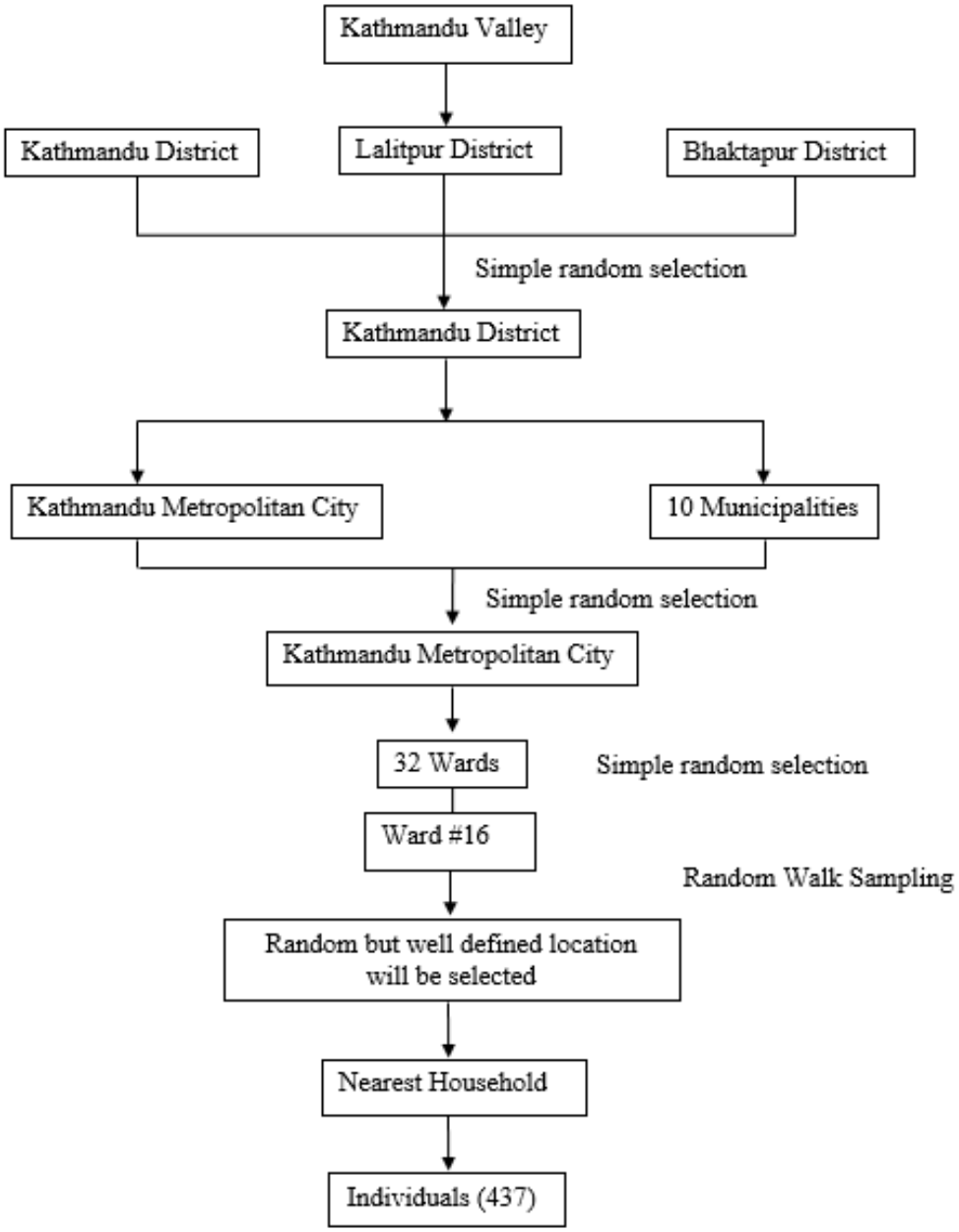


Figure 4: Sampling Flow Chart

3.6 Study Period

The study period of the study was from May 2018 to July 2018.

3.7 Measurement Tools

Questionnaire

Detailed study of various literatures on similar previous researches was performed to identify potential items for the study instrument such that the questionnaire matches the objectives of the study. Based on the review of three studies conducted in China and Kuwait (Awad & Aboud, 2015; Huang et al., 2013; Lv et al., 2014), consultation with a medical doctor and a senior nurse working in Kathmandu, Nepal, and an expert at Chulalongkorn University, Thailand, research questionnaire has been developed in English language. The questionnaire has been modified and adjusted to suit the requirement of local population in the Kathmandu valley. Two bilingual translators having clear understanding of the instrument were hired to translate the questionnaire formulated in English into Nepali language using the forward and backward translation. Then the accuracy and meaning of the translated versions, both forward and backward were assessed and necessary recommendations were incorporated. Lastly, a mono-lingual Nepalese citizen who is from the study population was asked to identify the items that were not clear and understandable. Following the response obtained from the participant, questionnaire was revised and reviewed again.

The questionnaire thus prepared had a total of 54 questions and was sub divided into 4 sections: general characteristics, knowledge of antibiotics, attitude towards antibiotics, and practice of antibiotics.

Section I: General characteristics

Section I of the questionnaire comprised of socio-demographic characteristics and had 9 questions:

Age: self-reported

Gender: as 1.) Male; and 2.) Female

Marital Status: as 1.) Single (includes unmarried, widowed, separated and divorced) and 2.) Married

Ethnicity: as 1.) Brahmin, 2.) Chhetri, 3.) Newar, 4.) Others (includes Hill/Mountain Janajati, Tarai Janajati, Tarai/Madhesi, Muslim, Dalit, etc.)

Education: 1.) 'Up to grade 8'; 2.) 'High school (Grade 9-12)', and 'Undergraduate' and above'.

Employment status: 1.) 'With employment' and 2.) 'Without employment'

Occupation: 1.) Employed, 2.) Self-employed and 3.) Unemployed (includes retired)

Monthly Income: self-reported

Distance to nearest health facility from the place of residence by walk: as 1) 'less than 10 minutes', 2) '10-29 minutes or more'

Section II: Knowledge on Antibiotics

This section consisted of 17 statements to assess the knowledge of respondents about antibiotics in four aspects: (1) General Knowledge on Antibiotics (8 statements from Q9-Q16), (2) Action and use of antibiotics (3 statements from Q17 - 19), (3) Side effects (2 statements Q20-Q21), and (4) Antibiotic resistance (4 statements from Q22-Q25).

All answers of the respondents were recorded in 3 categories - 1) Yes; 2) No; and 3) Don’t Know. All the responses obtained as 'Don’t Know' were converted to responses as 'No' during the time of data entry. A common grading system was employed for each statements in this section. The answers were graded as 'Right' or 'Wrong' for single answer statements. The 'Right' answers were assigned a score of 1 while the 'Wrong' answers to the statement/question were scored 0. Reverse scoring was performed for negative statements.

Question number 15 and 16 consisted of a multiple choice questions on “Which of the following are antibiotics?” and "Which of the following medicine is used in treatment of fever?", respectively. All correct responses were scored 1 and wrong 0.

The score ranged from 0-21. Bloom's cut off point was used to classify study participant's knowledge into 3 categories as mentioned below:

Poor	< 13 score	(<60%)
Moderate	13-17 score	(60-80%)
Good	> 17 score	(>80%)

Section III: Attitude towards Antibiotics

This section consisted of a total of 14 statements on attitude towards antibiotics from Q26-Q39. The section was divided into two parts 1) Positive attitude item (3 statements Q26, Q32 and Q36) and 2) Negative attitude items (11 statements from Q27, Q28, Q29, Q30, Q31, Q33, Q34, Q35, Q37, Q38 and Q39). The positive attitude statements were regarding completion of course of antimicrobials, self-medication and its role in development of resistance and reduction of effectiveness if there is no completion of full course of treatment while the 10 negative items were on acquiring antibiotics from family or friends, attitude towards obtaining antibiotics from pharmacy without prescription, storage of antibiotics, self-medication in minor illness, use antibiotics to treat sore throat, incompletion of the course after feeling better, use in cough, instruction dose not enough for treatment, decrease in effective of treatment if course is not completed, expensive and new antibiotics, and use in common cold.

A five point Likert scale categorized as "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Disagree" was used to evaluate the study participant's responses. The rating scale was measured as follows: Reverse scoring was performed for negative statements.

Positive statements		Negative statements	
Choice	Score	Choice	Score
Strongly Agree	5	Strongly Agree	1
Agree	4	Agree	2
Uncertain	3	Uncertain	3
Disagree	2	Disagree	4

Strongly Disagree	1	Strongly Disagree	5

Answers from all the respondents were be summed up and mean and standard deviation was calculated and represented as mean $\pm$ standard deviation. The attitude of respondents was categorized accordingly:

Poor attitude	Score ≤ mean - standard deviation
Fair attitude	Mean - standard deviation < score < mean + standard deviation
Good attitude	Score ≥ mean + standard deviation

Section IV: Practice regarding antibiotics

The section on practice of antibiotic drugs use consisted of two sub-sections and 15 questions in total. The first sub-section had 7 closed ended questions from Q40-Q46, and second sub-section with 8 questions (Q47-54) measured on a 5-pont Likert Scale ranging from "Never", "Rarely", "Sometimes", "Often" and "Always".

Questions in sub-section 1 are composed of following questions (Q40-Q46): whether the respondents had received any medical treatment in the last 1 year, how they received treatment for their illness, type of medicine used in self-medication, if self-medicated with antibiotics what type of antibiotics were used, illness in which the antibiotics were used, frequency of use, and reasons for self-medication with antibiotics. For all the questions in sub-section 1, descriptive statistics will be used to describe the results.

The 8 questions in sub-section 2 (Q47-Q54) are regarding the self-medication practice of respondents with antibiotics in last 1 year measured as on a 5-point Likert scale ranging from "Never", "Rarely", "Sometimes", "Often" and "Always". The 8 questions are regarding the frequency of practice of antibiotic use and include: purchase of antibiotics without medical prescription at a pharmacy, use of antibiotics that were originally prescribed for an infection which occurred again later, originally prescribed for another infection, use leftover antibiotics stored at home, switched antibiotics during the course of self-treatment, selection of more expensive

or newer antibiotics, change dose of antibiotics during self-treatment, completion of course of antibiotic treatment during self-medication, self-medication with antibiotics to prevent an illness.

Questions in sub-section 2 (Q47-Q54) will be measured in 5-point Likert Scale ranging from Never", "Rarely", "Sometimes", "Often" and "Always". Reverse scoring will be done for negative questions. The score will be calculated as:

Positive Questions		Negative Questions	
Choice	Score	Choice	Score
Never	5	Never	1
Rarely	4	Rarely	2
Sometimes	3	Sometimes	3
Often	2	Often	4
Always	1	Always	5

Poor practice	Score ≤ mean - standard deviation
Fair practice	Mean - standard deviation < score < mean + standard deviation
Good practice	Score ≥ mean + standard deviation

3.8 Validity

The questionnaire formulated for this study was based on previous similar researches' with validated questionnaires conducted in Kuwait and China, (Awad & Aboud, 2015; Huang et al., 2013; Lv et al., 2014) and modified to meet Nepal's context.

The first section containing questions on socio-demographic characteristics were based on general characteristics of the study participants. The second section on assessing the knowledge of the participants were sourced from the three studies mentioned above and were modified and adjusted to fit into Nepal's context.

Similarly, the latter two sections on attitude and practice have been modified and adjusted to fit Nepal's context.

Content validity from sections II to IV was assessed to ensure clarity, accuracy and appropriateness of the instrument. A group of three experts (Assoc. Prof. Ratana Somrongthong, Dr. Nipunporn Voramongkol and Dr. Hem Raj Paneru) were consulted to in order to evaluate the content of the questionnaire by Item-Objective Congruence (IOC) Index. The IOC was assessed on the basis of a scale as: +1 indicating the agreement between item and the study variable, 0 indicating undecided and -1 denoting disagreement between item and the study variable.

IOC calculation:

IOC = Sum (R)/n

Where, R = total score of the ith item,

n = number of experts

IOC of at least 0.75 was accepted.

3.9 Reliability

The reliability of the questionnaire was ensured by performing a pre-test carried out by the principal research among 30 participants in a district which is in close proximity to the Kathmandu valley. The pilot testing of the questionnaire was done among residents of that district. The internal consistency was tested by using Cronbach's Alpha coefficient. The alpha value of 0.7-0.9 was considered as an indication of good internal consistency (Tavakol & Dennick, 2011). To ensure that the study participants clearly understand the questions without losing its actual content, the interview was closely monitored by the researcher and modifications to the questionnaire was then made accordingly.

The value for knowledge scale (KR-20) was found to be 0.704 whereas Cronbach's alpha value for attitude scale was 0.728 and that for practice was noted to be 0.731.

3.10 Ethical Consideration

Prior to data collection, ethical approval was taken from Nepal Health Research Council (NHRC), Kathmandu, Nepal. Before conducting face to face interview with the study participants, the purpose of the study, each section of the questionnaire, and expected benefits were clearly explained to the respondent and a written informed consent was taken by the research assistants, indicating their anonymity, voluntary participation, freedom of withdrawal at any point and use of data strictly for the purpose of the study conducted.

For participants who were illiterate and cannot read or write, thumb impression was taken. To ensure that the information on the consent form is correct and as explained by research team, assistance from an individual who can read and write and is not from the research team was taken.

3.11 Data Collection

The data collection was done through face to face interview from the general population of Ward number 16 by using structured questionnaire. 3 research assistants who were undertaking Bachelor and Master of Business Administration were hired for the purpose of data collection. A one-day training program was organized to brief them on the overall purpose and objectives of the study. Training was also provided by the principal researcher on data collection, that is, how to conduct interviews, elicit informed consent and build rapport with the study participants.

Practice session was held to assess the knowledge and skills of the assistants regarding the objective of the study and method of collecting data. The interview was conducted in either Nepali or English based on the comfortability of the participants. The interview was around 15-20 minutes. Finally, after completion of each interview, the research assistants checked the questionnaire to ensure all sections were answered completely.

3.12 Data Analysis

After completion of data collection, the data will be cleaned, coded, entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 21. The independent variables and their measurement scale are as follows:

Age	Continuous variable
Gender	Nominal
Marital Status	Nominal
Ethnicity	Nominal
Education	Ordinal
Occupation	Nominal
Income	Ordinal
Distance from nearest health facility	Nominal

Descriptive statistic

The prevalence of self-medication with antibiotics among the general public, reasons for self-medication and the independent variables that are in nominal or ordinal scale will be presented as frequency and percentage, and continuous variable (age) will be presented as mean ± standard deviation.

Inferential statistic

Bivariate analysis will be done to determine the association between independent and dependent variables. For categorical data, Chi-square test (or Fisher's Exact Test as needed) will be used to analyze the association between independent and dependent variables.

Regression analyses will be used to analyze the association between independent and dependent variables.

3.13 Expectations and Benefits

The study is expected to provide information regarding self-medication and antibiotic use among the general population of Kathmandu valley. The findings are expected to be particularly useful in developing and initiating effective interventions to decrease the misconceptions regarding the use of antibiotic drugs. The intervention program will be easy to develop as the study will help identify the population to target in priority. Furthermore, as the study is first of its kind to be conducted among the general population, it provides a preliminary information for further additional research on antibiotic use and antibiotic resistance. The baseline data obtained is expected to be beneficial for policymakers to formulate pertinent public policies on antibiotics use since till date no such policies have been made. Also, the information from the study can be used in developing an antibiotic use controlling system in Nepal, through coordinated efforts from the government, private and the public side, in addition to international organizations such as WHO, ADB, World Bank, among others. This will help in decreasing the burden of antimicrobial resistance, thus taking away the financial burden of high cost of treatment for patients on the long run. Lastly, although the study was not intended to measure the prevalence of self-medication with antibiotics within Kathmandu valley, it can provide a rough estimate of the prevalence.

3.14 Obstacles and Strategies to overcome

One of the major obstacle in conducting this study was the lack of adequate documentation practice in Nepal which would have provided easy sampling of the population making the study comprehensive and more generalizable. Additionally, obtaining pertinent literatures and studies conducted in Nepal regarding self-medication with antibiotics is limited. During the data collection phase of the study, time constraint was one of the factor that needs to be considered. To overcome the challenges of literature, various relevant researches conducted in countries similar to Nepal were reviewed.

CHAPTER IV

RESULTS

4.1 Descriptive Statistics

4.1.1 General Characteristics

The general characteristics of respondents comprises of socio-demographic, socio-economic characteristics and distance from nearest health facility and are represented in Table 1.

4.1.1.1 Socio-demographic Characteristics

Table 1 describes the socio-demographic characteristics of the study participants of Ward No. 16, Kathmandu Metropolitan City, Kathmandu, Nepal. The socio-demographic characteristics consists of age, gender, marital status and ethnicity. Out of 437 participants in the study, majority were between the age group of 21-29 years (28.6%), followed by 30-39 years (24.5%) with the least number of participants above 60 years of age (5.0%). The age of respondents ranged from 18 to 73 years with mean age being 35.39 years. Male participants were higher (57.2%) compared to females (42.8%). A higher number of participants were married (64.1%) while 35.1% were single and about 1% were widowed or separated or divorced. A greater number (44.9%) of study participants belonged to Newar ethnicity, followed by Brahmin (30.4%) and Chhetri (13.5%).

4.1.1.2 Socio-economic Characteristics

According to Table 1, majority (97.7%) of the study participants had completed some form of education while 2.3% had never attended school. Higher number (35.8%) of study participants had completed higher secondary education (Grade 11 -12) followed by undergraduate level (25.9%) and 20.9% completed secondary education (Grade 9-10). Regarding employment status of the participants, 79.5% were involved in some form of work while 20.5% were unemployed. More than half (56.7%) of the participants had their own business while 22.8% were

employed in an organization. About 20% of the study participants were without occupation. Out of 437 participants only 272 provided information about their monthly income. About 43.0% of the study participants had monthly income lower than NRs. 30,000 while 57.0% had above NRs. 30,000.

4.1.1.3 Distance from nearest health facility

Almost all the study participants had a health facility very close to their place of residence. About 95.6% had a health facility in a distance less than 10 minutes' walk from their place of residence.

Table 1: General characteristics (socio-demographic, socio-economic and distance from nearest health facility) of study participants (n= 437)

General Characteristics	Number (n)	Percentage (%)
Socio-demographic		
Age Group		
Up to 20	48	11.0
21 - 29	125	28.6
30 -39	107	24.5
40 - 49	90	20.6
50 - 59	45	10.3
60 and above	22	5.0
Mean ± SD	35.39 ± 12.63	
Range	18 - 73 Years	
Gender		
Male	250	57.2
Female	187	42.8
Marital Status		
Single*	157	35.9
Married	280	64.1
Ethnicity		
Brahmin	133	30.4

Chhetri	59	13.5
Newar	196	44.9
Others**	49	11.2

Table 1: General characteristics (socio-demographic, socio-economic and distance from nearest health facility) of study participants (n= 437) (Continue)

General Characteristics	Number (n)	Percentage (%)
II. Socio-economic		
Education (436)		
Up to grade 8	39	8.9
High School (Grade 9 -12)	247	56.7
Undergraduate and above	150	34.3
Employment Status (434)		
With employment	345	79.5
Without employment	89	20.5
Occupation (434)		
Employed (includes labor)	99	22.8
Self-employed	246	56.7
Unemployed (includes retired)	89	20.5
Income (272)		
< NRs. 30,000	117	43.0
≥NRs 30,000	155	57.0
III. Distance from nearest health facility (433)		
Less than 10 minutes	414	95.6
10 to 29 minutes	19	4.4

*includes unmarried, separated, widowed and divorced; **includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.

4.1.2 Knowledge on antibiotics

The level of knowledge of 437 study participants of Ward No. 16, Kathmandu Metropolitan City, Kathmandu, Nepal were presented in Table 2. Knowledge on antibiotics was measured on general knowledge of antibiotics, its action and use, side effects, and antibiotic resistance. The median (IQR) attitude score of the study participants was 14 (5). According to Table 2, a higher percentage (40.0%) of participants were found to have moderate level of knowledge whereas 31.1% had poor knowledge and 28.8% had good knowledge on antibiotics. The maximum score obtained was 21 while the lowest score found in this study was 1.

Table 2: Study participant's level of knowledge of antibiotics (n = 437)

Knowledge level	Number (n)	Percentage (%)
Poor (<60% correct response)	136	31.1
Moderate (60 - 80% correct response)	175	40.0
Good (> 80% correct response)	126	28.8
Mean = 14.22 Median = 14 SD = 3.87 Minimum = 1 Maximum = 21		

The frequency and proportion of study participants who provided correct and incorrect answers for each statements regarding their knowledge on antibiotics were shown in Table 3. For the section on general knowledge of antibiotics, only 26.1% of the participants incorrectly answered that antibiotics and pain killer medicines were the same, while most (73.9%) answered the statement correctly. A majority of participants (71.2%) knew that one should not stop taking antibiotics as soon as the symptoms disappeared, and 84.7% of them had appropriate knowledge that many types of antibiotics should not be taken during the course of a single illness. As for the statements on efficacy of antibiotics, most of the participants correctly answered that newer antibiotics doesn’t mean greater efficacy of the antibiotics (59.3%), and that that higher the price of antibiotic doesn’t mean that its efficacy is higher (76.2%).

Around nine-tenth (90.8%) of the participants had knowledge that antibiotics should only be purchased with a prescription. However, the study found that most of the participants didn't have knowledge regarding the names of the antibiotics even when provided with the most commonly marketed brands of antibiotics. More than half (58.1%) didn't answered that amoxicillin is an antibiotic. Similarly, higher proportion of the participants incorrectly answered for azithromycin (70.9%), ampicillin and cloxacillin (70.3%), and ciprofloxacin (83.5%). Nevertheless, from the result it was noted that amoxicillin is the most well-known antibiotics by the study participants with around 42.0% correctly identifying the medicine as an antibiotic. Almost all (97.9%) of the participants correctly answered that paracetamol should be used for fever, while surprisingly 20.0% answered antibiotics should be used.

For the knowledge on "Action and Use", majority (81.7%) of participants had knowledge that antibiotics are effective against bacteria, but more than half (52.2%) incorrectly answered that antibiotics work on coughs and colds. Similarly, 67.0% of the participants incorrectly answered that antibiotics are effective against viruses, indicating poor knowledge regarding antibiotic's action against viruses.

On the topic of "Side effects", majority of the study participants had good knowledge. Around 94.7% percent of them correctly answered that antibiotic treatment should be stopped as soon as possible in case of any side effects such as skin rash, swelling and difficulty in breathing. Likewise, more than four-fifth (88.1%) were also well informed regarding never to take the same antibiotic again it one gets some skin reaction during the course of antibiotic treatment.

Regarding the knowledge on "Antibiotic resistance", most of the study participants were found to have good knowledge regarding antibiotic resistance. About three-fourth (72.3%) knew the definition of antibiotic resistance. Similarly, 84.2% correctly answered that incompletion of the course of antibiotics treatment would lead to development of resistance, 85.4% correctly answered that antibiotic overuse can result in antibiotic resistance and lastly, 83.5% had knowledge that frequent use of antibiotics will decrease effectiveness of the treatment when using the antibiotic again.

Table 3: Study participant by knowledge of antibiotics (n=437)

Statement	Number (%)	
	Incorrect	Correct
General Knowledge on Antibiotics		
Antibiotics and pain killer medicine are the same *	114 (26.1)	322 (73.9)
You can stop taking antibiotics as soon as the symptoms have disappeared*	123 (28.1)	314 (71.9)
You can take many types of antibiotics at the same time during the course of a single illness *	67 (15.3)	370 (84.7)
The efficacy is better if the antibiotics are newer *	178 (40.7)	259 (59.3)
The efficacy is better if the price of antibiotics are higher *	104 (23.8)	333 (76.2)
Antibiotics should only be purchased with prescription at a pharmacy	40 (9.2)	397 (90.8)
Which of the following are antibiotics?		
Amoxicillin	254 (58.1)	183 (41.9)
Azithromycin	310 (70.9)	127 (29.1)
Ampicillin and Cloxacillin	307 (70.3)	130 (29.7)
Ciprofloxacin	365 (83.5)	72 (16.5)
Which of the following medicine is used in treatment of fever?		
Paracetamol	9 (2.1)	428 (97.9)
Antibiotics*	87 (20.0)	348 (80.0)
Action and Use		
Antibiotics are effective against bacteria	80 (18.3)	357 (81.7)
Antibiotics work on coughs and colds*	228 (52.2)	209 (47.8)
Antibiotics are effective against viruses*	293 (67.0)	144 (33.0)
Side Effects		

If you get side effects (skin rash, swelling of face and tongue, difficulty breathing, etc.) during a course of antibiotics treatment you should stop taking them as soon as possible	23 (5.3)	385 (94.7)
If you get some skin reaction when using an antibiotic, you should not use the same antibiotic again	52 (11.9)	385 (88.1)
Antibiotic Resistance		
Antibiotic resistance is a situation where antibiotics become ineffective in controlling or killing bacteria	121 (27.7)	316 (72.3)
Incompletion of the course of antibiotic treatment leads to the development of resistance	69 (15.8)	368 (84.2)
Antibiotic overuse can result in antibiotic resistance	64 (14.6)	373 (85.4)
The frequent use of antibiotics will decrease effectiveness of the treatment when using the antibiotic again	72 (16.5)	365 (83.5)

* Negative Statement

4.1.3 Attitude towards antibiotics

Table 4 shows the attitude of 437 study participants of Ward No. 16, Kathmandu Metropolitan City, Kathmandu, Nepal towards antibiotics. The attitude towards antibiotics was measured based on positive and negative statements. It was found that about three-fifth (73.2%) of the respondents had fair attitude while 16.2% had poor attitude and 10.5% had good attitude towards antibiotics.

Table 4: Study participant's level of attitude towards antibiotics (n = 437)

Attitude level	Number (n)	Percentage (%)
Poor attitude (Score ≤ 48.08)	71	16.2
Fair attitude (48.08< Score < 59.56)	320	73.2
Good attitude (Score ≥ 59.56)	46	10.5
Mean = 53.83 Median = 54.0 SD = 5.75 Minimum = 36 Maximum = 70		

Table 5 describes the frequency and proportion of the study participants who provided answers as "Strongly disagree", "Disagree", "Uncertain", "Agree" and "Strongly Agree" for each statement regarding their attitude towards antibiotics. The median (IQR) attitude score of the study participants was 54 (5). A greater number (67.5%) of study participants agreed on completing the course of antibiotic treatment even if they felt better. Similarly, a larger percentage of participants disagreed on preferring to obtain antibiotics from relatives or friends while 19.2% strongly disagreed. Only a small percentage (2.3%) agreed on preferring to get antibiotics from relatives or friends. About seven-tenth (69.6%) of the participants disagreed on preferring to buy antibiotics from the pharmacy without medical prescription while 16.9% strongly disagreed. However, 11.0% of them agreed on preferring to purchase antibiotics without prescription at the pharmacy. It was also found that majority (85.3%) of the participants didn't prefer to keep antibiotic at home for future use whereas 12.1% preferred to keep antibiotics at home in case there is need for them later. Similar to other statements, 84.6% of the participants didn't agree to self-medicate with antibiotics rather than to see a doctor in case of minor illness. On the other hand, 113.7% agreed on self-medicating with antibiotics in case of minor illness. Seven-tenth (70.5%) of disagreed to prefer antibiotics to treat sore throat while 15.8% strongly disagreed to the statement. Only about 11.0% agreed on preferring to use antibiotics to treat sore throat.

About three-fourth (75.8%) of the respondents agreed that self-medication with antibiotic plays an important role in increasing antibiotic resistance whereas

around 13% disagreed. Correspondingly, around three-fourth (78.7%) disagreed on not completing the course of antibiotic treatment even after feeling better while around 19.0% agreed on not completing the complete course of treatment after feeling better. The result on preference to use antibiotics in case of cough showed that majority (90.6%) of the respondents had positive attitude towards not using antibiotics in case of cough. In contrast, only a small fraction (7.3%) agreed on preferring antibiotics if they had cough. Likewise, 82.2% of the respondents disagreed that the dose of antibiotic prescribed by the doctor is not enough to treat their illness while 12.4% thought that the dose prescribed by doctor is not enough to treat their illness. At the same time, 5.5% were uncertain about the statement. 88.8% of the respondents had positive attitude towards decrease in effectiveness of treatment if the full course of antibiotic treatment was not completed. On the other hand, 6.4% showed negative attitude towards the statement. In the same manner, 65.9% of the respondents disagreed and 13.0% strongly disagreed that expensive antibiotics are more effective and showed negative attitude towards the statement. 9.8% agreed and 3.7% strongly agreed to the statement that expensive antibiotics are more effective and therefore showed positive attitude towards the statement. Majority of the respondents didn't agree that newer antibiotics are more effective. 55.8% of the respondents disagreed to the statement while around 12.1% strongly disagreed. In contrast, 17.8% were found to have positive attitude towards newer antibiotics being more effective while 2.5% strongly agreed.

Lastly, 75.5% and 10.3% of the respondents disagreed and strongly disagreed respectively to the statements regarding taking antibiotics when a person has common cold whereas only 3.9% and 4.8% agreed and strongly agreed respectively.

Table 5: Study participants by attitude towards antibiotics (n = 437)

Statement	Frequency (%)					Median(IQR)
	SD	D	U	A	SA	
I always prefer completing the course of treatment of antibiotics even after I feel better	3 (0.7)	69 (15.8)	7 (1.6)	295 (67.5)	63 (14.4)	4 (0)
I prefer to get antibiotics from relatives or friends without having to see a medical doctor*	84 (19.2)	340 (77.8)	3 (0.7)	10 (2.3)	0 (0)	4 (0)
I prefer to buy antibiotics from the pharmacy without a medical prescription*	74 (16.9)	304 (69.6)	3 (0.7)	48 (11.0)	8 (1.8)	4 (0)
I prefer to keep antibiotics at home in case there is a need for them later*	74 (16.9)	299 (68.4)	8 (1.8)	53 (12.1)	3 (0.7)	4 (0)
I agree that one can self-medicate with antibiotics rather than to see a doctor when he/she has a minor illness*	74 (16.9)	296 (67.7)	7 (1.6)	50 (11.4)	10 (2.3)	4 (0)
I prefer to use an antibiotic to treat sore throat*	69 (15.8)	308 (70.5)	11 (2.5)	46 (10.5)	3 (0.7)	4 (0)
I agree that self-medication with an antibiotic plays an	6 (1.4)	52 (11.9)	48 (11.0)	284 (65.0)	47 (10.8)	4 (0)

important role in increasing antibiotic resistance						
I agree that if I feel better, I sometimes do not complete the course of antibiotic treatment*	60 (13.7)	284 (65.0)	8 (1.8)	73 (16.7)	12 (2.7)	4 (0)
I prefer to use an antibiotic if I have a cough*	78 (17.8)	318 (72.8)	9 (2.1)	31 (7.1)	1 (0.2)	4 (0)
I think that the dose of antibiotic prescribed by doctor is not enough to treat my illness*	79 (18.1)	280 (64.1)	24 (5.5)	48 (11.0)	6 (1.4)	4 (0)
I think the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed	5 (1.1)	23 (5.3)	21 (4.8)	341 (78.0)	47 (10.8)	4 (0)
I agree that newer antibiotics are more effective*	53 (12.1)	244 (55.8)	51 (11.7)	78 (17.8)	11 (2.5)	4 (1)
I agree that expensive antibiotics are more effective*	57 (13.0)	288 (65.9)	33 (7.6)	43 (9.8)	16 (3.7)	4 (0)
I agree that one should take antibiotics when one gets common cold*	45 (10.3)	330 (75.5)	24 (5.5)	17 (3.9)	21 (4.8)	4 (0)

* Negative Statement; IQR: Interquartile range: SD = Strongly Disagree; A= Disagree; U = Uncertain; D = Disagree; SD = Strongly Disagree

4.1.4 Practice of self-medication with antibiotics

Table 6 shows the number and percentage of study participants who received medical treatment and how they received it within the last 1 year. More than three-fourth (78.5%) of the participants received medical treatment while 21.5% didn't received any form of medical treatment since they were not sick at all within the last 1 year.

Among those who received medical treatment, 46.7% consulted a medical doctor while 54.7% self-medicated to treat their illness within the last 1 year. Out of those who received medical treatment, 23.8% only consulted doctor, 31.8% only self-medicated while 23.8% consulted medical doctor as well as self-medicated.

Table 6: Study participants by medical treatment (n = 437)

Treatment	Number (n)	Percentage (%)
Received medical treatment	343	78.5
Only Consult a medical doctor	104	23.8
Only Self-medicate	139	31.8
Consult medical doctor and self-medicate both	100	22.9
Did not receive any medical treatment	94	21.5

Table 7 describes the number and percentage of study participants who had self-medicated with various groups of medicines within the last 1 year. From the table it can be noted that cough and cold medicine (62.3%) and pain killers (51.9%) were highly used in self-medication. 16.3% of the participants reported self-medication with antibiotics while 7.5% self-medicated allergy medicine and only 0.8% didn't know what category of medicine they self-medicated with.

Table 7: Study participants by group of medicines self-medicated within last 1 year (n = 239)

Medicine Group	Number (n)	Percentage (%)
Pain killer	124	51.9
Antibiotics	39	16.3
Cough and cold medicine	149	62.3
Allergy medicine	18	7.5
Others	21	8.8
Don’t Know/ Don't Remember	2	0.8

Table 8 describes various medicines self-medicated by the study participants who have self-medicated within the last 1 year. Paracetamol was found to be the most widely self-medicated medicine (59.4%) followed by D-Cold (42.3%) followed by Sinex (38.1%). Regarding antibiotics, Amoxicillin (6.3%) and Azithromycin (5.9%) were the most commonly used antibiotics in self-medication followed by Ampicillin - Cloxacillin (1.3%), Amoxicillin - Clavulanate (0.8%) and Ciprofloxacin (0.8%). About 7.5% who self-medicated used medicines such as ibuprofen, vitamins, *flexon*, *nims* among others during self-medication where as 10.0% didn’t know the name of the medicine they self-medicated with.

Table 8: Study participants by name of medicine self-medicated within last 1 year (n = 239)

Name of medicine	Number (n)	Percentage (%)
Amoxicillin	15	6.3
Paracetamol	142	59.4
Azithromycin	14	5.9
Ampicillin and Cloxacillin	3	1.3
D-Cold	101	42.3
Amoxicillin - Clavulanate	2	0.8
Sinex	91	38.1

Ciprofloxacin	2	0.8
Cetirizine	1	0.4
Pantoprazole	30	12.6
Others	18	7.5
Don’t Know/ Don't Remember	24	10.0

Table 9 describes the total number and proportion of respondents who self-medicated with antibiotics within the last 1 year. 10.1% of the respondents reported self-medication with antibiotics while the majority (89.9%) did not self-medicate with antibiotics.

Table 9: Study participants by self-medication using antibiotics within the last 1 year (n = 437)

Self-medication with antibiotics	Number (n)	Percentage (%)
Yes	44	10.1
No	393	89.9

Table 10 describes various illness or conditions in which study participants self-medicated with antibiotics. Most of them who self-medicated with antibiotics took antibiotics for sore throat (47.7%) while 45.5% self-medicated antibiotics for cough and cold. 22.7% reported using antibiotics in case of fever while 9.3% self-medicated with antibiotics for other illness such as tonsillitis, swelling, chest infection and illness related to nerves.

Table 10: Study participants by illness in which antibiotic was self-medicated within the last 1 year (n = 44)

Illness	Number (n)	Percentage (%)
Cough and cold	20	45.5
Fever	10	22.7
Aches and pains	1	2.3
Sore throat	21	47.7
Others	4	9.1

Table 11 shows the frequency of self-medication with antibiotics by study participants within the last 1 year. A majority of study participants (68.2%) reported self-medicating with antibiotics once within the last 1 year whereas 27.3% reported self-medicating with antibiotics twice and 4.5% thrice in the last 1 year. None of the participants reported self-medication with antibiotic more than three times in the last 1 year.

Table 11: Study participants by frequency of self-medication with antibiotics within the last 1 year (n=44)

Frequency	Number (n)	Percentage (%)
Once	30	68.2
Twice	12	27.3
Thrice	2	4.5
Total	44	100

Table 12 describes the various reasons provided by study participants for self-medication with antibiotics within the last 1 year. A majority of participants who self-medicated with antibiotics within the last 1 year self-medicated with antibiotics because it was a minor illness (93.0%), past experience with similar illness (93.0%),

ease of access (88.4%) and recommendation from pharmacist (72.1%). More than half (51.0%) reported self-medication with antibiotics because visiting medical doctor took long time whereas only 16.3% cited reason for medical consultation being expensive and 9.3% for recommendation from family and friends.

Table 12: Study participants by reasons for self-medication with antibiotics within the last 1 year (n=44)

Reasons	Number (n)	Percentage (%)
Ease of access	38	88.4
Minor illness	40	93.0
Past experience with similar illness	40	93.0
Visiting medical doctor takes long time	22	51.0
Medical consultation is expensive	7	16.3
Recommendation form a family or friend	4	9.3
Recommendation from pharmacist	31	72.1
Total	182	

Table 13 explains the practice of 437 study participants of Ward No. 16, Kathmandu Metropolitan City, Kathmandu, Nepal regarding self-medication with antibiotics within the last 1 year. The practice of self-medication with antibiotics were measured on a 5-point Likert scale ranging from "Never" to "Always". It was found that majority (72.7%) of the respondents had fair practice while 22.7% had poor practice and only 4.5% had good practice of using antibiotics.

Table 13: Study participant's level of practice with self-medication with antibiotics (n =44)

Practice	Number (n)	Percentage (%)
Poor practice (Score ≤ 34.02)	10	22.7
Fair practice (34.02< Score < 38.26)	32	72.7
Good practice (Score ≥ 38.26)	2	4.5
Mean = 36.14 Median= 36.50 SD = 2.12 Minimum = 30 Maximum = 39		

Table 14 describes the frequency and proportion of study participants who provided answers as "Never", "Rarely", "Sometimes", "Often" and "Always" for each statement regarding their self-medication practice with antibiotics. The median (IQR) practice score of the study participants was 36.5 (3). Of those who self-medicated with antibiotics, a greater percentage (56.8%) of the participants rarely purchased antibiotics without medical prescription at a pharmacy while 22.7% often purchased antibiotics without a medical prescription. More than three-fifth (61.4%) reported never taking prescribed antibiotics for an infection which occurred again afterwards whereas 20.5% rarely practiced it and 4.5% often did it. On the other hand, none of the respondents were found to have taken a prescribed antibiotic for another type of infection.

Around 16.0% of the study participants rarely used leftover antibiotics that were stored at home while a majority (84.1%) never used leftover antibiotics within the last 1 year. More than nine-tenth (93.2) of the respondents never practiced switching to a different antibiotic during the course of self-treatment while only 6.8% rarely were found to have switched to a different antibiotic during the course of self-treatment. Similarly, 95.5% of the study participants never used newer antibiotics when they are ill during the last 1 year while 2.3% practiced it sometimes and rarely. It was also found that majority (93.2%) never changed the dose of antibiotic treatment during the course of self-treatment within the last 1 year where as 2.3% practiced it rarely, sometimes and often. Half of the participants rarely self-

medicated with antibiotics to prevent an illness beforehand while 15.9% were found to have practiced it often whereas 25.0% never practice it.

Table 14: Study participants by practice of self-medication with antibiotics (n = 44)

Statement	Frequency (%)					Median (IQR)
	Never	Rarely	Sometimes	Often	Always	
How frequently did you purchase antibiotic without medical prescription at a pharmacy?	0 (0)	25 (56.8)	9 (20.5)	10 (22.7)	0 (0)	4 (1)
How frequently did you take prescribed antibiotics for an infection that occurred again?	27 (61.4)	9 (20.5)	6 (13.6)	2 (4.5)	0 (0)	5 (1)
How frequently did you take antibiotic prescribed for another type of infection?	44 (100.0)	0 (0)	0 (0)	0 (0)	0 (0)	-
How frequently did you use leftover antibiotic that was stored at home?	37 (84.1)	7 (15.9)	0 (0)	0 (0)	0 (0)	5 (0)
How frequently did you switch to different	41 (93.2)	3 (6.8)	0 (0)	0 (0)	0 (0)	5 (0)

abiotic during the course of self-treatment?						
How frequently did you use newer antibiotic when you were ill?	42 (95.5)	1 (2.3)	1 (2.3)	0 (0)	0 (0)	5 (0)
How frequently did you change the dose of antibiotic treatment during the course of self-treatment?	41 (93.2)	1 (2.3)	1 (2.3)	1 (2.3)	0 (0)	5 (0)
How frequently did you self-medicate with an antibiotic to prevent an illness?	11 (25.0)	22 (50.0)	4 (9.1)	7 (15.9)	0 (0)	4 (2)

IQR: Interquartile range

4.2 Inferential Statistics

4.2.1 Bivariate Analysis

4.2.1.1 Association between General characteristics (Socio-demographic, Socio-economic and Distance from nearest health facility) and Knowledge on Antibiotics

Table 15 describes the association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and knowledge on antibiotics which was analyzed using Chi-square test (Fisher's exact test).

Categories of age were merged into four categories - "Up to 19 years", "20-39 years", "40 - 59 years" and "60 and above". Similarly, categories of ethnicity were merged into four categories - "Brahmin", "Chhetri", "Newar", and "Others", comprised of

"Hill/Mountain Janajati, Tarai Janajati, Tarai / Madhesi, Muslim, Dalit, etc.. The categories of variable marital status were combined into two - "Single" (unmarried, separated, widow/widower and divorced) and "Married", Education into three categories - "Up to grade 8", "High School (Grade 9 -12) and "Undergraduate and above". Occupation variable was also merged into three categories - "Employed", "Self-employed" and "Unemployed". Lastly, Income was also categorized into two as "< NRs. 30,000" and "≥ NRs. 30,000".

According to table 15, there was statistically significant difference between knowledge of antibiotics and gender (*p* -value = 0.004), education (*p*-value < 0.001), employment status (*p* -value = 0.033), occupation (*p*-value = 0.011) and income (*p*-value < 0.001). However, no association was found between age, marital status, ethnicity and distance from nearest health facility and level of knowledge. 32.4% of male participants had good level of knowledge while 39.6% of the females had poor level of knowledge and 42.8% of the males had moderate knowledge on antibiotics. Education was associated with level of knowledge of antibiotics. Highest level of knowledge was found among participants who had completed at least undergraduate level of education (47.3%) whereas poor knowledge was amongst those who completed Grade 8 or lower level of education (75%) and moderate level was highest among those who had completed high school (Grade 9 -12) (42.5%). Poor level of knowledge was found amongst those with employment (31.6%) while good knowledge was amongst without employment group (29.5%). With regards to occupation, respondents who were employed in an organization had good knowledge (47.5%) while poor knowledge was reported among those without employment (29.2%) and those employed in an organization (21.2%). Lastly, based on income category, good level of knowledge was among respondents who had monthly income greater than NRs. 30,000 (40.0 %) while poor knowledge was amongst respondents below NRs 30,000 (41.0%).

4.2.1.2 Association between General characteristics (Socio-demographic, Socio-economic and Distance from nearest health facility) and Attitude towards Antibiotics

Table 16 describes the association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and attitude towards antibiotics. There was statistically significant difference between attitude towards antibiotics and education (*p*-value = 0.027), employment status (*p*-value = 0.028) and occupation (*p*-value = 0.040). However, no association between gender, ethnicity, distance from nearest health facility, and income of attitude towards antibiotics

Study participants who had completed at least undergraduate level of education (16.0%) were found to have good attitude towards antibiotics while those who had only completed lower than high school (Grade 9 -12) had poor attitude (39.1%). Good attitude was found among study participants without employment (14.6%) while poor attitude was among those with employment (18.6%). Likewise, good attitude was found among individuals who worked in a company - employed (14.6%) compared to self-employed and unemployed group while poor attitude was found among respondents who were unemployed (7.9%).

Table 15: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and level of knowledge of antibiotics

General Characteristics	Knowledge Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Moderate n (%)	Good n (%)		
I. Socio-demographic characteristics					
Age (Years)				14.008	0.173
≤ 20	15 (31.3)	19 (39.6)	14 (29.2)		
21 – 29	32 (25.6)	46 (36.8)	47 (37.6)		

30 - 39	30 (28.0)	50 (46.7)	27 (25.2)		
40 - 49	29 (32.3)	26 (40.0)	25 (27.8)		
50 - 59	19 (42.2)	16 (35.6)	10 (22.2)		
≥ 60	11 (50.0)	8 (36.4)	3 (13.6)		
Gender				11.186	0.004*
Male	62 (24.8)	107 (42.8)	81 (32.4)		
Female	74 (39.6)	68 (36.4)	45 (24.1)		
Marital Status				0.088	0.957
Single**	49 (31.2)	64 (40.8)	44 (28.0)		
Married	87 (31.1)	111 (39.6)	82 (29.3)		
Ethnicity				5.960	0.428
Brahmin	42 (32.6)	55 (41.4)	36 (27.1)		
Chhetri	16 (27.1)	25 (42.4)	18 (30.5)		
Newar	59 (30.1)	73 (37.2)	64 (32.7)		
Others***	19 (38.8)	22 (44.9)	8 (16.3)		

* Significance at *p* -value < 0.05; **includes unmarried, separated, divorced and widow/widower; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.; † Fisher's Exact test

Table 15: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and level of knowledge of antibiotics (Continue)

General Characteristics	Knowledge Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Moderate n (%)	Good n (%)		
II. Socio-economic Characteristics					
Education (436)				69.098	< 0.001*
Up to Grade 8	27 (69.2)	10 (25.6)	2 (5.1)		

High School (Grade 9 - 12)	89 (36.0)	105 (42.5)	53 (21.5)		
Undergraduate and above	19 (12.7)	60 (40.0)	71 (47.3)		
Employment Status				6.842	0.033*
With employment	109 (31.6)	147 (42.6)	89 (25.8)		
Without employment	26 (29.2)	28 (32.5)	35 (39.3)		
Occupation (434)†					
Employed (includes labor)	21 (21.2)	31 (31.3)	47 (47.5)	38.881	<0.001*
Self-employed	88 (35.8)	116 (47.2)	42 (17.1)		
Unemployed (includes retired)	26 (29.2)	28 (31.5)	35 (39.3)		
Income (272)				23.629	<0.001*
< NRs. 30,000	48 (41.0)	50 (42.7)	19 (16.2)		
≥NRs 30,000	30 (19.4)	63 (40.6)	62 (40.0)		
III. Distance from nearest health facility (433)				1.767	0.423
Less than 10 minutes	126 (30.4)	168 (40.6)	120 (29.0)		
10 to 29 minutes	8 (42.1)	5 (26.3)	6 (31.6)		

* Significance at *p* -value < 0.05; **includes unmarried, separated, widowed and divorced; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.

† Fisher's Exact test

Table 16: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and attitude towards antibiotics.

General Characteristics	Attitude Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Fair n (%)	Good n (%)		
I. Socio-demographic characteristics					
Age (Years)				11.788	0.299
≤ 20	5 (10.4)	39 (81.3)	4 (8.3)		
21 – 29	18 (14.4)	93 (74.4)	14 (11.2)		
30 - 39	21 (19.6)	71 (66.4)	15 (14.0)		
40 - 49	15 (16.7)	66 (73.3)	9 (10.0)		
50 - 59	11 (24.4)	33 (73.3)	1 (2.2)		
≥ 60	1 (4.5)	18 (81.8)	3 (13.6)		
Gender				1.636	0.441
Male	45 (18.0)	181 (72.4)	24 (9.6)		
Female	26 (13.9)	139 (74.3)	22 (11.8)		
Marital Status				2.695	0.260
Single**	29 (18.5)	116 (73.9)	12 (7.6)		
Married	42 (15.0)	204 (72.9)	34 (12.1)		
Ethnicity				11.565	0.071
Brahmin	18 (13.5)	100 (75.2)	15 (11.3)		
Chhetri	13 (22.0)	34 (57.6)	12 (20.3)		
Newar	31 (15.8)	150 (76.5)	15 (7.7)		
Others	9 (18.4)	36 (73.5)	4 (8.2)		

* Significance at p -value < 0.05; **includes unmarried, separated, widowed and divorced; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.; † Fisher's Exact test

Table 16: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and attitude towards antibiotics (Continue)

General Characteristics	Attitude Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Fair n (%)	Good n (%)		
II. Socio-economic Characteristics					
Education (436)				10.934	0.027*
Up to Grade 8	8 (20.5)	29 (74.4)	2 (5.1)		
High School (Grade 9 -12)	46 (18.6)	181 (73.3)	20 (8.1)		
Undergraduate and above	16 (10.7)	110 (73.3)	24 (16.0)		
Employment Status				7.154	0.028*
With employment	64 (18.6)	249 (72.2)	32 (9.3)		
Without employment	7 (7.9)	69 (77.5)	13 (14.6)		
Occupation (434)†				19.277	0.001*
Employed (includes labor)	8 (8.1)	78 (78.8)	13 (13.1)		
Self-employed	56 (22.8)	171 (69.5)	19 (7.7)		
Unemployed (includes retired)	7 (7.9)	69 (77.5)	13 (14.6)		
Income (272)				4.651	0.098
< NRs. 30,000	23 (19.7)	88 (75.2)	6 (5.1)		
≥NRs 30,000	23 (14.8)	113 (72.9)	19 (12.3)		
III. Distance from nearest				2.610	0.240

health facility (433)[†]			
	68 (16.4)	300	46 (11.1)
Less than 10 minutes		(72.5)	
10 to 29 minutes	2 (10.5)	17 (89.5)	0 (0.0)

* Significance at *p* -value < 0.05; **includes unmarried, separated, widowed and divorced; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.; [†] Fisher's Exact test

4.2.1.3 Association between General characteristics (Socio-demographic, Socio-economic and Distance from nearest health facility) and Practice towards Antibiotics

Table 17 describes the association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and practice of self-medication with antibiotics. No statistically significant association was found between age (*p* -value = 0.500) gender (*p* -value = 0.413), marital status (*p* -value = 0.510), ethnicity (*p* -value = 0.094), education (*p* -value = 0.536), employment status (*p* -value = 0.669), occupation (*p* -value = 0.842), income (*p* -value = 0.657), and distance from nearest health facility (*p* -value = 1.000), and level of practice of self-medication with antibiotics.

Table 17: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and practice of self-medication with antibiotics.

General Characteristics	Practice Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Fair n (%)	Good n (%)		
I. Socio-demographic characteristics					
Age (Years)†				9.922	0.500
≤ 20	0 (0.0)	1 (100.0)	0 (0.0)		
21 – 29	2 (11.1)	15 (83.3)	1 (5.6)		
30 - 39	3 (37.5)	5 (62.5)	0 (0.0)		
40 - 49	4 (40.0)	5 (50.0)	1 (10.0)		
50 - 59	0 (0.0)	4 (100.0)	0 (0.0)		
≥ 60	1 (33.3)	2 (66.7)	0 (0.0)		
Gender†				2.193	0.413
Male	6 (25.0)	18 (75.0)	0 (0.0)		
Female	4 (20.0)	14 (70.0)	2 (10.0)		
Marital Status†				1.288	0.510
Single**	2 (14.3)	11 (78.6)	1 (7.1)		
Married	8 (26.7)	21 (70.0)	1 (3.3)		
Ethnicity†				9.420	0.094
Brahmin	5 (41.7)	7 (58.3)	0 (0.0)		
Chhetri	2 (28.6)	4 (57.1)	1 (14.3)		
Newar	2 (8.7)	20 (87.0)	1 (4.3)		
Others***	1 (50.0)	1 (50.0)	0 (0.0)		

* Significance at p -value < 0.05; **includes unmarried, separated, widowed and divorced; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.

† Fisher's Exact test

Table 17: Association between general characteristics (socio-demographic, socio-economic, and distance from the nearest health facility) and practice of self-medication with antibiotics (Continue)

General Characteristics	Practice Level			Chi square/ Fisher's Exact	P-value
	Poor n (%)	Fair n (%)	Good n (%)		
II. Socio-economic Characteristics					
Education (436) †				3.088	0.536
Up to Grade 8	0 (0.0)	3 (100.0)	0 (0.0)		
High School (Grade 9 -12)	5 (19.2)	19 (73.1)	2 (7.7)		
Undergraduate and above	5 (35.7)	9 (64.3)	0 (0.0)		
Employment status†				1.402	0.669
With employment	8 (20.5)	29 (74.4)	2 (5.1)		
Without employment	2 (40.0)	3 (60.0)	0 (0.0)		
Occupation (434)†				1.905	0.840
Employed (includes labor)	2 (22.2)	7 (77.8)	0 (0.0)		
Self-employed	6 (20.0)	22 (73.3)	2 (6.7)		
Unemployed (includes retired)	2 (40.0)	3 (60.0)	0 (0.0)		
Income (272)†				1.584	0.657
< NRs. 30,000	2 (14.3)	12 (85.7)	0 (0.0)		
≥NRs 30,000	4 (25.0)	11 (68.8)	1 (6.3)		
III. Distance from nearest health facility (433) †				1.898	1.000
Less than 10 minutes	10 (23.3)	31 (72.1)	2 (4.7)		

10 to 29 minutes	0 (0.0)	1 (100.0)	0 (0.0)

* Significance at p -value < 0.05; **includes unmarried, separated, widowed and divorced; ***includes hill/mountain janajati, tarai janajati, tarai/madhesi, muslim, dalit, etc.; † Fisher's Exact test

4.2.2 Multivariate Analysis

4.2.2.1 Factors significantly associated with level of knowledge of antibiotics

A multinomial logistic regression was used to analyze the predictors for level of knowledge – classified as poor knowledge, moderate knowledge and good knowledge. The reference category for the outcome variable was "good knowledge" and each of the other two categories were compared to the reference group. Gender, educational level, employment status, occupation and income were found to be the predictors of level of knowledge.

Table 18 describes the result of "poor knowledge" compared to "good knowledge" which is the reference category. Out of the five predictor variables gender, educational level, occupation and income were found to be independently associated with poor level of knowledge. The odds of male participants to females having poor knowledge on antibiotic (OR: 0.465, CI: 0.283 - 0.765, *p*-value = 0.003) is 0.465 times lower than good knowledge. Also, with regards to educational level participants who had completed grade 8 or lower were 50.445 times more likely to have poor knowledge than good knowledge (OR: 50.44, CI: 11.001 - 231.332, *p*-value < 0.001). Likewise, those who completed high school compared to those who have completed at least undergraduate level were 6.275 times more likely to have poor knowledge than good knowledge (OR: 6.275, CI: 3.410 - 11.547, *p*-value < 0.001). Study participants who were self-employed were more likely to have poor level of knowledge than good knowledge compared to those who were unemployed (OR: 2.821, CI: 1.507 - 5.278, *p*-value < 0.001). Similarly, the odds of people with income below NRs 30,000 were 5.221 times more likely to have poor level of knowledge

than good knowledge compared to those with income higher income (OR: 5.221, CI: 2.626 - 10.380, *p*-value < 0.001).

Table 19 shows the result of "moderate knowledge" compared to "good knowledge" which is the reference category. Out of the five predictor variables educational, employment status, occupation and income were found to be independently associated with moderate level of knowledge. It was also found that study participants who had completed grade 8 or lower level of education were almost 6 times as more likely than those with at least undergraduate degree in having moderate level of knowledge compared to the reference group of good knowledge (OR: 5.917, CI: 1.248 – 28.061, p-value = 0.025). On the other hand, those with education level of high school (grade 9 -12) were found to be 2.344 times more likely to have moderate knowledge than good knowledge compared to individuals with at least undergraduate degree (OR: 2.344, CI: 1.456 – 3.776, p-value < 0.001). With regards to occupation, people who are self-employed were 3.452 times more likely to have moderate than good knowledge as compared to the people who were unemployed (OR: 3.452, CI: 1.877 - 6.351, *p*-value <0.001). While people who have monthly income less than NRs. 30,000 were 2.590 times more likely to have moderate than good knowledge as compared to those with income above the mean (OR: 2.590, CI: 1.374 – 4.882, *p*-value = 0.003).

Table 18: Factors associated with poor level of knowledge

Factor	**Categories**	**Poor antibiotic knowledge (N =136)**		
		AOR	**AOR (95% CI)**	***p*-value**
Gender	Male	0.465	0.283 - 0.765	0.003*
	Female	1.000		
Education	Up to Grade 8	50.447	11.001 - 231.332	<0.001*
	High School (Grade 9 -12)	6.275	3.410 - 11.547	<0.001*
	Undergraduate and above	1.000		
Employm	With employment	1.649	0.923 – 2.943	0.091
ent status	Without employment	1.000		

Occupation	Employed (includes labor)	0.601	0.292 - 1.239	0.168
	Self-employed	2.821	1.507 - 5.278	0.001*
	Unemployed (includes retired)	1.000		
Income	< NRs. 30,000	5.221	2.626 - 10.380	<0.001*
	≥ NRs. 30,000	1.000		

* Significance at *p* -value < 0.05; Reference category is: Good Knowledge

Table 19: Factors associated with moderate level of knowledge

Factor	**Categories**	**Moderate antibiotic knowledge (N = 175)**		
		AOR	**AOR (95% CI)**	***p*-value**
Gender	Male	0.874	0.544 - 1.405	0.579
	Female	1.000		
Education	Up to Grade 8	5.917	1.248 - 28.061	0.025
	High School (Grade 9 -12)	2.344	1.456 - 3.776	<0.001*
	Undergraduate and above	1.000		
Employment status	With employment	2.065	1.177 – 3.623	0.012*
	Without employment	1.000		
Occupation	Employed (includes labor)	0.824	0.421 - 1.616	0.574
	Self-employed	3.452	1.877 - 6.351	<0.001*
	Unemployed (includes retired)	1.000		
Income	< NRs. 30,000	2.590	1.374 - 4.882	0.003*
	≥ NRs. 30,000	1.000		

* Significance at *p* -value < 0.05; Reference category is: Good Knowledge

4.2.2.2 Factors significantly associated with level of attitude towards antibiotics

A multinomial logistic regression was used to analyze the predictors for level of attitude– classified as poor, fair and good. The reference category for the outcome variable was "good attitude" and each of the other two categories were compared to the reference group. Education, employment status and occupation were found to be the predictors of level of attitude.

Table 20 describes the result of "poor attitude" compared to "good attitude" which is the reference category. All the three predictor variables - education, employment status and occupation were found to be independently associated with poor level of attitude. Individuals who had completed grade 8 or lower had greater odds of having poor attitude than good attitude by 6 times compared to those who completed at least undergraduate level education (OR: 6.000, CI: 1.125 - 31.989, p-value = 0.036). Individuals who had completed high school education had odds of having poor attitude by 3.450 times than good attitude (OR: 3.450, CI: 1.516 - 7.849, p-value = 0.003) compared to those who completed at least undergraduate level. Study participants with employment were 3.714 times more likely to have poor attitude than good attitude compared to those who were unemployed (OR: 3.714, CI: 1.350- 10.219, p-value = 0.011). Lastly, compared to unemployed people, individuals who were self-employed were 5.474 times more likely to have poor attitude than good attitude towards antibiotics (OR: 5.474, CI: 1.904 - 15.735, p-value = 0.002).

Table 21 describes the result of "fair attitude" compared to "good attitude" which is the reference category. Out of the four predictor variables only education was found to be independently associated with fair level of attitude. Individuals who had completed high school were almost 2 times more likely to have fair attitude than good attitude compared to those who have completed undergraduate level (OR: 1.975, CI: 1.042 – 3.741, p-value = 0.037).

Table 20: Factors associated with poor level of attitude

Factor	Categories	Poor antibiotic attitude (N = 71)		
		AOR	AOR (95% CI)	*p*-value
Education	Up to Grade 8	6.000	1.125 - 31.989	0.036*
	High School (Grade 9 -12)	3.450	1.516 - 7.849	0.003*
	Undergraduate and above	1.000		
Employment status	With employment	3.714	1.350 – 10.219	0.011*
	Without employment	1.000		
Occupation	Employed (includes labor)	1.143	0.320 - 4.081	0.837
	Self-employed	5.474	1.904 - 15.735	0.002*
	Unemployed (includes retired)	1.000		

* Significance at *p* -value < 0.05; Reference category is: Good Attitude

Table 21: Factors associated with fair level of attitude

Factor	Categories	Fair antibiotic attitude (n = 320)		
		AOR	AOR (95% CI)	*p*-value
Education	Up to Grade 8	3.164	0.706 - 14.170	0.132
	High School (Grade 9 -12)	1.975	1.042 - 3.741	0.037*
	Undergraduate and above	1.000		
Employment status	With employment	1.466	0.730 – 2.945	0.282
	Without employment	1.000		
Occupation	Employed (includes labor)	1.130	0.491 - 2.603	0.773
	Self-employed	1.696	0.794 - 3.622	0.173
	Unemployed (includes retired)	1.000		

* Significance at *p* -value < 0.05; Reference category is: Good Attitude

CHAPTER V

DISCUSSION

The main objective of the study was to determine the knowledge, attitude and practice of self-medication with antibiotics among general public in Kathmandu valley, Nepal. The independent variables (socio-demographic factors - age, gender, marital status and ethnicity; socio-economic factors - education, occupation and monthly income; distance from nearest health facility) associated with the dependent variables - knowledge, attitude and practice of self-medication with antibiotics were considered after extensive and comprehensive review of various literatures.

The study was a cross-sectional study conducted among 437 general public of Ward No. 16 of Kathmandu Metropolitan City, Nepal who met the inclusion criteria. The survey was conducted though a face-to-face interview using validated and reliability tested semi-structured questionnaire. The data was coded, cleaned and analyzed using IBM SPSS version 21. The results of the analysis have been discussed in this chapter as follows:

5.1 Discussion on general characteristics of the study participants

The result of this study showed that majority of the study participants had some source of income, out of 437 participants 89 were not employed, hence had no income. However, only 272 out of 348 participants who were employed or engaged in an occupation provided information on their monthly income and 76 were missing data. People were found to not reveal their monthly income as question on it is personal and private.

Similarly, missing information was also present in case of other variables in socio-economic category. Four of the study participants did not answer the distance from their residence of the nearest health facility while three did not provide answers regarding their employment status and occupation while only one of the study participant didn’t provide answer regarding their education.

5.2 Discussion on self-medication, class of medicine self-medicated, name of medicine self-medicated, conditions in which antibiotic was self-medicated, frequency of self-medication with antibiotics and reason for self-medication with antibiotics

5.2.1 Prevalence of self-medication

The result of this study found that approximately 55.0% of the study participants self-medicated with some form of medicine within the last 1 year, which is consistent with previous study conducted by Shankar et al. (2002) in Pokhara valley of Nepal (59.0%). However, our result is comparatively lower than the findings of a study conducted in India on prevalence and pattern of self-medication in the coastal regions of South India among 200 patients where about 71.0% were reported to have self-medicated (Balamurugan & Ganesh, 2011).

Nevertheless, when compared with the previous studies conducted in western countries (Figueiras et al., 2000; Paula Martins et al., 2002), our results and previously mentioned studies conducted in Nepal and India show higher percentage of self-medication. One of the possible reasons contributed to the similarity in high practices of self-medication in South Asia might come from close relationship and similarities in culture, religion, and lifestyle between the two countries (Government of Nepal, 2018; K., L., & D., 2006; Lunt, Horsfall, & Hanefeld, 2015; Shankar et al., 2002). Furthermore, higher self-medication observed in this study can also be attributed to easy access of medicines, including antibiotics, without the requirement of appropriate medical prescription. Moreover, lax monitoring and controlling systems could also be regarded as a possible reason for higher prevalence of self-medication in Kathmandu valley (Banerjee et al., 2016; Basnyat et al., 2015; Sah et al., 2016).

Whereas, low prevalence of self-medication reported in the developed countries such as Portugal's Lisbon and Porto city, and Spain (26.6% and 12.7%, respectively) (Figueiras et al., 2000; Paula Martins et al., 2002) could possibly be due to the fact that purchase of medicines are more strictly controlled and regulated in developed

nations in contrast to developing ones like Nepal and India (Awad & Aboud, 2015; Bennadi, 2013).

5.2.2 Class of medicines self-medicated by the study participants

This study found that majority of the medicines that were used in self-medication were cough and cold medicines (62.3%) followed by painkillers (51.9%) while only 16.3% of the study participants self-medicated with antibiotics to treat their illness. The findings of the study are consistent with findings from studies conducted in Nepal where cough and cold preparations and painkillers were the most widely self-medicated drugs (Bhattarai et al., 2014; Shankar et al., 2002). Similar findings were also reported from study conducted in Spain, Portugal, Turkey and Uganda where medicines for flu, cold, cough and sore throat were mostly used medicine for self-medication followed by analgesics (Figueiras et al., 2000; Ocan et al., 2014; Oztora et al., 2017; Paula Martins et al., 2002). The similar findings could be the result of over-the-counter availability of these category of the medicine all over the world due to which patients were easily able to purchase them (L. Hughes, Whittlesea, & Luscombe, 2002; Wazaify, Shields, Hughes, & McElnay, 2005) . Another possible reason could be that cough, cold and sore throat are the most common and frequent illnesses in the world (Danchin et al., 2007; Mossad, Macknin, Mendendorp, & Mason, 1996; Schroeder & Fahey, 2004).

5.2.3 Medicines used for self-medication by the study participants

Paracetamol was found to be the most commonly used medicine for self-medication (59.4%) followed by D-cold (42.3%) in this study. The finding is similar to other studies conducted in Nepal where paracetamol was the most self-medicated medicine followed by other category of medicine like cough and cold medicine, antibiotics, among others (Banerjee et al., 2016; Bhattarai et al., 2014; Jha, Bajracharya, & Shankar, 2013).

5.2.4 Prevalence of self-medication with antibiotics

The findings of this study on self-medication with antibiotics is in conformity with other findings, that is, lower rates of self-medication with antibiotics. A prospective cohort study conducted in 14 primary care research networks in 13 European countries, out of 2520 patients 11.4% reported self-medication with antibiotics (Francis et al., 2012). Although the study conducted among 200 people in Nancy, France reported lower rates (20%), the result is relatively higher compared to this study (Demoré et al., 2017).

However, various studies have also reported higher rates of antibiotic self-medication in contrast to this study (A. Al Rasheed et al., 2016; Ilhan et al., 2009; Jamhour et al., 2017). L. Grigoryan et al. (2007) reported in their study conducted in 12 different European countries among 1101 adult study participants that self-medication with antibiotics varied from 2.6% in the Netherlands to 62.4% in Lithuania. This indicates that the rates of self-medication with antibiotics varies from country to country without specific pattern. It can also be interpreted that cultural differences, demographic factors, lifestyle and economic factors could play an important role in self-medication with antibiotics as reported from various studies from different parts of the world (Abdulrahman Al Rasheed et al., 2016; Awad & Aboud, 2015; Ilhan et al., 2009; Pavydė et al., 2015; Widayati et al., 2011)

5.2.5 Conditions in which antibiotics are self-medicated by the study participants

In this study, antibiotics were most commonly used for the sore throat (47.7%), cough and cold (45.4%). The finding of this study is consistent with findings from a study conducted in the US and Riyadh city of Kingdom of Saudi Arabia (A. Al Rasheed et al., 2016; Zoorob et al., 2016). This finding shows that there is a misconception among people that antibiotics work on most coughs, colds and sore throat which could have led the people to self-medicate antibiotics in case of such ailments. This demonstrates the lack of appropriate knowledge and information among most of the people regarding the action and uses of antibiotics. Moreover, we found that more than half of the respondents incorrectly answered that antibiotics can be used to treat cough and cold. This is an important issue which needs to be

addressed promptly as the misconceptions and misunderstanding of antibiotics as miracle medicine has resulted in inappropriate practices among people and therefore, can lead to the development and spread of antibiotic resistance (Brookes-Howell et al., 2012; Levy, 1997). Hence, medical professionals, including pharmacists have the responsibility to inform and education patients and general public on rational use of antibiotics especially in developing countries like Nepal.

5.2.6 Antibiotics used for self-medication by the study participants

Regarding antibiotics, the most commonly used antibiotics for self-medication in this study were amoxicillin (6.3%) followed by azithromycin (5.9%). This finding is in accordance with other studies conducted in Nepal. Study conducted in Nepal among medical students reported azithromycin and amoxicillin to be the most commonly used antibiotics for self-medication while study among nursing students in three nursing colleges in Nepal also reported amoxicillin and azithromycin to be the antibiotics mostly used for self-medication (Banerjee et al., 2016; Sah et al., 2016). The findings are also consistent with findings reported by Ocan et al. (2014) in their household survey conducted in Uganda among 884 adults where amoxicillin was found to be used in higher proportion compared to azithromycin, ampicillin, cloxacillin, ciprofloxacin, among others. The findings on commonly use antibiotics of this study not only show similarity within developing countries but the results from previous studies conducted in various European nations as well as the Middle East (Abdulrahman Al Rasheed et al., 2016; Larissa Grigoryan et al., 2006; Ilhan et al., 2009; Mitsi et al., 2005) also reported that amoxicillin was most commonly used antibiotics followed by azithromycin. This might be because amoxicillin is one of the most commonly used antibiotic to treat sore throat (Barnett & Linder, 2014; Linder, Bates, Lee, & Finkelstein, 2005; Pichichero, 1997), which also supported by the results on higher percentage of people using antibiotics for sore throat (mentioned in the preceding paragraph).

5.2.7 Reasons for self-medication with antibiotics

"Past experience with similar illness", "minor illness" and "ease of access" were the most common reasons for self-medication with antibiotics among the participants in this study which is consistent with the findings of studies conducted in different countries (Al-Azzam et al., 2007; Abdulrahman Al Rasheed et al., 2016; Lv et al., 2014; Ocan et al., 2014). Because people have previous experience with similar illness, they might have perceived that they could treat their illness like the last time. According to Bourdieu and Nice (1977), *habitus,* which is the attitude that individuals internalize when being conditioned by past experiences and perform the same action in present could perhaps be the reason for the findings.

Since antibiotics can be obtained easily over-the-counter in Nepal as well as other least developed and developing countries without doctor's prescription, people could have possibly had a reason for self-medicating their illness with antibiotics as well without consulting a medical doctor (Banerjee et al., 2016; Bennadi, 2013; Morgan et al., 2011; Rather et al., 2017). Furthermore, drug retailers are also involved in unnecessary dispensing of antibiotics because of profit interest which has made easy availability of antibiotics (Awad & Aboud, 2015). These findings underscore the urgent need of stringent monitoring and controlling process as well as educating people regarding prudent use of antibiotics in order to decrease the burden of antibiotic resistance.

5.3 Knowledge of study population on antibiotics

In this study, majority of the study participants (40.0%) had moderate level of knowledge while 31.1% were found to have poor level and 28.8% had good level of knowledge regarding antibiotics. The findings are consistent with the study from Malaysia where higher proportion (54.7%) of the participants had moderate level of knowledge and 28.9% had poor knowledge (Oh et al., 2010).

Around 26.1% of the participants incorrectly answered that antibiotics and pain killer medicines are the same. This could be possibly due to belief among

people that antibiotics are actually used in relieving pain same as the ones used in symptomatic relief produced by using non-steroidal anti-inflammatory medicines such as in case of sore throat and common colds (Lim & Teh, 2012). This finding was in concurrence with the study conducted in western China among university students regarding self-medication with antibiotics where similar percentage of students had misconception that antibiotics are pain killer medicines (Lv et al., 2014). In contrast, another study conducted in Lithuania found that lower percentage (5.3%) of study participants confused antibiotics with other medicines such as pain killers (Pavydė et al., 2015).

Over 90% of the study participants in this study had knowledge that antibiotics should only be purchased with a medical prescription. Studies conducted in China also reported higher percentage of participants having knowledge of purchasing antibiotics with prescription (Lv et al., 2014; Yu et al., 2014); however, the proportion was low compared to that found in this study. This could be one of the reasons attributed to lower prevalence of self-medication with antibiotics in Ward No. 16 of Kathmandu Metropolitan City as seen in this study.

In this study more than half of the participants didn't know names of the most commonly prescribed and self-medicated antibiotics with around 58.1% incorrectly identifying amoxicillin, 70.9% for azithromycin, 70.3% for ampicillin and cloxacillin and more than three-fourth failing to identify ciprofloxacin. The participants were not able to identify the names of the antibiotics even when the commonly prescribed brand names (market names) were provided to them. This indicates that even people living in an urban area have lack of knowledge and information regarding antibiotics.

Regarding action and use of antibiotics, more than four-fifth of the participants had knowledge that antibiotics are effective against bacteria, however, around 36.6% of those who answered bacteria also answered that antibiotics are effective against virus. Moreover, more than half of the study participants answered that antibiotics are effective against coughs and colds. These findings of this study are in accordance with studies conducted in Kuwait, Lithuania, a comparative study done

in 12 European countries, and the one conducted in two major cities of Lebanon, where participants were confused about the effectiveness of antibiotics in case of bacterial or viral infections and use of antibiotics in treatment of sore throat and cough and colds (Awad & Aboud, 2015; L. Grigoryan et al., 2007; Jamhour et al., 2017; Pavydė et al., 2015). One of the possible reasons for people answering incorrectly for effectiveness of antibiotics on viruses could be that the general population are not aware of and cannot differentiate between bacteria and viruses and therefore believe that antibiotic can kill viruses as well (Bourdieu & Nice, 1977; Shehadeh et al., 2012; Suaifan et al., 2012). In contrast to the general public, studies among medical students have found respondents having better knowledge regarding the effectiveness of antibiotics and the conditions in which they should be used as can be noted in a study from China among medical and non-medical students (Huang et al., 2013). This difference could possibly be attributed to the fact that medical students receive in-depth and detailed knowledge on antibiotics whereas others do not.

The findings on side effects showed that majority of participants in this study were knowledgeable of the side effects caused by antibiotics and answered correctly for the two statements - "If you get side effects (skin rash, swelling of face and tongue, difficulty breathing, etc.) during a course of antibiotics treatment you should stop taking them as soon as possible " (94.7%) and "If you get some skin reaction when using an antibiotic, you should not use the same antibiotic again" (88.1%). These findings were uniform with the study form Kuwait where 83.4% and 77.8% of the study participants agreed on the two statements, respectively (Awad & Aboud, 2015). Another study in Lithuania also reported over 90% of respondents having knowledge that antibiotics can cause side effects (Pavydė et al., 2015). However, a study among Swedish population found less than 70% of the respondents answered the question regarding side effects of antibiotics correctly (Vallin et al., 2016) which is lower compared to this study. Although there are variations in the reporting, these findings on side effects provide a good insight that most people are aware of when and how to stop the antibiotic treatment in case of side effects or an unwanted

reaction. This finding is significant in helping in limiting the number of fatalities due to adverse reactions from antibiotics.

Surprisingly, majority of the study participants were found to have knowledge regarding antibiotic resistance. 72.3% correctly answered the statement "Antibiotic resistance is a situation where antibiotics become ineffective in controlling or killing bacteria", while more than 80% correctly answered that incompletion of the course of antibiotic treatment, antibiotic overuse leads to development of antibiotic resistance and decrease in the effectiveness of treatment. Similar findings from various other nations (China, France, Sweden and Lebanon) also reported higher percentage of participants, ranging from 42.0% to 90.5%, agreeing to development of resistance if antibiotics are misused, overused or used frequently (Demoré et al., 2017; Jamhour et al., 2017; Lv et al., 2014; Vallin et al., 2016; Yu et al., 2014). These higher percentages of agreement in this study could possibly be due to the educational qualification of the study participants where around 70.2% had completed at least high school and the fact the study participants are from urban location.

5.4 Attitude towards antibiotics

In this study, more than 70.0% of the participants were found to have fair attitude towards antibiotics while 16.2% had poor attitude and only 10.2% had good attitude towards antibiotics. In this study most of the participants expressed positive attitude towards all the antibiotics related statements for attitude.

Over four-fifth of the study participants in this study agreed on preferring completing the course of antibiotic treatment ever after feeling better. In contrast, about only 55.0% of participants agreed on preferring to complete the course in a study conducted among 770 general public in Kuwait and similarly only about 15.0% disagreed while another 5.0% strongly agreed that they could stop taking antibiotics after they feel better according to a study from China conducted among 731 university students (Awad & Aboud, 2015; Lv et al., 2014). One of the reason for this

higher positive attitude found in this study could be due to antibiotic awareness program organized by WHO on World Antibiotic Awareness week between 16 and 22 November, 2017 in Kathmandu, Nepal which highlighted on the topic of antibiotic resistance (World Health Organization, 2017d). A large number of study participants (97.0%) expressed positive attitude towards not to get antibiotics from family or friends without seeing a medical doctor, not preferring to purchase antibiotics from a pharmacy without medical prescription (86.5%), not to keep or store antibiotics at home for future use (85.3%), disagreeing that one can self-medicate with antibiotics rather than seeing a medical doctor in case of minor illness (84.6%), not preferring to use antibiotics to treat sore throat (86.3%), agreeing to self-medication with an antibiotic plays an important role in increasing antibiotic resistance (75.8%), disagreeing not to complete the course of antibiotic treatment if they felt better (78.7%), disagreeing to prefer antibiotics for cough (90.6%). 82.2% agreeing that the dose prescribed by doctor is enough to treat their illness while 88.8% agreeing decrease in effectiveness of treatment if full course of antibiotic treatment was not completed, 67.9% not agreeing newer antibiotics are more effective, 78.9% disagreeing expensive antibiotics are more effective and 85.8% disagreeing that one should take antibiotics when they get common cold.

These findings were quite high compared to study from Kuwait conducted among 770 Kuwaiti population where 76.6% expressed positive attitude towards not to obtain antibiotics from family or friends without consulting a medical doctor, not to obtain antibiotics from pharmacy with prescription (66.6%), not to store antibiotics at home for use in future (55.7%), and to always preferring to complete the full course of antibiotic treatment (57.6%). The study from Kuwait also revealed that higher number of negative attitudes was towards using antibiotics for treatment of sore throat (73.4%) and cough (57.1%).

Likewise according to a study conducted in China by Lv et al. (2014) among medical students found that about 70% of the respondents had positive attitude towards decrease in effectiveness of treatment when full course of antibiotic was not completed whereas more than 70.0% of the respondents disagreed that the dose of

antibiotic prescribed by the doctor is not enough to treat their illness, while around three-fifth of the students had positive attitude that expensive antibiotics are more effective while half of the respondents had positive attitude towards not to take antibiotics in case of common cold. Around 65.0% of the study participants agreed to self-medicating with antibiotics in case of a minor illness rather than visiting a medical doctor which is in stark contrast to this study where very low (7.0 to 10.0%) showed negative attitudes towards using antibiotics for sore throat, coughs or colds were.

5.5 Practice of self-medication with antibiotics

This study found that a majority (72.7%) of the participants had fair practice, while 22.7% had poor practice and only 4.5% were found to have good practice. Over one-fifth of the participants who self-medicated with antibiotics within the last one year often purchased antibiotics without prescription at a pharmacy while one-fifth purchased antibiotics sometimes without prescription. Although, the proportion of self-medication with antibiotics is low in this study, it has to be noted that antibiotics are available easily without a prescription at a local pharmacy in Nepal (Banerjee et al., 2016). This is because most of the medicine dispensers in Nepal are not qualified licensed pharmacists without comprehensive knowledge regarding medicines and they have been found to promote self-medication among the public with the intention of profit making (Awad & Aboud, 2015; Banerjee et al., 2016; Kamat & Nichter, 1998; Shankar et al., 2002). Furthermore, because of lax monitoring and regulation from the government, antibiotics can be purchased with an ease from pharmacies in Nepal (Banerjee et al., 2016) in contrast to developed countries like Kuwait where the country's policy makes it illegal to dispense antibiotic without prescription (Awad & Aboud, 2015).

In this study, 20.5% of the study participants rarely took antibiotics prescribed for an infection that occurred again later, whereas 13.6% practiced it sometimes and none of the respondents took antibiotics that was prescribed for another type of

infection. Study from Kuwait reported 63.6% of the participants had used antibiotics that were originally prescribed for an infection that occurred again later whereas 11.2% had used prescribed antibiotics for another type of infection showing a difference between the two studies (Awad & Aboud, 2015). This difference could possibly be because greater number of participants having positive attitude towards antibiotics as identified in this study resulting in them not engaging in inappropriate practices. Another possible reason could be that the urban population has in this study has become more health conscious and careful in using antibiotics following the WHO awareness program (World Health Organization, 2017d).

About 16.0% of the study participants had rarely used antibiotics that were stored at home and 6.8% rarely switched to a different antibiotic during the course of self-treatment which is in contrast to a study by Lv et al. (2014) among 731 university students in western China where more than half of the students reported storing antibiotics and 45.0% of the students switching to another antibiotic. These differences showed that the study participants in China might not have completed the course of antibiotics resulting in storage of medicine. Lower percentage of participants storing antibiotics at home in this study could possibly be interpreted as people might have completed the course of antibiotic treatment, noted from the positive attitude expressed by over 80.0% the participants regarding completing the course of antibiotic treatment even after feeling better. Very low percentage (2.3%) reported using newer antibiotics when they were ill. This finding is in agreement with the findings from the study in China among university students (Lv et al., 2014). Around half of the study participants in this study reported rarely self-medicating with an antibiotic to prevent and illness while about 16.0% often practiced it. This finding is quite interesting as unnecessary use of antibiotics can lead to development and spread of antibiotic resistance. As most of the study participants in this study stated that they self-medicated antibiotics because of minor illness or past experience, it is possible that they practiced self-medication for these reasons these reasons.

5.6 Association between general characteristics (socio-demographic, socio-economic characteristics, distance from nearest health facility) and knowledge level.

The multivariate logistic regression analysis showed that being male, single, education up to grade 8 and high school (grade 9 -12) and monthly income below NRs. 30,000 was found to be significantly associated with poor knowledge on antibiotics. On the other hand, being single, completion of education of grade 8 or lower and high school (grade 9 -12), with employment, non-health related work, and monthly income below NRs. 30,000 was found to be statistically significant with moderate level of knowledge.

5.6.1 Association between gender and level of knowledge

The findings of the study found that in bivariate analysis, there was a statistically significant association between gender and level of knowledge on antibiotics. In multivariate analysis using multinomial logistic regression, males were 0.465 times less likely to have poor knowledge than good knowledge in comparison to females. The findings are in accordance to the study done in Sweden where females were found to be 3.638 times less likely to have knowledge of antibiotics and its effectiveness than males (André, Vernby, Berg, & Lundborg, 2010). These findings are also consistent with the findings from Jordan and France where gender was associated with knowledge. In contrast, females were reported to have higher level of knowledge than men in both the studies. The study from Jordan reported that females had higher levels of knowledge compared to males (Suaifan et al., 2012) and the study from France demonstrate that in multivariate analysis female gender was independently associated with variables of knowledge (Demoré et al., 2017). The possible reason for better knowledge of males compared to females in this study could be due to higher educational attainment of males and more active role of males in the society compared to females in Nepal (Shankar et al., 2002). Furthermore, societal discrimination between males and females and the subsequent less opportunity for women in various aspects of life, especially

education in developing countries like Nepal could probably have played a significant role (Khanal, 2018; Leone, Matthews, & Zuanna, 2003). However, there is also a study which reported gender not being independently associated with level of knowledge (Pavydė et al., 2015; Shehadeh et al., 2012).

5.6.2 Association between education and level of knowledge

This study found that people who have education level of high school or lower were found to have poor and moderate level of knowledge compared to those who have completed at least undergraduate level. The findings of this study are in accordance with the findings from South Korea, Hong Kong, Malaysia, Italy, Sweden, Poland, Lithuania in which study participant's education was significantly associated with level of knowledge, specifically, those with lower than university or college level of education were less knowledgeable of antibiotics (André et al., 2010; Kim, Moon, & Kim, 2011; Lim & Teh, 2012; Mazińska, Strużycka, & Hryniewicz, 2017; Napolitano, Izzo, Di Giuseppe, & Angelillo, 2013; Oh et al., 2010; Pavydė et al., 2015; You et al., 2008). Since education plays an important role in providing more information regarding different subject matter, it could be a possible reason for those having higher education to have better knowledge of antibiotics. This also supports the hypothesis that education plays an important role in health promotion by strengthening the knowledge of people (Herd, Goesling, & House, 2007). Therefore, educational awareness programs on antibiotics should be provided to those who have low educational level.

5.6.3 Association between employment status and level of knowledge

Employment status was found to be associated with level of knowledge in bivariate analysis and in the multivariate analysis those with employment were found to be twice more likely to have moderate knowledge than good knowledge compared to those without employment. This finding is similar to that of study from Italy by Napolitano et al. (2013) who reported that being employed was 3.1 times more likely of having knowledge on antibiotics compared to unemployed people.

However, study from South Korea reported statistical significance between the two variables in bivariate analysis but not in multivariate analysis (Kim et al., 2011) while study conducted in Malaysia found no significant association between the two variable (Lim & Teh, 2012). The possible explanation for such disparities between studies could be the result of different instruments, variations in study settings, selection of diverse socio-demographic study population and health status.

5.6.4 Association between occupation and level of knowledge

In this study, multivariate analysis showed that being self-employed was statistically significant with poor level of knowledge as well as moderate level of knowledge. Study participants who were self-employed were 2.821 times more likely to have poor level of knowledge than good knowledge compared to those who are unemployed and 3.452 times more likely to have moderate level of knowledge than good knowledge. The findings is in contrast to the findings from Kuwait which reported participants who were employed had higher knowledge than those who did not (Awad & Aboud, 2015). Some other studies have also reported no association between the two variables (Lim & Teh, 2012; You et al., 2008)

5.6.5 Association between income and level of knowledge

Bivariate analysis using Chi-square test showed statistically significant association between income and level of knowledge. In the multivariate analysis, people with monthly income less than NRs. 30,000 were found to be 5.221 times more likely to have poor knowledge than good knowledge compared to those with higher income. In addition, respondents with monthly income below NRs. 30,000 were also 2.590 times more likely to have moderate knowledge than good knowledge compared to those with higher income. Similar findings have been reported by several studies conducted in different countries all of which report lower income being a predictor of poor antibiotic knowledge (Kim et al., 2011; Oh et al., 2010; Shehadeh et al., 2012; You et al., 2008). The probable reason could be because of the potential association between income and education which might

have resulted in association between income and knowledge as can be seen in the present study. however, further studies among the determinants needs to be conducted to obtain complete information on education, income level and knowledge level as pointed out by You et al. (2008). In contrast, studies conducted in China, Lebanon and Kuwait have reported income not being a predictor variable of poor level of knowledge (Awad & Aboud, 2015; Jamhour et al., 2017; Lv et al., 2014).

5.7 Association between general characteristics (socio-demographic, socio-economic and distance from nearest health facility) and level of attitude

5.7.1 Association between education and level of attitude

In this study educational level was found to be statistically significant with level of attitude. Lower level of education below undergraduate were more likely to have poor and fair level of attitude than good attitude compared to those with at least undergraduate degree. The findings of this study are in agreement with studies conducted in India, Hong Kong, Malaysia, Saudi Arabia and Kuwait where attitude was reported to be more positive with increase in educational level (Agarwal, Yewale, & Dharmapalan, 2015; Awad & Aboud, 2015; El Zowalaty et al., 2016; Oh et al., 2010; Vallin et al., 2016; You et al., 2008). The reason could perhaps be due to the fact that an individual has more opportunity of obtaining greater and advanced knowledge as educational level increases. Therefore, the finding re-enforces with increase in educational level, attitude towards various health aspects increases which could possibly be the result of increase in access to information and new knowledge on health and self-care (Herd et al., 2007). Furthermore, education has an impact on health through its effects on an individual's attitude towards health, health behavior, opportunities to learn about health and health outcomes, and also providing available choices to make healthy decisions (Zimmerman, Woolf, & Haley, 2015). On the contrary, studies have also found no significant association between educational level and attitude (Kim et al., 2011; Napolitano et al., 2013).

5.7.2. Association between employment status and level of attitude

The present study showed a statistically significant association between employment status and level of attitude in bivariate and multivariate. Multivariate analysis revealed significant influence of employment status on poor level of attitude. The result of this study is in concurrence with the study from Malaysia which reported statistically significant association between employment status and attitude in bivariate analysis while in multivariate analysis being employed was significant with one of the item of inappropriate attitude (Lim & Teh, 2012) as well as that conducted in Namibia (Pereko, Lubbe, & Essack, 2015) These findings were, however, in contrast to the findings from Kuwait, Italy and South Korea which reported no significant association between the two variables (Awad & Aboud, 2015; Kim et al., 2011; Napolitano et al., 2013).

5.7.3 Association between occupation and level of attitude

The present study showed statistically significant association between occupation status and level of attitude in bivariate and multivariate analysis. Multivariate analysis revealed that individuals who were self-employed were more likely to have poor attitude compared to those who work are unemployed. The findings are in contrast to the study from Kuwait, which reported study participants employed in a health related filed were found to exhibit more positive attitude than those who did not (Awad & Aboud, 2015). The primary reason could be that those who are employed (health-related profession) are exposed to greater information regarding health compared to those who do not work in a health-related occupation. Hence, suitable intervention programs should be designed targeting unemployed groups so as to improve their attitude towards antibiotics as demonstrated in a study in Nepal (Jha et al., 2013).

5.8 Limitations of the study

The limitations of the study are as follows:

1. Only one of the 3 three districts of Kathmandu valley was selected. Furthermore, only one ward was selected for the study due to resource constraints.
2. The use of multi-stage sampling technique can lead to large errors due to involvement of division and sub-divisions of various strata in each stage.
3. Further division of wards to ‘tole' (cluster of houses) or other suitable levels cannot be performed due to lack of availability of data from the Kathmandu Metropolitan City (KMC) Office, Ward Office, and the Central Bureau of Statistics.
4. The study findings cannot be generalized to 100% of the population of Kathmandu valley as the sampling technique cuts off portions of the populations from the study.

5.9 Conclusion

The cross-sectional study conducted among 437 general public in Ward Number 16 of Kathmandu Metropolitan City provides a baseline data regarding the knowledge, attitude and practice of self-medication with antibiotic. The study found the prevalence of self-medication with antibiotic to be low (around 10.0%) compared to other countries. The analysis of the level of knowledge, attitude and practice showed that 31.1% of the respondents had poor knowledge of antibiotics, majority had fair attitude (73.2%) and 72.7% had fair practice.

The study highlighted that study participants confused antibiotics with pain killer medicines like paracetamol. The finding was quite similar to other studies as well where people had misconception regarding antibiotics and non-steroidal anti-inflammatory medicine. Further, very limited number were able to correctly identify the names of antibiotics. This indicates an urgent need of educational campaigns similar to the one done in Malaysia (Know Your Medicine Campaign). Likewise,

people also had low knowledge that antibiotics are ineffective against viruses and most of them agreed antibiotics can be used in the treatment of most coughs and colds. Surprisingly, majority of the people correctly answered statements regarding antibiotic resistance. The widely used medicine in self-medication was paracetamol while amoxicillin was the commonly self-medicated antibiotic. Antibiotics were used in conditions of sore throat, cough and cold the most. Common reasons cited for self-medication with antibiotic were minor illness, past experience with similar illness and ease of access to medicine.

Multivariate analysis revealed that female gender, education of high school or lower and income below NRs 30,000 were significantly associated with having poor knowledge of antibiotics while having education of high school or lower, with employment and non-health related occupation was significantly associated with poor attitude towards antibiotics. Therefore, it can be concluded from these findings that various factors play an important role in determining the knowledge, attitude and practice of self-medication with antibiotic. Although the rate of antibiotic self-medication is lower, there is still a need of educational programs to increasing awareness among the general public regarding antibiotics and their appropriate use especially in rural communities. Furthermore, medical professionals (doctor, nurses and pharmacists) have an important role to play in instilling positive attitude and behavior in the people as they are the primary points of contact for a patient.

5.10 Recommendations

5.10.1 Recommendation for future research

1. This study was carried out in only one of the three districts of Kathmandu valley; hence, future research can involve the general public of all the three districts to give a better picture of the self-medication with antibiotics.
2. Because of resource constraints, random walk sampling was used in the study. A study using probability sampling could be done in future so that the results can be generalized to the entire population.
3. A comparative study could be done comparing rural and urban locations in the village to understand how the factors associated with self-medication with antibiotics vary in the two locations.
4. Several other factors like having a child at home, exposure to antibiotic awareness or other related programs, previous antibiotic use, exposure to advertisements or other media, etc. which could be associated with knowledge, attitude and practice can also be studied in future research.
5. Effectiveness of educational interventions programs on rational use of antibiotics can be conducted which would be helpful in providing information on its impact on knowledge, attitude and practice of self-medication with antibiotics.
6. Qualitative studies such as in-depth interviews and focused group interviews could be conducted to provide further information on the topic.

5.10.2 Recommendation for policy makers

1. The key findings of this study will help policy makers in designing appropriate intervention programs targeting key population (those with low level of education, negative attitude and inappropriate practices) to promote rational use of antibiotics. All possible media such as television, newspaper and the internet should be utilized for effective public educational programs.

2. There should be stringent monitoring and regulation of antibiotic prescribing in health care facilities to control the inappropriate use of antibiotics.
3. Communication should also be improved between personnel involved in health care and the patient regarding appropriate use of antibiotics.
4. The government should also highlight the role of pharmacists in health education and promotion and in dispensing of antibiotics only with prescription.
5. Policy makers should also make strict regulations regarding involvement of only those who have correct qualification and knowledge to dispense antibiotics and other prescription medicines in a pharmacy.
6. The government should update the 1995 National Drug Policy and implement policies to promote rational use of medicines
7. Careful and close monitoring and evaluation of prescribing and use of medicines and its processes should be detailed in National Drug Policy

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APPENDIX

APPENDIX A: CONSENT FORM

I am a currently pursuing Master of Public Health (MPH) program at College of Public Health Science, Chulalongkorn University, Bangkok, Thailand. I am conducting a study as part of the MPH program to collect data regarding the knowledge, attitude, and practice of self-medication with antibiotics.

I am inviting your participation, which will involve voluntary participation in the research, a one-time survey that will take approximately 20 minutes to complete. You have the right not to answer any question, and to stop participation at any time.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. Participation is limited to the age group of 18 years and above. Your responses to the survey will be used to inform policy on health promotion and rational use of antibiotics. There are no foreseeable risks or discomforts to your participation.

Efforts will be made to limit the use and disclosure of your personal information to those who have a need to review and check the authenticity of this information. We cannot promise complete secrecy. The results of this study may be used in reports, presentations, or publications, however, your name will not be used. There is no way that the study result can be linked to your identification.

If you have any questions concerning the research, please contact the research team. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the principal researcher, Mr. Parishan Shrestha: +977-9841217530; email: parishan.shrestha@gmail.com.

If you agree to be a part of the study, please sign below:

Name: _____

Signature:.....

Right Thumb Print (for participants who cannot read and write)

APPENDIX B: Interviewer Administered Questionnaire

The questionnaire is divided into 4 sections. Please answer each of the questions below. Be assured that your answers will be kept confidential. There is no way we can link your name with your answer on the questionnaires. Please answer by TICKING (√) or writing in the given spaces.

Participant ID:_____ Interview Date:___/___/2018

SECTION I: General characteristics

1. What is your current age? _____ years

2. What is your gender?

☐ 1. Male ☐ 2. Female

3. What is your marital status?

☐ 1. Unmarried ☐ 4. Separated

☐ 2. Married ☐ 5. Divorced

☐ 3. Widow/Widower

4. What is your ethnicity?

☐ 1. Brahmin ☐ 6. Tarai/Madhesi

☐ 2. Chhetri ☐ 7. Muslim

☐ 3. Newar ☐ 8. Dalit

☐ 4. Hill/Mountain Janajati ☐ 9. Other please specify

☐ 5. Tarai Janajati

5. What is your highest earned education?

☐ 1. Primary School (Grade 1-5) ☐ 5. Undergraduate

☐ 2. Lower Secondary School (Grade 6-8)

☐ 3. Secondary School (Grade 9-10)

☐ 4. Higher Secondary School (Grade 11-12)

☐ 6. Postgraduate and above

☐ 7. Never attended school

6. What is your current occupation?

☐ 1. Employee

☐ a. Health Related

☐ b. Non-health Related

☐ 2.Self-employed

☐ a. Health Related

☐ b. Non-health Related

☐ 3. Labor

☐ 4. Retired

☐ 5. Unemployed

7. What is your current monthly income? NRs_____/month

8. How long does it take you to reach the nearest healthcare facility from your place of residence by walk?

☐ 1. Less than 10 minutes

☐ 2. 10 to 29 minutes

☐ 3. 30 to 59 minutes

☐ 4. 60 to 119 minutes

☐ 5. 120 minutes and more

SECTION II: Please answer the following questions on **KNOWLEDGE** regarding Antibiotics

	Yes	**No**	**Don't Know**
General Knowledge on Antibiotics			

9. Antibiotics and pain killer medicine (eg. Paracetamol, Niko, Cetamol, Brufen, etc.) are the same	[0]	[1]	[0]
10. You can stop taking antibiotics as soon as the symptoms have disappeared	[0]	[1]	[0]
11. You can take many types of antibiotics at the same time during the course of a single illness	[0]	[1]	[0]
12. The efficacy is better if the antibiotics are newer	[0]	[1]	[0]
13. The efficacy is better if the price of antibiotics are higher	[0]	[1]	[0]
14. Antibiotics should only be purchased with prescription at a pharmacy	[1]	[0]	[0]
15. Which of the following medicines are antibiotics?			
Amoxicillin (Perimox 500, Curemox 500,etc.)	[1]	[0]	[0]
Azithromycin (Aziwok, Azithral, Azithro, Zulid, etc.)	[1]	[0]	[0]
Ampicillin and Cloxacillin	[1]	[0]	[0]
Cirpofloxacin (Cifran500, Cicin500, Ciplox500)	[1]	[0]	[0]
Others, please specify	----------		
16. Which of the following medicine is used in treatment of fever?			

Paracetamol (Cetamol, Niko, etc.)	[1]	[0]	[0]
Antibiotics (Amoxicillin - Perimox 500, Curemox 500, Amoxicillin-Clavulanate - Clavum 625, Clavum 375, Super CV, Indclav-Ds, Ampicillin, Azithromycin - Aziwok, Azithral, Azithro, Zulid, etc.)	[0]	[1]	[0]
c. Others, please specify	----------		
Action and Use of Antibiotics			
17. Antibiotics are effective against bacteria	[1]	[0]	[0]
18. Antibiotics work on coughs and colds	[0]	[1]	[0]
19. Antibiotics are effective against viruses	[0]	[1]	[0]
Side Effects			
20. If you get side effects (skin rash, swelling of face and tongue, difficulty breathing, etc.) during a course of antibiotics treatment you should stop taking them as soon as possible	[1]	[0]	[0]
21. If you get some skin reaction when using an antibiotic, you should not use the same antibiotic again	[1]	[0]	[0]
Antibiotic resistance			
22. Antibiotic resistance is a situation where antibiotics become ineffective in controlling or killing bacteria	[1]	[0]	[0]

23. Incompletion of the course of antibiotic treatment leads to the development of resistance	[1]	[0]	[0]
24. Antibiotic overuse can result in antibiotic resistance	[1]	[0]	[0]
25. The frequent use of antibiotics will decrease effectiveness of the treatment when using the antibiotic again	[1]	[0]	[0]

SECTION III: Please answer the following questions regarding your **ATTITUDE** towards antibiotics.

Instruction to Interviewer: DO NOT READ **"UNCERTAIN"** response to the participant and only use if respondent is not able to provide another answer	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
26. I always prefer completing the course of treatment of antibiotics even after I feel better	[1]	[2]	[3]	[4]	[5]
27. I prefer to get antibiotics from relatives or friends without having to see a medical doctor	[5]	[4]	[3]	[2]	[1]
28. I prefer to buy antibiotics from the pharmacy without a medical prescription	[5]	[4]	[3]	[2]	[1]
29. I prefer to keep antibiotics at home in case there is a need for them later	[5]	[4]	[3]	[2]	[1]
30. I agree that one can self-medicate with antibiotics rather than to see a	[5]	[4]	[3]	[2]	[1]

doctor when he/she has a minor illness					
31. I prefer to use an antibiotic to treat sore throat	[5]	[4]	[3]	[2]	[1]
32. I agree that self-medication with an antibiotic plays an important role in increasing antibiotic resistance	[1]	[2]	[3]	[4]	[5]
33. I agree that if I feel better, I sometimes do not complete the course of antibiotic treatment	[5]	[4]	[3]	[2]	[1]
34. I prefer to use an antibiotic if I have a cough	[5]	[4]	[3]	[2]	[1]
35. I think that the dose of antibiotic prescribed by doctor is not enough to treat my illness	[5]	[4]	[3]	[2]	[1]
36. I think the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed	[1]	[2]	[3]	[4]	[5]
37. I agree that newer antibiotics are more effective	[5]	[4]	[3]	[2]	[1]
38. I agree that expensive antibiotics are more effective	[5]	[4]	[3]	[2]	[1]
39. I agree that one should take antibiotics when one gets common cold	[5]	[4]	[3]	[2]	[1]

SECTION IV: Please answer the following questions on your **PRACTICE** with antibiotic

Sub-section 1

40. Did you receive any medical treatment when you were ill in the last 1 year?

☐ 1. Yes ☐ 2. No

41. How did you receive medical treatment for your illness in the last 1 year? Please select all that are applicable in your case

☐ 1. Consult a medical doctor ☐ 3. Others, please specify _____

☐ 2. Self-medicate without prescription

1. What were the groups of medicine you self-medicated for your illness within the last 1 year? Please select all the categories of medicines that are applicable in your case

☐ 1. Pain killers ☐ 4. Allergy medicine

☐ 2. Antibiotics ☐ 5. Others, please specify _____

☐ 3. Cough and cold medicine ☐ 6. Don't Know/ Don't Remember

☐ 7. Not applicable

2. Which was the name of the medicine you self-medicate in the last 1 year? Please select all that are applicable in your case.

☐ 1. Amoxicillin (Perimox 500, Curemox 500, etc.)

☐ 2. Paracetamol (Niko, Cetamol)

☐ 3. Azithromycin (Aziwok, Azithral, Azithro, Zulid, etc.)

☐ 4. Ampicillin and Cloxacillin (Megapen)

☐ 5. D-cold

☐ 6. Amoxicillin-Clavulanate (Clavum 625, Clavum 375, Super CV, Indclav-Ds, etc.)

☐ 7. Sinex

☐ 8. Ciprofloxacin (Cifran 500, Cicin 500, Ciplox 500)

☐ 9. Cetrizine (CTZ)

☐ 10. Pantoprazole (Pan-top)

☐ 11. Other please specify _____

☐ 12. Don't Know/ Don't Remember

☐ 13. Not applicable

3. What were the illness in which you self-medicated with antibiotics in the last 1 year? Please select all that are applicable in your case.

☐ 1. Cough and cold
☐ 2. Fever
☐ 3. Aches and pains
☐ 4. Sore throat
☐ 5. Diarrhea
☐ 6. Skin wounds
☐ 7. Other please specify _____
☐ 8. Not Applicable

4. How frequently did you self-medicate with antibiotics in the last 1 year?

☐ 1. Once
☐ 2. Twice
☐ 3. Thrice
☐ 4. More than three times
☐ 5. Not applicable

5. What were your reasons for self-medication with antibiotics in the last 1 year?

Ease of access	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Minor illness	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Past experience with similar illness	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Visiting medical doctor takes long time	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Medical consultaiton is expensive	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Recommendation from a family or friend	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable
Recommendation from pharmacist	☐ 1. Yes	☐ 2. No	☐ 3. Not applicable

Sub-section 2

Please provide your answers on the following regarding your practice of self-medication with antibiotics in the last 1 year.

	Never	Rarely	Sometimes	Often	Always
6. How frequently did you purchase antibiotic without medical prescription at a pharmacy?	[5]	[4]	[3]	[2]	[1]
7. How frequently did you take prescribed antibiotics for an infection that occurred again?	[5]	[4]	[3]	[2]	[1]
8. How frequently did you take antibiotic prescribed for another type of infection?	[5]	[4]	[3]	[2]	[1]
9. How frequently did you use leftover antibiotic that was stored at home?	[5]	[4]	[3]	[2]	[1]
10. How frequently did you switch to different antibiotic during the course of self-treatment?	[5]	[4]	[3]	[2]	[1]
11. How frequently did you use newer antibiotic when you were ill?	[5]	[4]	[3]	[2]	[1]
12. How frequently did you change the dose of antibiotic treatment during the course of self-treatment?	[5]	[4]	[3]	[2]	[1]
13. How frequently did you self-medicate with an antibiotic to prevent an illness?	[5]	[4]	[3]	[2]	[1]

APPENDIX C: BUDGET

1. Training of data collection team	5,500 BHT
2. Ethical Approval in Nepal	3,000 BHT
3. Data collection team cost (3)	28,000 BHT
4. Travel Costs	15,000 BHT
5. Translators (2)	10,000 BHT
6. Printing and photo copy cost	2,000 BHT
7.Pre-testing of questionnaires	2,500 BHT
TOTAL	**66,000 BHT**

APPENDIX D: TIMELINE

Research Activities	Time Frame (month)									
	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	
Literature review										
Proposal Writing										
Proposal Exam										
Ethical approval										
Respond to the comments from research ethic review										
Pre-test questionnaire										
Contact and train the research assistants for data collection										
Data collection										
Data entry										
Data analysis										
Thesis writing and thesis defense										
Total	9 months									

APPENDIX E: ETHICAL APPROVAL

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 2675

10 May 2018

Mr. Parishan Shrestha
Principal Investigator
Chulalongkorn University
Thailand

Ref: **Approval of thesis proposal** entitled **Knowledge, attitude and practice of self-medication with antibiotics among general public in Kathmandu Valley: A cross-sectional survey**

Dear Mr. Shrestha,

It is my pleasure to inform you that the above-mentioned proposal submitted on **25 March 2018** (**Reg. no. 162/2018**) has been approved by Nepal Health Research Council (NHRC) National Ethical Guidelines for Health Research in Nepal, Standard Operating Procedures Section 'C' point no. 6.3 through Expedited Review Procedures.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol. Expiration date of this proposal is **July 2018.**

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and **submit progress report in between and full or summary report upon completion.**

As per your thesis proposal, the total research budget is **NRs 82,400** and accordingly the processing fee amounts to **NRs 10,000.** It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the Ethical Review M & E Section at NHRC.

Thanking you,

Prof. Dr. Anjani Kumar Jha
Executive Chairperson

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VITA

A. Personal Details

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Nationality: Nepalese

B. Educational/Qualifications

1. Master of Business Administration (MBA) in Project Management - Kathmandu University School of Management - 2016

2. Bachelor of Pharmacy (B. Pharma) - St. John's Pharmacy College - 2012

C. Professional Work Experience

1. July 2016 - March 2017

Research Associate, Transformational Healthcare, Frost & Sullivan

2. 18 November 2015 – 13 June 2016

Internship: Swisscontact, Nepal Vocational Qualifications System (NVQS)

Position: Project Management Intern