A survey on practice and prevalence of self-medication with antibiotic by parents of children

A Dissertation submitted to the Department of Pharmacy, East West University, Bangladesh, in partial fulfillment of the requirements for the Degree of Bachelor of Pharmacy.

Submitted by

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Declaration by the Research Candidate

I, am MD. Shahnewaz Sharif, ID: 2013-3-70-028 hereby declaring that the dissertation entitled **"practice and prevalence of self-medication with antibiotic by parents of children."** submitted by me to the Department of Pharmacy, East West University and in the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy, under the supervision and guidance Ms. Farah Shahjin, Senior Lecturer, Department of Pharmacy, East West University, Dhaka.

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Certificate by the Supervisor

This is to certify that the thesis entitled " **practice and prevalence of self-medication with antibiotic by parents of children .''** submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a record of original and genuine research work carried out by MD. Shahnewaz Sharif, ID: 2013-3-70-028 during the period 2017 of his research in the Department of Pharmacy, East West University, under the supervision and guidance of me.

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Certificate by the Chairperson

This is to certify that the thesis entitled " **practice and prevalence of self-medication with antibiotic by parents of children''** submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a record of original and genuine research work carried out by MD. Shahnewaz Sharif, ID: 2013-3-70-028 during the period 2017 of his research in the Department of Pharmacy, East West University.

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Acknowledgement

At first, I would like to thanks the almighty “ALLAH” the most gracious and merciful

For enabling me to successfully completing my research work soundly and orderly.

I would like to express my deepest gratitude to my research supervisor, **Ms. Farah Shahjin,** Senior Lecturer, Department of Pharmacy, East West University, who had been always optimistic and full of passion and ideas. Her generous advice, constant supervision, intense support, enthusiastic encouragements and reminders during the research work not only helped shape this study but also moulded me into being a better researcher. Her in-depth thinking, motivation, timely advice and encouragement have made it possible for me to complete this research.

I put forward my most sincere regards and profound gratitude to Chairperson **Dr. Shamsun Nahar Khan**, Associate Professor, Department of Pharmacy, East West University, for her inspiration in my study. She also paid attention for the purpose of my research work and extending the facilities to work.

I want to give special thanks to **Shamim Samad,Nusrat Jahan,Imrul kayes, Shahriar Shimul** and my all friends, who gave me support for my research work and for their extended cooperation for my study.

I express my sincere thankfulness to my family for guiding me all through my life, including that for my research project.

During the course of this research work, a lot of experiences I have received in which is of inestimable value for my life.

Dedication

This research work is dedicated to my beloved parents, honorable faculties and loving friends.

Content

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List of Abbreviations

ADR- Adverse drug reactions

CAM- Complementary and alternative medicine

CQ- Chloroquine

DNA- Deoxyribonucleic acid

FDA-Food and drug administration

MUR-Medicines use review

NSAID- Nonsteroidal anti- inflammatory drugs

NAFDAC- National agency for food and drug agency and control

NONRX-CVH-Non prescription drugs on cardiovascular health

OTC-Over the counter drug

PBP- Penicillin-binding protein

PI-Partnership instrument

PGE- Prostaglandin

PNG-Papua new guinea

RNA- Ribonucleic acid

SI-Statutory instruments

STI-Sexually transmitted infection

SMA-Self-medication with antibiotic

tRNA-Transfer ribonucleic acid

UK-United kingdom

USA-United states of America

UTI- Urinary tract infection

VISA- Vancomycin intermediate-resistant *S. aureus*

WHO-World health organization

Abstract

A questioner based survey ‘‘**practice and prevalence of self-medication with antibiotic by parents of children**” was conducted on parents of children in **Rajshahi city** have required antibiotic in the last 6 months. The aim of the study was to determine the prevalence of self-medication tendency of children by parents bear recognizing antibiotic usage and resistance. The prevalence was very low.02% and most parents preferred visiting the doctor or dispensary attendant to obtain the medication. Almost 67.2% parents through that their child’s health status was moderate to fairly poor. Antibiotic that is self-medicated highest tendency was Tetracycline although most parents preferred to the professional help upon child’s diseases condition. When asked about antibiotic resistance, most parents had no idea about what the term meant of how it is recalled to misuse or discontinuation of antibiotic therapy. To stop the abuse of antibiotic in Bangladesh and development of resistance antibiotic prescription should be closely monitored awareness should be spread about the consequence of misuse of antibiotic.

Chapter 1: Introduction

1. Introduction

1.1 Overview

Self-medication can be defined as the use of non-prescription medicines by people on their own initiative. The definition can be expanded to include treatment of family members and dependents, in particular children/minors and the elderly. Self-medication is a component of self-care and is considered as primary public health resource in health care system. Studies have revealed the burden of self-medication with antibiotics to be higher in developing countries than in developed countries. World Health Organization has mentioned, according to a survey that self-medication, if administered appropriately and responsibly can help prevent and treat diseases economically and without medical consultation. Although self-medication may prove useful when used judiciously, it is more often used erroneously, without proper guidance and rationale. Many adults believe that antibiotics cure common cold and cough. Medications administered inappropriately not only leads to wastage of resources but also carries potential serious and life-threatening adverse effects for the users. Research of health seeking attitudes in different parts of the world reveals that self-medication (with any drug) is higher among the literate, the young and people in low and middle income countries. The misuse of antibiotics is a serious problem in several respects. Most of the general public in Bangladesh knows the definition of antibiotic resistance and very few know when it was appropriate to use antibiotics. The developing world is the hub for the emergence of rapidly mutating and resistant strains of several pathogens, including *S. pnemoniae, S. typhi, and Shigella*species .Emergence of antibiotic resistant strains of several pathogens is linked directly to the use of antibiotics and with their unregulated use (or misuse).Secondly, unregulated use of antibiotics results in improper dosing (over and under dosing), which may adversely affect the person being administered the drug. Thirdly, antibiotics have their own side effects and hazards, which need to be considered, in particular, for people with other comorbids. Public education and enforcing and implementing laws about prescribed medications can help decrease the rate of self-medication as shown by previous researches in the developed world. Therefore, ideally, antibiotics need to be regulated via prescription-only sales. Legally, the sale of antibiotics is regulated on a ‘sold on prescription only’ basis and this needs to be put into effect in reality as well. So for implementation of such policies and carrying out

general awareness programs, information should be available about how common the use of self-medicated antibiotics is. Therefore, we aimed to provide the prevalence of self-medication with antibiotics amongst the university students of Karachi, who are not associated with health care or medicine.

1.2 Self-medication

Some conditions when people don't contract doctors to take any medication rather than taking by own dicission is normally addressed as self-medication. Sometimes we feel bad (bad physical conditions) but not like that alarming such conditions we take OTC drugs for which we do not contract health care professionals. It is both good and bad from different aspects because it has both of benefits and risk potential.

1.3 Definition of self-medication

Self-medication can be defined as the use of drugs to treat self-diagnosed disorders or symptoms, or the intermittent or continued use of a prescribed drug for chronic or recurrent disease or symptoms. (Whittaker, 2015)This is done by the consumer normally rather than prescriber. Prevalence of this is seen in developing countries. The main cause behind this is the poor communication between patients & healthcare professionals. (Hamel MJ, et. al. 2001 Policy makers should be concerned if the spectrum of drugs available without a prescription includes antibiotics. The increase in antibiotics resistance in developing countries is of current public and professional concern as it results in multiple resistant organisms difficult to treat. (WHO, 2001) Self-medication with antibiotics may increase the risk of inappropriate use and the selection of resistant bacteria. The objective of the study was to evaluate the level of knowledge about antibiotic of those who do self-medication of antibiotic. WHO has introduced a good concept on rational drug use named essential drugs in 1970s.The principle of this concept was limited number of drugs would lead to a better supply of these drugs, better prescribing, and lower costs for health care. Though the introduction of the essential drug list in over 100 countries is done, drug consumption still increased worldwide (Le Grand, Hogerzeil, and Haaijer-Ruskamp, 1999). Though antibiotics are one of the most useful drug , it is estimated that the volume of the antibiotic market worldwide is between 108 and 216 kg of products (Wise R., 2001).It is well documented that the inapropriate use of antibiotics has led to hospital, waterborne and food-

borne infections by antibiotic-resistant bacteria, enteropathy (irritable bowel syndrome, antibiotic-associated diarrhoea etc.), drug hypersensitivity, biosphere alteration, human and animal growth promotion, and destruction of fragile inter specific competition in microbial ecosystems (Zdziarski, Simon, and Majda, 2003). These consequences are increasing day by day infections caused by resistant microbes fail to respond to treatment, taking longer time to be cured & sometimes cause death. Drug regulation that controls the availability of antibiotics is implemented differently in different countries and can play an important role in misconceptions about the use of antibiotics. In addition, regulations (and their enforcement) also vary for the dispensation of prescription antibiotics. For example, common self-medication with antibiotics in developing countries Bangladeshi, India, Nepal, Africa may be a consequence of poor enforcement and control over the laws and regulations influencing prescription, which has a knock-on effect upon community pharmacy services.

Half of the respondents were aware of antibiotic resistance and this awareness was the lowest in countries with a higher prevalence of resistance. In many countries like Dubai, according to the national antibiotics policy and guide to antimicrobial therapy, antimicrobials should only be sold or supplied by prescription from an authorized medical practitioner or dentist.

Table 1.1: For the purposes of rational use, antimicrobials are classified into three groups according to the level of prescription. (Sharif, Bugaighis, and Sharif, 2015)

Group A	For common use, all practitioners may prescribe them (safe, effective and relatively cheap)
Group B	Restricted use; for prescription by specialists only (expensive, toxic and new agents)
Group C	For use in primary health care (similar to group A), with some omissions.

1.4 Prevalence of self-medication

Self-medication with antibiotics by university is high in little income countries like Sri lanka, Vutan, Africa, Pakistan, India, Nizeria etc. This finding is in agreement with a similar study which posited that the commonest groups of medication prone to self–medication include antimalarials and antibiotics. (Afolabi, 2000) The study revealed that the prevalence of self-medication with antibiotics and antimalarials by university students in Southwestern Nigeria is

very high. Self-medication is frequent among undergraduate nursing students. They use pain killer for mild or moderate pain & inflammation. The young students were, predominantly female practiced self-medication based on their own information and suggestions from relatives and the main reason that led them to practice self-medication was lack of time to go to a physician. Globally, self-medication has been reported as being on the rise. In developing countries people are not only using non-prescription drugs but also prescription drugs, as self-medication products, without supervision. The World Health Organization has emphasized that self-medication must be correctly taught and controlled. In a number of developing countries many drugs are dispensed over the counter without medical direction. In this case, self-medication provides a lower cost-alternative for people who cannot afford the fee of medical services. However, increased access to non-prescription medicines may encourage patients to believe that there is a drug treatment for every ailment. (Hughes C., 2003) This is more happening in developing countries than developed ones due to low education level, age, cost, time & gander.

1.5 Importance of self-medication

Self-medication is becoming an increasingly important area within healthcare. It moves patients towards greater independence in making decisions about management of minor illnesses, thereby promoting empowerment (Bushra et al., 2012). Self-medication makes consumers more health conscious, reduces treatment burden on healthcare facilities and curtails the cost and time of obtaining access to treatment. However, it increases risks such as drug resistance, adverse drug reactions, incorrect diagnosis, drug interactions and polypharmacy (Eticha and Mesfin, 2014). A survey conducted for first-year medical students of the Arabian Gulf University, Bahrain (including some Saudi students) suggested that these students had a poor knowledge about adequate self-medication whereas the knowledge of medication usefulness and harms was adequate. The attitude towards self-medication was positive and although the practice of self-medication was common, it was in most cases inadequate (Sharma et al., 2005).Consumers are willing and able to take more responsibility for their own health and by so doing a significant amount of resources could be utilized in more pressing areas than patients receiving consultation and prescription for minor ailments. Consumer behavior research has shown that people want to take responsible self-medication, know what illness they could treat themselves, use of medicine

with caution and when to seek professional help (Tejashree, Sarala, and Girish, 2014). In some cases, the practice is frequently and successfully used. An Australian-based study revealed that in only 2% of cases self-treatment for minor ailments were the actions taken assessed as inappropriate and potentially harmful. This agrees with a later study which showed that few, if any were consuming nutrient supplements in amount considered toxic and that most consumers used self-medication preparations in a safe and proper way. This agrees with other studies. Hence, in some patients, self-medication was recommended if they continue to have recurrences of a chronic infective process. Further, because OTC drug sales statistics reflects pattern of self-medication, it may be used to monitor the practice.

Table 1.2: The factors causing increase in self-care. (Stanhope, 1983)

Reason	**Remarks**
Socioeconomic factors	Growing empowerment, resulting from improved educational levels and greater access to in-formation, combined with increased individual interest in personal health, is resulting in growing demand for direct participation in health care decisions.
Lifestyle	Awareness has increased of the impact of certain lifestyle factors -such as avoidance of smoking and keeping to a well-balanced diet -on maintaining health and preventing illness.
Accessibility	Consumers prefer the convenience of readily available of medicinal products to long waiting times at clinics or at other health facilities. In many countries, however, such availability may mean paying higher prices.
Management of acute, chronic and recurrent illnesses, and rehabilitation	It is now recognized that certain medically diagnosed conditions may be appropriately cont-rolled by self-medication or no medication at all. Indeed, in some countries this may a necessity rather than a choice.
Public health and environmental factors	Good hygiene practices and appropriate nutrition, safe water and sanitation have contributed to the capacity of individuals to establish and maintain their health, and prevent illness.

To be continued.

Demographic and epidemiological factors	Demographic transition towards a more elderly population is requiring changes in health poli-cy and delivery. Likewise, epidemiological factors arising from changing disease patterns are necessitating adaptation of primary health care provision and funding. These changes and adaptations include enabling individuals to ass-ume greater responsibility for their health care needs. This in turn means increasing individu-alls' capacity for self-care.
Health sector reforms	In the midst of declining economic activity and resources, governments and other third-party payers and individuals worldwide are grappling with escalating health care costs. Many countries are establishing mechanisms whereby these costs can be contained and health care made more cost-effective. World-wide, self-medication is being promoted as a means of reducing the health care burden on the public budget. Structural changes including increased reliance on private sector delivery are also increasingly being put in place.

1.6 Historical perspective

Man has used drugs for various purposes from the dawn of history. Herbal and other plant derived remedies have been estimated by the World Health Organization (WHO) to be the most frequently used therapies worldwide. Plant-derived remedies can contain chemicals with potent pharmacological and toxicological properties. From the ancient civilization of South America came cocaine obtained from the leaves of Erythroxylon coca which were chewed for pleasure and reduction of fatigue. Extracts of cacti and mushroom species, used for religious purposes among Central and North American Indians can be used as a hallucinogenic agent. In Africa, eserine, a component of mitotic eye drops develops from calabar beans used in fetish practices. Bronchiodilatory effects of ephedra develops from ephedra plants species in ancients China while digitalis, a potent heart stimulant was developed from purple foxglove, an ingredient of herbal folk medicine in England. Self-medication had also been derived from other sources outside plants. In the southern United States of America, certain foods are used to reduce the excess volume o "blood'' which was believed to cause the illnesses; in Latin America, certain foods are used to counteract "hot" or "cold" illness and to restore the body equilibrium; in the

majority of Xhosa speaking women of South Africa, indigenous healing practices are used for themselves and their babies because of the need to „strengthen" the womb against sorcery, prevent childhood illness and to treat symptoms they perceive biomedical services would not be able to treat. (Afolabi, 2008)

1.7 Condition treated by self-medication

There is a wide variety of conditions, given in figure. In which OTC drugs are used. Most commonly available OTC medications are pain killers, cough and cold remedies, anti-allergy medicines, vitamins and energy tonics. Although these medications are considered risk-free and useful for the treatment of common health problems, their excessive use can also lead to serious side-effects and unfavorable reactions. Generally, Consumers tend to utilize private pharmacies rather than public facilities for self-medication. (Goel et al., 1996)

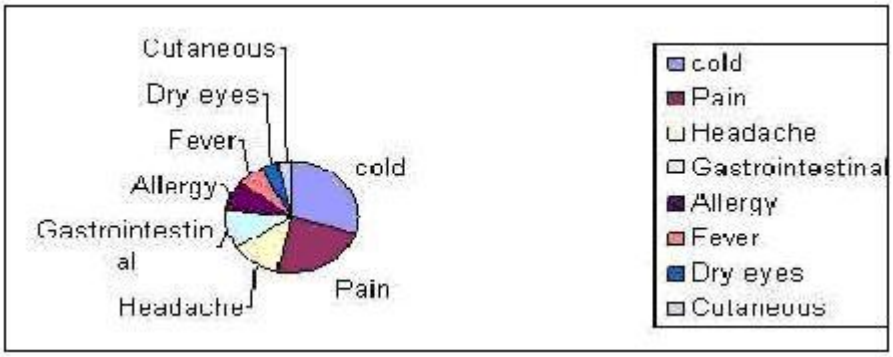

Figure 1.1: Patient preferences for OTC drugs patient preferences for OTC drug. (Goud, Kumar, and K, 2014)

1.8 Knowledge and attitude in self-medication

Self medication with drugs is an economical choice of treatment for common self limiting illnesses all over the world.In spite of this, the knowledge of the benefits as well as hazardous effects is not as popular as the practice itself. Certain studies amongst different populations reveal that the people had a fairly good knowledge on the advantages of self medication, as they correctly perceived it as time-saving and economical, doing away with the need to go to a doctor for minor illness and providing quick, easy and convenient relief. These perceptions are similar to those reported by the WHO that self-medication provides a cheaper and convenient alternative

for treating common minor illnesses. The same can however not be said concerning the knowledge of consumers with respect the drugs being used, the right indications, dosages, and duration of use as well as the side effects of the drugs. From a study reported that common over the counter (OTC) medications led to adverse health reactions and even fatalities due to inadequate drug knowledge. Various studies have shown that because of lack of knowledge and information many people take and use their medication incorrectly or in appropriately. This in turn leads to loss of efficacy and an inefficient use of the considerable resources which are spent annually on drugs. In a descriptive study in Hong Kong in which patients were asked how much they knew about the therapeutic and side-effects of the medications they used, 69% knew at least some of the therapeutic effects while 31% did not know any of the therapeutic effects, so rendering themselves at risk from inappropriate use of drugs. Furthermore, the vast majority 93% of the patients were totally unaware of the possibility of side-effects in that study. A study in Malaysia, about 82% of the respondents stated that their level of knowledge regarding OTC medications was moderate to low.

The sources of information or knowledge of drug use according to most surveys include pharmacists, general medicine dealers, general and private medical practitioners, household Worldwide, particularly in developed countries, surveys reveal that modern consumers wish to take a greater role in the maintenance of their own health and are often competent to manage chronic and recurrent illnesses after proper medical diagnosis and with only occasional professional advice, particularly with the use of analgesics, antibiotics, histamine H_2-receptor blocker, topical corticosteroid, antibiotic and antifungal, and oral contraceptive. They are understandably unwilling to submit to the inconvenience of visiting a doctor for what they rightly feel they can manage for themselves.

1.9 Parental knowledge about antibiotic use/discontinuation in Bangladesh

Many studies suggest that parents had considerable misunderstandings that may contribute to inappropriate antibiotic use. In Bangladesh, high percentage of parents thought that antibiotics could cure infections caused by viruses and also cold, fever and sore throat. A major concern is that nearly half of the parents thought that taking antibiotics in advance could protect children from the common cold.

In Bangladesh, children's are self-medicated by antibiotics for some common cause such as fever, cold, and diarrhea etc. Among the antibiotic drugs, Ceftriaxone, Cefixime, Levofloxacin, Metronidazole etc. were mostly used and the peoples had a little knowledge of antibiotics use.
Other studies also suggest a considerable contrast in perceptions of antibiotics between parents living in central towns and those living in rural villages. Specifically, parents from central towns had a better knowledge of appropriate indications and of side effects of antibiotic use than the rural villages.

1.10 Scope and distribution

Self-medication encourages an individual to look after minor ailments with simple but effective remedies. People think that medicines should be used in the event of any sickness or discomfort. The government of encourages self-reliance but agencies like WHO promote individual family and community participation in primary health care. Poor diagnostic ability and a limited knowledge of appropriate management are the cause of in the increase of self-medication and low rate of health care utilization. (Afolabi, 2008)

1.11 Self-medication – socio-demographic and medical factors

The most common socio-demographic determinants are age, gender, occupation, education, marital status, religion, race, income and culture. The younger age group is more likely to self-medicate than the older ones. But somebody refuges the relation between Self-medication and age. Women have above average knowledge about drugs and risks of self-medication than men. They also use more supplements, OTC tranquilizers and analgesics for self-medication than men who on the other hand commonly use more stimulants. Factors related to general health status and women's reproductive role (pregnancy, breast feeding, and menstruation) influences gender differences in self-medication. During breastfeeding, self-medication was dictated by the mother and her infant's disorder. Furthermore women use caffeine as a form of self-medication to relieve the pre-menstrual symptoms. Self-medication was associated with educational level. For instance, there is a positive correlation between level of education and self-medication. Employment status affected the pattern of OTC and prescription drugs. The relationship between race and self-medication had been documented from various studies. Nonwhites had a higher probability of using tranquilizers than whites and whites likely than blacks to consume

supplements. Among the elderly, fewer blacks reported the use of OTC medications than non-blacks. While some studies found little or no association between self-medication and social status, others reported that among school aged subjects, social classes of parents has a direct relationship with drug consumption among their children. (Afolabi, 2008)

1.10 Commonest complaint responsible

Usually, self-medication is indicated for trivial symptoms perceived by the patient. It was favored for skin condition, general health care, aches and pain, problems of the eye, mouth, gastrointestinal and respiratory tract. Among adult patients with acute pathology, the most common complaints were pain and increase body temperature. In a recent rural population study in Nigeria, it was in the order: malaria, gastrointestinal problems and urinary tract infections. Among rural Japanese housewives it was headache, tiredness and gastrointestinal problems while in American and British housewives, it was emotional or psychological complaints. Among children, respiratory symptoms especially for common cold with or without fever were the commonest complaints. With the use of antibiotics, the indication varies with different studies. The commonest complaints were for soft tissue, sexually transmitted diseases, upper respiratory and gastrointestinal tract infection; upper respiratory tract infection; respiratory infection; throat, dental and urogenital infection; respiratory tract infection and acute diarrhea and diarrhea. Abdominal pain, fever and rashes for analgesics, the commonest complaints associated with its use are limb and back pain; self-perceived pain and poor health; and body pain, headache, body weakness and fever. Supplements are consumed for enhancement of diet, energy, immune system and for cancer prevention. (Afolabi, 2012)

1.13 Safe dosage of drug

Safety is a major concern when the FDA considers reclassifying the prescription drugs as OTC. Most OTC drugs unlike health foods, dietary supplements (including herbs) and complimentary therapies have been studies scientifically and extensively. However, all drugs have benefits and risks and some degree of risk has to be tolerated if people are to receive a drug's benefits. Safety depends on using a drug properly. For OTC drugs proper use often relies on consumer self-diagnosis, which leaves room for error. People who purchase OTC drugs should read instruction carefully because different formulation such as immediate release and control release (slow

release) formulation may have the same brand name, the label should be checked is time a product is purchased and the dosage should be noted.

Safety in self-medication (an overriding requirement) depends on four parameters:

1. Drug: Its inherent properties, dose and duration of use, including its power to induce dependence.
2. Formulation: devised with unsupervised use in mind, e.g. low dose.
3. Information: available with all purchases (printed) and rigorously reviewed (by panels of potential users) for user friendliness and adequacy for a wide range of education and intellectual capacity.
4. Patient compliance.

1.14 Guidance to physicians and their patients regarding responsible self-medication

The World Medical Association has developed this statement to provide guidance to physicians and their patients regarding responsible self-medication.

1) Distinction between Self-Medication and Prescription Medicine

a) Medicinal products can generally be divided into two separate categories: prescription and non-prescription medicines. This classification may differ from country to country. The national authorities must assure that medicines, categorized as non-prescription medicines, are sufficiently safe not to be harmful to health.

b) Prescription medicines are those which are only available to individuals on prescription from a physician following a consultation. Prescription medicines are not safe for use except under the supervision of a physician because of toxicity, other potential or harmful effects (e.g. addictiveness), the method of use, or the collateral measures necessary for use.

c) Responsible self-medication, as used in this document, is the use of a registered or monographed medicine legally available without a physician's prescription, either on an individual's own initiative or following advice of a healthcare professional. The use of prescription medicines without a prior medical prescription is not part of responsible self-medication.

d) The safety, efficacy and quality of non-prescription medicines must be proved according to the same principles as prescription medicines.

2. Use of self-medication in conjunction with prescription medication a course of treatment may combine self-medication and prescription medication, either concurrently or sequentially. The patient must be informed about possible interactions between prescription medicines and non-prescription medicines. For this reason the patient should be encouraged to inform the physician about his / her self-medication.

3. Roles & responsibilities in self-medication

a) In self-medication the individual bears primary responsibility for the use of self-medication products. Special caution must be exercised when vulnerable groups such as children, elderly people or pregnant women use self-medication.

b) If individuals choose to use self-medication, they should be able:

A. To recognize the symptoms they are treating;

B. To determine that their condition is suitable for self-medication;

C. To choose an appropriate self-medication product;

D. To follow the directions for use of the product as provided in the product labelling.

c) In order to limit the potential risks involved in self-medication it is important that all health professionals who look after patients should provide:

A. Education regarding the non-prescription medicine and its appropriate use, and instructions to seek further advice from a physician if they are unsure. This is particularly important where self-medication is inappropriate for certain conditions the patient may suffer from;

B. Encouragement to read carefully a product's label and leaflet (if provided), to seek further advice if necessary, and to recognize circumstances in which self-medication is not, or is no longer, appropriate.

d) All parties involved in self-medication should be aware of the benefits and risks of any self-medication product. The benefit-risk balance should be communicated in a fair, rational manner without overemphasizing either the risks or the benefits.

e) Manufacturers in particular are obliged to follow the various codes or regulations already in place to ensure that information provided to consumers is appropriate in style and content. This refers in particular to the labeling, advertising and all notices concerning non-prescription medicines.

f) The pharmacist has a professional responsibility to recommend, in appropriate circumstances, that medical advice be sought.

4. Role of Governments in Self-Medication Governments should recognize and enforce the distinction between prescription and non-prescription medicines, and ensure that the users of self-medication are well informed and protected from possible harm or negative long-term effects.

5. The Promotion and Marketing of Self-Medication Products

   a) Advertising and marketing of non-prescription medicines should be responsible, provide clear and accurate information and exhibit a fair balance between benefit and risk information. Promotion and marketing should not encourage irresponsible self-medication, purchase of medicines that are inappropriate, or purchases of larger quantities of medicines than are necessary.

People must be encouraged to treat medicines (prescription and non-prescription) as special products and that standard precautions should be followed in terms of safe storage and usage, in accordance with professional advice. (*Guidelines for the regulatory assessment of medicinal products for use in self-medication*, 2000)

1.15 Role of Pharmacist in self-care and prevention of self-medication

In most countries pharmacies are conveniently accessible and, in them, pharmacists are available for a considerable period during each working day and no appointment to see them is necessary. In countries where pharmacies are not well distributed, the aim of governments should be to ensure that the vast majority of the public have convenient access to a pharmacy. Pharmacists

have a professional responsibility to provide sound, unbiased advice and to ensure that self-medication is resorted to only when it is safe and appropriate to do so. Pharmacists have the necessary knowledge to advice on safe storage of medicines in the home and on safe disposal of medicines once a course of treatment has been completed or, in the case of a medicine, which is obtained for occasional use, when the expiry date has been reached. Pharmacists can also advise that medicines prescribed for one individual or purchased for the treatment of a specific medical condition should not be used by another person without professional advice first being sought. Pharmacy Act 2007 requires that the supply of medicines be from a pharmacy under personal supervision of a pharmacist. Pivotal role of the pharmacist to ensure and facilitate appropriate medicines utilization, legislative requirements under SI 488 of 2008 those when supply occurs that information and advice be provided. Robust regulatory framework provides for opportunity to develop pharmacy services. PI2020 looking at evolving roles in respect of ensuring health, MUR, medicines management, screening Evidence supportive that the development and promotion of self-care is of value for the patient, and value for public health. (You et al., 2011) Medication compliance is one of the important elements in self-care. It is common for patients to use over-the-counter (OTC) medicines without the supervision of healthcare professionals, which can limit the opportunity for ongoing patient follow-up and safety monitoring. The establishment of a robust pharmacovigilance system is therefore advocated in which pharmacists play an important role in providing advice to patients when they purchase OTC drugs. In the UK, there is also a move to promote the role of pharmacists and develop a broader concept of the primary care team. Pharmacist's role has been extended to tobacco cessation therapy, local health promotion, advice to family doctors and other health professionals, repeated prescription, advice to nursing and residential homes, health screening and diagnosis, etc. Meanwhile, general practitioners have also become more supportive of pharmacists' extended role in western countries. (Mahajan et al., 2015) The evolution of the Hong Kong healthcare system and the health policy might explain why Hong Kong people have a low acceptance rate on pharmacist-led self-care management. In Hong Kong, patients receive health services from either private or public sectors seldom have the opportunity to consult community pharmacists as patients usually receive prescribed medications from private doctors directly or from government clinic pharmacies. Community pharmacists would only have the chance to provide consultation when patients visited them to buy drugs over the counter. Patients, therefore, are not familiar with the

role of pharmacists besides dispensing drugs and not very supportive of pharmacist-led self-care management. (You et al., 2011) Role of a pharmacist can be:

1.15.1 As a communicator

- The pharmacist should initiate dialogue with the patient (and the patient's physician, when necessary) to obtain a sufficiently detailed medication history;
- In order to address the condition of the patient appropriately the pharmacist must ask the patient key questions and pass on relevant information to him or her (e.g. how to take the medicines and how to deal with safety issues);
- The pharmacist must be prepared and adequately equipped to perform a proper screening for specific conditions and diseases, without interfering with the prescriber's authority;
- The pharmacist must provide objective information about medicines;
- The pharmacist must be able to use and interpret additional sources of information to satisfy the needs of the patient;
- The pharmacist should be able to help the patient undertake appropriate and responsible self - medication or, when necessary, refer the patient for medical advice;
- The pharmacist must ensure confidentiality concerning details of the patient’s condition.

1.15.2 As a qualified drug supplier

- The pharmacist must ensure that the products he/she purchases are from reputable sources and of good quality;
- The pharmacist must ensure the proper storage of these products.

1.15.3 As a trainer and supervisor

To ensure up-to-date quality service, the pharmacist must be encouraged to participate in continuing professional development activities such as continuing education. The pharmacist is often assisted by non-pharmacist staff and must ensure that the services rendered by these auxiliaries correspond to established standards of practice.

To achieve these pharmacists must develop:

- Protocols for referral to the pharmacist;

- Protocols for community health workers involved with the handling and distribution of medicines. The pharmacist must also promote the training and supervise the work of non-pharmacist staff.

1.15.4 As a collaborator

It is imperative that pharmacists develop quality collaborative relationships with:

- Other health care professionals;
- National professional associations;
- The pharmaceutical industry;
- Governments (local/national) and,
- Patients and the general public.

In so doing, opportunities to tap into resources and expertise, and to share data and experiences, in order to improve self - care and self-medication, will be enhanced.

1.15.5 As a health promoter

As a member of the health-care team, the pharmacist must:

- Participate in health screening to identify health problems and those at risk in the community;
- Participate in health promotion campaigns to raise awareness of health issues and disease prevention; and
- Provide advice to individuals to help them make informed health choices

1.15.6 Specific situations

In many developing countries, the ratios of pharmacists and pharmacies to population are so low that access to pharmaceutical care is impeded. In such cases, consultation with other health workers or community health care workers, household carers and other appropriate lay people, provided they have received the appropriate pharmaceutical training and orientation, should be encouraged (Brower et al., 2001).The majority of respondents supported self-care for chronic diseases. However less than half supported pharmacist-led self- care programs despite the fact that elderly people and those with lower education level and a chronic condition were at high risk

of encountering problems with OTC products. To overcome these limitations, self-care programs provided by pharmacists should be gradually developed with the support of the Government. (You et al., 2011)

1.16 Reasons for self-medication

Self-medication is very common and a number of reasons behind it like, socioeconomic factors, lifestyle, ready access to drugs, the increased potential to manage certain illnesses through self-care and greater availability of medicinal products (Tolossa and Bekele, 2014). A study in Yemen showed there was a significant difference between the prevalence of self- medication with antibiotics and the sex of the patients. In the present study, the results showed that female children were more exposed to self-medication than males. This can be explained by the fact that many families in Yemen prefer male children than females, so they seek medical advice for boys early without trial of antibiotics without prescriptions. (Mohanna, 2010) Home and self-treatment is a central part of local medical culture in Kenya societies, where people are used to taking treatment into their own hands. Most common illnesses are dealt with by laypeople on their own; only when an illness is prolonged or serious do people seek expert advice, be it a local healer or a biomedical professional (Geissler et al., 2000). The common reported reasons for self-medication were shortages of drugs at health facilities, long waiting time at health facilities, long distance to health facilities, inability to pay for health care charges and the freedom to choose the preferred drugs in Tanzania. The participants preferred self- medication practice due to freedom of choosing the drug of their choice. Some participants said that if they go to the drug shop, they were able to make the decision on which drug to use. Also, they admitted going to the pharmacy/drug shop because they could obtain drugs such as quinine and anthelmintic, which they believed would cure their sick children but these drugs were rarely prescribed from health care facilities. (Chipwaza et al., 2014)According to a report the reason for self-medication, given in male (35.48%) and female (15.56%) used self -medication due to the lack of time, 32.26% male and 26.67% female used self- medication due to high consultant fee of Physician, 29.03% male and 11.11% female wants quick relief, 3.33 % male and 24.44% female believe in Ayurveda. There are some cases of female (6.67%) in which there is no family support hence they use self-medication, 15.56% female used self-medication due to their inability to walk. There are some other reasons like wider availability of medicine, greater choice

of treatments, ease of access an active role in his/ her own health care and self-reliance in preventing or reliving miner symptoms or condition, ailment was minor and financial constraint. (Jain, Malvi and Purviya, 2011) In a study of WHO 'self-care medication identified patients' reasons for self-medication the commonest was the illness was regarded as minor (80.2%).More than two-thirds of respondents (70.1%) indicated that they self-medicated because health care facilities were unavailable at times when they needed care, more than half of those (52.0%) reported that they did so lacked of time to visit formal health care facilities, more than 40% of those, indicated the cost of consultation with a doctor was a reason for self-medication. Other reasons of self-medication were expectations of less/no benefit from modern health care, remoteness of health care sites and convenience. (Alghanim and Alomar, 2011)

Table 1.3: Most common reasons of self-medication are found to be. (Jain, Malvi and Purviya, 2011)

Most common reasons	Remarks
Extreme poverty	Poor people don't want to go to hospital as they cannot afford to pay for drugs or hospital bills. Thus they prefer to go to chemist or pharmacies to save cost at the expense of their health.
Ignorance	Many people are unaware of harmful effect of drug, hence need proper advice from qualified personnel before use, but ignorance of people about the adverse effect of drugs leads to severe problem.
Lack of easy excess to some prescribed drugs	Sometimes people have to go to long distance to get their prescribed drugs. Therefore, they prefer to settle for more easily available alternatives
Quackery	There are many unqualified people work as health professional who prescribes drugs willingly who has worsened the case of self-medication.
Lack of proper enforcement of existing laws	On drug's procurement in most developing countries.

To be continue.

Wrong attitude of people	Many people lack proper medical because of their tight schedule or are too busy and thus prefer to engage self-medication.
Weak health system	Many of health system are weak and lead many people to losing faith in them.
Alternative medicine	This is another great problem. Many traditional and alternative medical practitioners are guilty of making money by deceiving people.
Religious misconception	The proliferation of different religious houses, ideologies now-a-days has had some negative impacts on health. Some people have some misconceptions that prevent them from seeking proper medical care. Example of these people is who refuse to go to hospital because they have been told they must not take injections or drugs.

Table 1.4: There are also some other reasons which are less common. (Mumtaz et al., 2011)

Less common reasons	Remarks
Urge of self-care	Due to business or hurry people avoid going to doctors and do self-medication. They become too busy to treat themselves as soon as possible with maximum result.
Self-need to play active role	Some people think that what they do or what they use is right. They consider themselves intelligent and avoid going to doctors for advice.
Illness to be minor	If illness is minor, then people especially poor people avoid going to hospital or doctors. They take advice from others and take medicines.
Embarrassed of discussing their symptoms	People of developing countries as they have less education, women do not go outside often from religious due to cultural or religious reservations feel shame to discuss their internal problem with doctors and often do self-medication.
Suggestion of friend or relatives	Sometimes people take suggestion from friends or relatives who got benefit from medicines and advice others to take the same medicines for disease similar to theirs. This can lead to error in therapeutic outcome.

1.17 Sources of information for self-medication

In developing countries which are economically deprived countries most episodes of illness are treated by self-medication. Whether one lives in a developing country or in a developed one, the sources of information are similar. A person may seek advice from 'an older person in your household who possesses the knowledge of simple herbal remedies for common illnesses' or with a pharmacist because they can 'provide a good help to assess the symptoms' and 'spend time explaining how to use the medication properly' Or one may purchase an OTC medicine 'based on a previous medical recommendation', A study shows that the commonest source of information was the private sector pharmacy salesmen (including pharmacists), reported by about three- quarters of respondents (74.0%). This was followed by respondents' experiences or knowledge from previous episodes (50.8%). Health staff was the least common source of information, reported by only 9.6% of respondents. Other sources of information about medications were relatives/friends, the Internet and advertisements. (Alghanim, 2011)

In a study of rural area of Barabanki showed that the important sources of information for self-medication were previous prescription of doctors (72.6%), friends and neighbors (52.4%) and chemists (38.1%) In present study, most common reasons for favoring self-medication were time saving (45.2%) followed by high cost of consultation (42.3%), minor illness (39.9%) followed by convenience (25.0%). (Keshari, Kesarwani and Mishra, 2014)

Table 1.5: The common sources of drugs in self- medication. (Bennadi, 2014)

Previous prescriptions	Local hawkers
Traditional sources	Native helpers
Advertisements	Internet
Family and Friends	Chemist shop
Magazines	Books
Pharmacists	Leaflets along with OTC drugs

1.18 Risks and Benefits of self-medication

According to WHO guidelines responsible self-medication can help prevent and treat diseases that do not require medical consultation and reduce the increasing pressure on medical services for relief of minor ailments especially when resources are limited. Otherwise self-medication if not based on authentic medical information can lead to irrational use of drugs, wastage of resources, and increased resistance of pathogens and can lead to serious health hazards such as adverse drug reaction and prolonged morbidity. Not much is known about health related problems and healthcare utilization, including self-medication among young adults. The youth are highly influenced by the media and the internet which promote self-medication behavior. The increased advertising of pharmaceuticals poses a larger threat of self-medication to the younger population in general. This raises concerns of incorrect self-diagnosis, drug interaction, and use of drugs other than for the original indication. (Pandya et al., 2013) In developing countries, such as Papua New Guinea (PNG), self-medication may pose a threat to public health unless the population is adequately educated on responsible self-medication so as to avoid problems associated with irrational medicine use.PNG has a fair share of heath service problems, with reports indicating that anti-malarial medicine resistance and resistance to some antibiotics are on the increase (Meauri, Temple, and Lauwo, 2011). Strict measures are needed to monitor advertisements of medicines both in print and electronic media. The possibility of having access to medicines not listed as OTC drugs should be minimized by taking appropriate monitoring measures including implementing effective legislation. There is also a need to explore the possibility of developing partnerships between physicians, pharmacists and consumers to educate and disseminate information on self-medication. So that threats can be minimized. Medication should be taken on the advice of a doctor or a trained health professional. Proper drug control is very important. Drug should not be dispensed without prescriptions. There should be proper maintenance of records of dangerous drugs, by shop selling medicines. Drugs inspectors should be more vigilant in checking these pharmacists. Sometimes antibiotics are given only for a one or two days. There should be some restrictions on over the counter drugs. (Shahwar Awan and Hussain, 2016) Mixing drugs can have an unpredictable effect, as it is difficult to predict how the drugs will interact. When dropping off a new prescription at the pharmacy, patients should ask about drug interactions. It’s also a good idea for patients to use the same pharmacy for all of their

prescriptions so that interactions will be spotted more easily in the computer system. Patients also can take charge of their health by using an online tool to check interactions each time they are prescribed a new drug, they buy an OTC medicine or they pick up a dietary supplement. (Pandya et al., 2013)

Self-medication is defined as the selection and use of medicines by individuals (or a member of the individuals' family) to treat self-recognized or self-diagnosed conditions or symptoms. Several benefits have been linked to appropriate self-medication, among them: increased access to medication and relief for the patient, the active role of the patient in his or her own health care, better use of physicians and pharmacists skills and reduced (or at least optimized) burden of governments due to health expenditure linked to the treatment of minor health conditions However, self-medication is far from being a completely safe practice, in particular in the case of non-responsible self-medication. Potential risks of self-medication practices include: incorrect self-diagnosis, delays in seeking medical advice when needed, infrequent but severe adverse reactions, dangerous drug interactions, incorrect manner of administration, incorrect dosage, incorrect choice of therapy, masking of a severe disease and risk of dependence and abuse. In this short review the author analyzes recent literature on some of the most important dangers related to self-medication practices, particularly: polypharmacy and drug interactions, medications abuse or dependence, misdiagnosis and incorrect choice of treatment. The author also proposes measures that could be adopted in order to solve or improve these issues.

1.18.1 Potential benefits of self-medication

1. Product safety when used as recommended in the instructions;
2. Wider availability of medicines;
3. Reliability and safety: the individual will often choose a product which experience has shown to be suitable. The scope and duration of self-medication can be kept within safe limits by appropriate selection of approved indications, labeling texts, dosage strengths and forms, and package sizes;
4. Acceptable risk, even when used for a longer duration, at a higher dose, or somewhat differently than recommended in the instructions
5. Greater choice of treatment;

6. An active role in his or her own health care;
7. Self-reliance in preventing or relieving minor symptoms or conditions;
8. Direct, rapid access to treatment;
9. Economy, particularly since medical consultations will be reduced or avoided;
10. Efficacy: i.e. the product does what it is claimed to do;
11. Educational opportunities on specific health issues (i.e. stop-smoking aids and products to treat heartburn);
12. Convenience.

1.18.2Potential risks of self-medication

1. Failure to recognize that the same active substance is already being taken under a different name (products with different trademarks may have the same active ingredient);
2. Food and drug interactions;
3. Incorrect choice of therapy;
4. Failure to recognize special pharmacological risks;
5. Rare but severe adverse effects;
6. Failure to report current self-medication to the prescribing physician (risk of double medication or harmful interaction);
7. Excessively prolonged use;
8. Excessively prolonged use;
9. Failure to recognize or self-diagnose contraindications, interactions, warnings and precautions;
10. Risk of dependence and abuse;
11. Risks at work or in sport;
12. Food and drug interactions;
13. Risk of dependence and abuse;
14. Failure to seek appropriate medical advice promptly;
15. Failure to recognize or report adverse drug reactions
16. Incorrect route or manner of administration;
17. Inadequate or excessive dosage;

1.19 Advantages of self-medication

Self-medication has been successfully integrated into many health care systems throughout the world. It is widely accepted that self-medication has an important role to play in health care and, with the continued improvement in people's education, general knowledge and socio-economicstatus, self-medication has been successfully integrated into many health care systems throughout the world. (Whittaker, 2015)Self-medication is not necessarily something to be frowned upon, but it is something that one need to be cautious about. Most health care professionals also avoid treating themselves and when faced with any illness will seek medical attention. Self-medication does offer tremendous benefits, particularly when faced with non-threatening infections like the common cold or mild backaches and so on. In such scenarios self-medication is beneficial as it gives you a greater role in your own health care. Keep in mind that self-medication does not mean that you should rely on drugs and strong medication but instead you can use home remedies and natural treatment methods to get rid of a minor but persistent problem. This also reduces your dependence on health care professionals, whose skills and expertise are indispensable in the treatment of more serious health conditions. This also reduces health care costs for the government.

Some drugs in the UK and USA which have been deregulated in the past decade from prescription- only category to availability without prescription. The deregulation process has been championed by the pharmaceutical industry, the pharmacy profession and government health policy maker and is supported by the acceptance that patients wish to have a greater role in their own treatment. (Hughes, McElnay, and Fleming, 2001)

In developed countries, self-medication has also been used very widely to combat behavioral and psychological problems such as smoking. According to the 2009 World Self Medication Industry (WSMI) statistics nicotine replacement therapy in the United States, the first year after its switch to non-prescription status, yielded an estimated 114000 to 304000 new former smokers annually. That is up to 300000 people each year who are able to reduce their risk of lung cancer, emphysema, stroke, heart attack and complications in pregnancy because of self-care products that help them stop. (AL Bashtawy et al., 2014) Self-medication also has advantages for health care systems as it facilitates better use of clinical skills, increases access to medication and may

contribute to reducing prescribed drug costs associated with publicly funded health programs. Expected health benefit from self-medication depends on perceived effectiveness of self-medication. In a world of scarce government and in many countries scarce individual resources, responsible self-medication should be a cornerstone of healthcare provision and health policy. (Hughes, McElnay and Fleming, 2001)

Responsible self-medication may include:

- Help to prevent and treat symptoms and ailments that do not require a doctor.
- Self–administration helps patients to learn and understand about their medication regimes, which may lead to better compliance.
- Increase the availability of health care to populations living in rural or remote areas.
- Enable patients to control their own chronic conditions.
- Cost effective.
- Education opportunities on specific health issues. (i.e. stop smoking aids and products to treat heartburn)
- Convenience.
- Patients are able to take their medications in accordance with their usual routines thereby reducing the potential for harm with, for example incorrectly timing insulin administration.
- This is especially important with medications such as those to treat Parkinson's disease where patients have very specific dose timing schedules to optimize symptom control.

These benefits translate into patient and consumer wellness and productivity, economic gain for employers, and cost savings to healthcare budgets through reduced medicine budget cost and reduced physician visits. These conditions aim at ensuring the safety of taking self-medicated drugs. (Jain, S., Malvi, R. and Purviya, J. 2011)Good self-medication can also provide benefits in community level such as:

- ❖ Saving scarce medical resources from being wasted on minor conditions
- ❖ Lowering the costs of community funded health care programs
- ❖ Reducing absenteeism from work due to minor symptoms
- ❖ Reduce the pressure on medical services where health care personnel are insufficient

- Increase the availability of health care to populations living in rural or remote area. (Bennadi, D. 2014)

Infections are illnesses which usually present acutely. Patients may therefore benefit specifically from the greater immediacy and convenience of access to antibacterials (as discussed above). This could potentially shorten the period of illness, reducing both the length of symptoms and the period of infectivity. The OTC availability of treatment for vaginal candidosis and herpes labialis probably shortens the delay between onset of symptoms and start of effective treatment. (Reeveset et al., 1999) Society benefits from a citizenry that is better informed about health care and therefore abler to exercise self-reliance. Having the tools available to help consumers practice such self-reliance also allows scarce health resources to be directed toward illnesses or conditions that require treatment in the professional healthcare system. Having appropriate nonprescription medicines available can also reduce illegal use of prescription products without a prescription – something which occurs too frequently in some countries, and is sometimes referred to as "self-prescription." In Mexico, for example, an increase in the availability of nonprescription medicines helped to reduce the estimated rate of "self-prescription" by 20 percent from 1989 to 1999. (THE STORY OF SELF-CARE AND SELF-MEDICATION, 2010)

1.20 Disadvantages of self-medication

Despite the significant benefits of self-medication there are some inherent risks as well. The irresponsible use of over the counter medications can be particularly damaging and this is in fact the biggest risk. The risks of self-medication go beyond simple over reliance on drugs and remedies. When individuals with no knowledge or limited knowledge of medicine and health care attempt self-treatment, it typically also involves self-diagnosis.

Modern medicine has become absorbed rapidly in to the local custom throughout the world, their ubiquitous distribution, powerful marketing and poor control mean that they are used and misused for a wide range of applications. Misuse is defined as using an over the counter drug product for a legitimate medical reason but in higher doses or for a longer period than recommended. For example, long term uses of some drugs have been associated with chronic renal failure. Many earlier reports implicated phenacetin-containing analgesics as the risk factor. Since the early 1980s, several case-control studies have reported associations between chronic renal failure and use of other forms of analgesics, including paracetamol, aspirin, and other

nonsteroidal anti- inflammatory drugs (NSAIDs). (Bennadi, 2014) There are several critical issues involved before deciding if drugs should be authorized for self- medication. First and foremost, is the principle that no drug is absolutely safe - prescription drugs remain potent medications. In many countries, the possibility of reporting adverse drug reactions (ADR) to self-medication products is not available since many conventional ADR reporting schemes operate through health care professionals. Only in a small number of countries with highly developed ADR systems are patients and consumers able to report ADRs directly to the authorities or through pharmacies. Moreover, clinical trial data for prescription use may not necessarily be valid for self-medication. This situation is beginning to improve within some countries that now demand OTC-environment studies to be undertaken before registration. (Pandya et al., 2013)In many countries, vaginal antifungal drugs have been released on over-the-counter (OTC) markets, yet little is known about women's management of their symptoms. In a study in this case, Physicians had observed several disadvantages of self-treatment, with unnecessary use and use for the wrong indications being the most often reported. In all, 31% of gynecologists and 16% of GPs reported that these adverse events had been clinically significant, with delay in the treatment of other infections being the most common problem. (Sihvo et al., 2000)

The risks from irresponsible use of self-medication are also worrying because of their implications on our health not just as individuals, but as a species as well. Our over reliance and almost abusive dependence on antibiotics for various conditions for example, has created a variety of drug resistant strains of bacteria. This poses a greater health risk than most of us can even fathom, as a global pandemic resulting from a drug resistant bacterial strain could prove disastrous.

It is acknowledged that microbiological diagnostic tests will not be available to self-medicating patients, unlike to GPs. However, it is also known that few GPs take specimens from patients for whom they prescribe antibacterials. For example, in managing acute UTI it is common practice to treat empirically without taking a specimen. Misdiagnoses could have several adverse consequences. These include:

- The partial or complete failure to treat an infection (such as therapy for presumptive urinary tract infection (UTI) when the patient has a sexually transmitted disease)

- The failure accurately to identify or treat the presenting infection (such as otitis media complicated by meningitis)
- Exposure to the risks of antibacterials without benefit when no treatable bacterial infection is present.
- possible increase in the number of patients receiving antimicrobials with consequent increase in the ecological pressure for resistance
- Failure to recognize that an infection might be a manifestation of underlying disease (e.g. sepsis in diabetes mellitus). (Reeves et al., 1999)

Finally, according to the World Self Medication Industry (WSMI) while self-care through responsible self-medication can play an important role in the prevention of chronic diseases The unfortunate feature of self –medication in a good number of developing countries where good healthcare systems are absent or weak is self-prescription. Self- prescription, according to studies in parts of Asia and the American continent is a leading cause of antibiotic resistance, and this is similar to the findings in certain parts of Nigeria. (Togoobaatar et al., 2010)

It is hard to strike a balance between self-medication that is necessary and the irresponsible use of medications and home remedies. Setting ourselves strict deadlines can help address this problem to a great extent however. In other words, if you find that the ailment in focus does not respond to treatment within a deadline, you should seek immediate medical attention. The length of the deadline would naturally vary, depending on the severity of the symptoms or the severity of the condition they could be symptomatic of.

1.21 Self-medication and drug dependency

It is commonly held that substance use comorbidity in schizophrenia represents self-medication, an attempt by patients to alleviate adverse positive and negative symptoms, cognitive impairment, or medication side effects. However, recent advances suggest that increased vulnerability to addictive behavior may reflect the impact of the neuropathology of schizophrenia on the neural circuitry mediating drug reward and reinforcement. We hypothesize that abnormalities in the hippocampal formation and frontal cortex facilitate the positive reinforcing effects of drug reward and reduce inhibitory control over drug-seeking behavior. In this model, disturbances in drug reward are mediated, in part, by dysregulated neural integration of

dopamine and glutamate signaling in the nucleus accumbens resulting form frontal cortical and hippocampal dysfunction. Altered integration of these signals would produce neural and motivational changes similar to long-term substance abuse but without the necessity of prior drug exposure. Thus, schizophrenic patients may have a predilection for addictive behavior as a primary disease symptom in parallel to, and in many cases independent from, their other symptoms.

1.22 Self Medication of children done by their parents

Parents who self-medicate their children are more likely than adults who medicate themselves to say they do so because the illness isn't serious enough to warrant a visit to the doctor (88% parents of children under 18 versus 78% adults in general parents are also more likely than adults in general to believe that non-prescription medications are just as effective as prescription drugs. (Jain, Malvi and Purviya, 2011)The consumption of pharmaceuticals can be considered an indirect indicator of the quality of health care services and children and adolescents are strongly susceptible to the irrational use of drugs with and without medical control. In developing countries like Bangladesh due to poverty and insufficient knowledge of parents and children themselves perform irrational use of drugs. (Pereira et al., 2007) Analgesic, antipyretic, non-hormonal anti-inflammatory drugs followed by drugs with action on the respiratory tract and systemic antibiotics played an important role in the self-medication patterns and arise a big concern about the risks that some of these drug classes may produce in this context. The risks of non- hormonal anti-inflammatory drugs consumed by children are well documented. Antibiotics have a potential risk for public health and the widespread of multi resistance of antibiotics. (Pfaffenbach, Tourinho and Bucaretchi, 2010) The use of herbal medicines for common childhood illnesses has been reported in Nigeria but its use in the management of colic has not been explored. About 85% of Nigerians are known to use and consult traditional medicine for healthcare, social and psychological benefits because of poverty and disillusionment with conventional medical care. Only a few of the herbal medicines in circulation in Nigeria are registered by the National Agency for Food and Drug Agency and Control (NAFDAC). The importance of traditional medicine in Nigerian healthcare has been recognized by the national government who set up a high profile committee to develop, promote and commercialize traditional medicine products. Efforts have also been made by the government to preserve

indigenous Nigerian medical knowledge by boosting research into traditional medicine. (Oshikoya and Senbanjo, 2010) Adolescents need to be reared with lot of patience, tact and affection even though maintaining discipline and setting limits on their behavior have their own role. Proper and early education regarding drugs will clear their misconceptions and myths regarding drugs abuse and lower their tendency towards experimenting new drugs on themselves. They will be enlightened about the systemic effects of drugs on body. School health program has not been much developed in India and school curriculum does not cater to the needs of imparting the knowledge of drugs of common use or commonly used drugs of minor ailments to any grade/class of students. Imparting knowledge about drugs will go in a long way to curb the menace of lying steating, truancy and juvenile delinquency. (Saini, 2010) OTC medicines, among children were a point of interest among researchers particularly in the 1990s. Earlier studies indicate that the improvement of information sources concerning self- medication is needed, not only for OTC medicines, but for CAMs as well. Research shows that therapeutic errors do sometimes happen when medicines are administered for children at home usual errors are connected with the dose, such as giving double the dose that has been recommended. Parents were found to feel safe in using CAMs for their child in this study and earlier, and to sometimes use them especially if they are worried about the adverse effects of conventional medicines. In addition, according to a qualitative study, parents that had given CAM to their child had less knowledge about the possible harmful effects of CAM than thenon-users of CAM. (Sallam et al., 2009)

Table 1.6: Factors related to self-medication in children who perform self-medication. (Moraes et al., 2011)

The great availability of products in the current days.
Quality of health care
Difficult access to health care services in poor countries
The state of health that a pharmaceutical agent may represent irresponsible publicity

Table 1.7: Drugs commonly used by children aged from 0-14 years. (Moraes et al., 2011)

Aspirin	Laxatives
Antacid	Local eye and skin treatment
Analgesics	Salbutamol
Anti-histamines	Non-steroidal topical anti-inflammatory agents
Cough suppressant	Vitamins or electrolyte supplements

1.23 Common diseases of children

1.23.1 Fever

Fever itself is not a disease. It is just a symptom of another disease. Fever happens when the body's internal "thermostat" raises the body temperature above its normal level. Hypothalamus a part of brain responsible for maintaining body temperature sometimes increase the temperature level higher the normal level due to various causes like physical & environmental reasons which is called fever. Fauci, Anthony (2008). A trigger of the fever, called a pyrogen, causes a release of prostaglandin E2(PGE2). PGE2 then in turn acts on the hypothalamus, which generates a systemic response back to the rest of the body, causing heat-creating effects to match a new temperature level.

1.23.2 Runny nose

A runny nose is the result of excess nasal mucus production, leading to watery nasal secretions that discharge from the nostrils or drip down into the throat. While a cold or the flu is often the culprit, a runny nose can also be the result of allergies.Runny nose is a common symptom of allergies (hay fever) or certain diseases, such as the common cold. It can be a side effect of crying, exposure to cold temperatures, cocaine abuse or withdrawal, such as from opioids like methadone. Saline nasal sprays and vasoconstrictor nasal sprays may also be used, but may become counterproductive after several days of use, causing rhinitis medicaments. Antihistamines may be used. (Aubrey, 2007)

1.23.3 Nasal congestion

Nasal congestion is the blockage of the nasal passages usually due to membranes lining the nose becoming swollen from inflamed blood vessels. It is also known as nasal blockage, nasal obstruction, blocked of nose, stuffy nose, or plugged nose. It may be caused by Allergies, Common cold, Hay fever, Rhinitis medicaments. Alpha-adrenergic agonists are the first treatment of choice. They relieve congestion by constricting the blood vessels in the nasal cavity, thus resulting in relieved symptoms. Examples include oxymetazoline and phenylephrine.

1.23.4 Sore throat

A sore throat refers to pain, itchiness, or irritation of the throat. You may have difficulty swallowing food and liquids, and the pain may get worse when you try to swallow. Throat pain is the primary symptom of a sore throat. It may caused by a dry throat, swollen glands in the neck, white patches on the tonsils, hoarseness.Acetaminophen, [Nonsteroidal anti-inflammatory drugs (NSAIDs)], Ibuprofen, such as Advil or Motrin, Naproxen, such Aspirin (also a nonsteroidal anti-inflammatory drug).

1.23.5 Skin wound or infection

Skin wounds may happen due to various reasons. It is not as much as dangerous like other diseases. In skin wounds the wounds place should be washed with clean water. If antibacterialslike ethanol, alam can be used it would be good. After the primary treatment one should consult a doctor if the case is severe.

1.23.6 Painful urination

Painful urination is any pain, discomfort, or burning sensation during urination. Painful urination is most often caused by an infection or inflammation somewhere in the urinary tract. For example it may be a:

- ✓ Bladder infection in an adult
- ✓ Bladder infection in a child
- ✓ Swelling and irritation of the tube that carries urine out of the body (urethra)

Causes of Painful urination includes bladder stones ,chlamydia ,cystitis (bladder infection), drugs, kidney infection, Kidney stones , prostatitis (prostate inflammation) ,sexually transmitted infections (STIs), soaps, perfumes and other personal care products, urethral stricture (narrowing of the urethra), urethritis (infection of the urethra),urinary tract infection (UTI), vaginitis (vaginal infection), yeast infection (vaginal).Antibiotics can treat UTIs, bacterial prostatitis, and treatable sexually transmitted infections.

1.23.7 Gingivitis

Gingivitis is a term used to describe inflammation of the gums. One's gums may be a bit red and bleed when you brush, but he may not notice anything. The warning signs of gingivitis are puffy gums, traces of blood on your toothbrush, or a change in the color of his gums, but it is not painful. The good news is gingivitis can be prevented and if started, it can be reversed. The overall cause of Gingivitis is dipotion of food in or around teeth which results in growing of microorganism in the teeth then makes several gum diseases. (Kistler et al., 2013)

Treatment for Gingivitis includes:

A number of medications can be used to treat gingivitis.

- Antibiotic mouthwash containing chlorhexidine can be used to disinfect the mouth.
- Time-release antiseptic chips containing chlorhexidine can be inserted into pockets after root planning.
- Antibiotic microspheres made with minocycline can be inserted in pockets after scaling and planning.
- Oral antibiotics can be used to treat persistent areas of gum inflammation.
- Doxycycline, an antibiotic, can help keep enzymes from causing tooth damage

  Surgery
- Flap surgery is a procedure where the gums are lifted back while plaque is removed. The gums are then sutured in place to fit snugly around the tooth.
- Bone and tissue grafts can be used where the teeth and jaw are too damaged to heal.

1.23.8 Pain and redness of tonsils

At the back of throat, two masses of tissue called tonsils act as filters, trapping germs that can otherwise enter in airways and cause infection. They also produce antibodies to fight infection.

But sometimes they themselves become infected. Tonsillitis is a painful inflammation or infection of the tonsils, the tissue masses located at the back of the throat. Overwhelmed by bacteria or viruses, they swell and become inflamed, a condition known as tonsillitis. Tonsillitis is common, especially in children. The condition can occur occasionally or recur frequently. To determine the cause, your doctor may perform a rapid strep test or throat swab culture. In these cases, antibiotics may be prescribed without performing a rapid strep test. If tests reveal bacteria, treatment will consist of antibiotics by mouth for 10 days.Although symptoms will likely improve within two or three days after starting the antibiotic to cure the infection.

1.24 Medication commonly used in Self-Medication

Some medicines are commonly used to self-medicate which has been reported. This included antibiotics. analgesics, vitamins, oral antibiotics, pain relievers, cough remedies, creams, antimicrobials among primary care patients, while for OTC drugs the commonly requested were for nervous system, analgesics, cough or cold medications. (Antonov, 1998)

A qualitative survey reported that parents in Mongolia used antibiotics such as chloramphenicol to treat child diarrhea and another study noted that 32–35% of families practiced self-injection at home. The present study suggests that caregivers in Ulaanbaatar commonly use non-prescribed antibiotics for children younger than 5 years of age. Some determinants of this practice were the child's age, caregivers' misconceptions about the efficacy of antibiotics for upper respiratory tract infections, caregivers' own experience with self-medication, and the availability of antibiotics at home. (Togoobaatar et al., 2010)

In another survey a random sample (n = 13,295, response rate 79.4%) of the Swedish population aged 16 years and older was interviewed about health, medication use and related matters, among other things. In all, 35% of the population used analgesics at least once during a two-week period, and analgesic use was more than 50% higher among women than men. Analgesic use was less common among those aged 45-64 years and 65-74 years than those 18-44, after controlling for all other variables. The study showed that self-perceived poor health and pain explain much analgesic use. Analgesic use is further explained by lifestyle, sleeping problems, and health care utilization. Marital status, educational level, socioeconomic status, social

network and working conditions were found to be of minor importance. (Antonov and Isacson, 1996)

In a study of United Arab Emirates prevalence of antibiotic use with and without a prescription was high (40 %). The pharmacy was the main source where the majority (slightly more than 90%) obtained antibiotics. The course of antibiotic was completed by larger number of respondents with (75.3%) than without (632.5%) prescriptions. Influenza, upper respiratory tract infection, skin conditions, gastrointestinal problems and urinary tract infection were the conditions for which antibiotics were used. The most commonly prescribed antibiotics were amoxicillin (42.1%), amoxicillin-clavulinic acid combination (40.9 %), and penicillin (6.8%). On the other hand, for self-medication respondents, the order was slightly different with amoxicillin-clavulinic acid combination (48.9 %), amoxicillin (27%) and penicillin (10.1%). Similar numbers of respondents obtained prescribed (93.2%) and self-used (92.1 %) antibiotics from pharmacy while the rest used antibiotics stored at home. Surprisingly, large numbers of both groups of students were aware of bacterial resistance associated with misuse of antibiotics. (Sharif, 2012) Of the 9281 participants, in Jordanian survey among 2133 (23%) were using antibiotics over the study period: 842 (39.5%) of them were self-medicating with antibiotics and 1291 had antibiotics prescribed for treatment. The analysis of questionnaire data showed that the main source of antibiotic supply were the previously prescribed antibiotics stored in the household (392) or purchased at retail pharmacies (370). Supplies by friends and relatives accounted for about 68 cases.

Table 1.8: List of drugs used for self-medication. (Bennadi, 2014)

Category	**Drugs**
Cough and cold	D-cold Total, Corex, Benadryl glycodin
Analgesics	Saridon, Disprin, Diclofenac, Nimesuide
Antipyretics	Calpol, Crocin
Antiseptics	Detol, Boroplus
Antibiotics	Ciprofloxacin, Norfloxacin, Amoxicillin, Cefadroxil
Others	DaburChawanprush

Analysis in 2005 shows that 10% of participants (n=315) self-reported taking one or more nonprescription medications in the past 2 weeks for a perceived cardiovascular health purpose. Among these individuals, prevalence of use of vitamin/mineral supplements, non-vitamin/ non-mineral supplements, and over-the-counter products for a cardiovascular purpose was 37.5%, 21.3%, and 54.6%, respectively. Popular perceived cardiovascular health (NONRX-CVHs) were aspirin (52.1%), vitamin E (24.4%), garlic (9.8%), and omega-3/fish oils/fatty acids (3.8%).NONRX-CVH users were older than general nonprescription users ($p<0.001$). Of 613 people using a prescription drug for cardiovascular reasons, 135 (22%) reported using one or more NONRX- CVH medications. (M. B. et al., 2006).Aspirin, acetaminophen and caffeine were the most frequently abused among chronic headache sufferers. Orthodox medications were preferred to traditional African medicines for most common symptoms. However, some studies in developing countries revealed that people prefer traditional African medicines for diarrhea, vomiting, cough and cold, rheumatic and neurological complaint. Among Hong Kong Chinese, Chinese tonic was the most frequently used traditional medicine for self-medication which was perceived as equally effective as western medicine. The most commonly used supplement among Americans were minerals, multivitamins, vitamin C, calcium, vitamin E and A while the remaining percentage were for herbal products, mega dose vitamins, protein and amino acid preparation. (Afolabi, 2008) Among market women surveyed in a sub-urban community in Nigeria, antipyretic analgesics, hematinic/vitamins, antibiotics, antimalarial and alternative or traditional medicines respectively were commonly consumed. In a European study of those presenting with acute illness, the most commonly used medications were analgesics and antipyretics and among pediatric presentations were antipyretics, analgesics, antitussives and antibiotics. In a community-based pharmacy study in Portugal, the main therapeutic groups used for self-medications were in the order: throat, cough, cold, stemmatological, laxative, analgesics and dermatological products respectively antibiotics and antimalarial for illness management and analgesics and antibiotics in dental outpatients from recent Nigerian studies; analgesics, cough, cold remedies, anti- allergies, vitamin and energy tonic were the commonest OTC used as revealed from a recent review of self-medication in India. (Bennadi, 2014)

1.25 Dangerous aspect of self-medication

It is very common in developing countries for people to developed distrust in going to doctors for treatment. This is not surprising considering the vast array of treatment which can be found at local facilities. It can vary from excellent to absolutely appalling. Educated people can easily fall into a bad habit in Africa of self-prescribing and self-treating; this is exacerbated by the ease at which they can get hold of prescription medications over the counter at the pharmacy without a prescription. This is an extremely dangerous practice. A large number of people when they fall ill don't consult a physician. They either consult a chemist and obtain medications or consult his friend or neighbor who may be having some medications left over from his previous illness. As people vary greatly in their sensitivity to drugs, and appropriate dose to one can be overdose to another and can lead to toxicity, a drug effective in one may cause allergy in other. While persons self-medicate, they won't consider this biological variability and other dangerous drug interactions. Self-medication becomes harmful when some diseases unknown to the patient gets suppressed for the time being. Some drug doses can vary from time to time and taking drugs safe at one time may cause harm at another time for the same person. (Goud, Kumar, and K, 2014)
However inappropriate self-medication may result in serious health hazards such as adverse drug reactions, drug dependence and increased resistance of pathogens. Self-Medication with antibiotics among students, termed, a silent epidemic. is a global problem. The consequences of inappropriate self-medication among healthcare professionals have severe implications including legal, ethical, health defects, negative impacts on patient and quality of health care delivery. Prior to any intervention for promoting rational antibiotic administration, it is prudent to determine the magnitude of SMA and the factors that contribute to this practice (Urmi et al., 2015). Many headache suffers do not receive any preventive treatment even though they might benefit from. In addition, in the case of very frequent headache excessive self-administration over a period of time might cause the discomfort to worsen and increase in frequency, causing a state of chronic headaches, dependence on the analgesics and organic toxicity all of which can jeopardize the effect of prophylactic condition. (Ferrari et al., 1996) To our knowledge, the occurrence of insomnia and its self-medication with alcohol has not been investigated simultaneously in alcoholic groups (4–6). Nevertheless, other studies provide useful frequency estimates of self-medication. Study reported that 62% of treated alcoholics believed

that alcohol helped them sleep. Likewise, another study found that 60% of 92 males in patients with alcoholism reported hypnotic use of alcohol. These self-medication rates are greater than rates reported for the general population (6% to 13%) and for people with initial insomnia (15% to 28%) Perhaps the highest rate of self-medication was reported for a group of 155 older women (85 or more years old) with symptomatic insomnia, of whom 70% used alcohol for sleep. (Brower et al., 2001) Although these medications are considered risk free and useful for the treatment of common health problems, their excessive use can also lead to serious side effects and unfavorable reactions. For instance, the therapy may be poorly suited for the illness in question, delay diagnosis and the beginning of effective therapy, increased inorganic risk(s) due to inadequate drug therapy or of unnecessary expense and drug interaction between prescription and non-prescription drug. The prevalence of side effects was associated with lack of knowledge about the drug prior to its usage. Insufficient curative treatment with chloroquine (CQ) for individuals who treat themselves for suspected malaria fever could result in resistance to Plasmodium falciparum the agent causing the ailment. Chronic CQ toxicity was important in the causation of heart block in Africa, CQ retinopathy and abnormal ophthalmological findings, cardiac arrhythmia. Stevens Johnson syndrome following self-medication with fansidar has been reported. (Afolabi, 2008) It is seen more for common health worries; one may take a medicine as he feels soreness in his throat. But there might be another medicine that can help him recover fast from the problem. Thus he may waste his money and also delay his recovery. People suffering from anxiety and depression are more prone to taking drugs that are dangerous. This observation is alarming because it leads to addiction and you all know what effects drugs and alcohol have on the body. Potential dangers can also result from using wrong creams and lotions without the consultation of the doctor. The creams and lotions come loaded with harmful chemicals that can harm the skin if it is sensitive or unsuitable to that particular ointment. (Sallam et al., 2009) The dangers of self-medication include

Table 1.9: Dangers of self-medication. (Sawalha, 2008)

Dangers	Remarks
Misleading the illness	A minor health issue which could be resolved easily with the doctor's advice may become a major problem over time. Symptoms may subside temporarily with self-medication but it would become difficult for a doctor to correctly diagnose and treat latter.
Habituation	One could become addicted to prescription drugs such as antacids, cough syrups and pain relievers.
Allergic Reaction	Some antibiotics such as penicillin or sulpha drugs can cause severe reactions in the body for some people. This could be fatal.
Insufficient dosage	Incorrect dosage of medicines will not cure and will prolong recovery. On the other hand, over dosage may damage liver, kidneys an d other organs. Indiscriminate use of antibiotics: these could over a long time lead to microbial resistance. Consequently, the antibiotic may become ineffective when taken in the future.
Risk of stroke	The most commonly misused medicines are painkillers. Analgesics can induce gastritis and can also increase risk of stroke by four times in patients in high blood pressure.
Drug interactions	Some herbal drugs and medicines may cause drug to drug interactions and adversely affect the body.
Self-medication by pregnant women	This could adversely affect the unborn child causing congenital anomalies and birth defects. Unlike other factors of self-care, self-medication involves the intake of drugs, which have the potential to be beneficial or harmful. Their improper use can have serious health implications. especially among children, the aged and in people with special physiological conditions such as pregnancy and lactation. The government and health authorities must ensure that only safe drugs are made available OTC. Consumers should be given adequate information about their safe use.

1.26 Self-medication responsibilities

This is the practice whereby individuals treat their ailments and conditions with medicines which are approved and available without prescription, and which are safe and effective when used as directed.

Responsible self-medication requires that:

1. Medicines used are of proven safety, quality and efficacy.

2. Medicines used are those indicated for conditions that are self-recognisable and for some chronic or recurrent conditions (following initial medical diagnosis). In all cases, these medicines should be specifically designed for the purpose, and will require appropriate dose and dosage forms.

Such products should be supported by information, which describes:

- How to take or use the medicines,
- Effects and possible side-effects,
- How the effects of the medicine should be monitored,
- Possible interactions,
- Precautions and warnings,
- Duration of use,
- When to seek professional advice.

1.27 Government and health professional outlook

Many national and international organizations have looked at how best to establish and structure national drug policies within their healthcare systems. As a starting point, one fundamental to keep in mind was articulated at an International Conference on Primary Health Care, held in Alma-Ata in 1978:

In line with a philosophy of individual participation and empowerment, the World Health Organization has stated that responsible self-medication can:

- Help prevent and treat symptoms and ailments that do not require medical consultation;
- Reduce the increasing pressure on medical services for the relief of minor ailments, especially when financial and human resources are limited;

- Increase the availability of health care to populations living in rural or remote areas where access to medical advice may be difficult; and
- Enable patients to control their own chronic conditions.

As the most accessible form of health care, self-medication fills a series of valuable and sometimes crucial functions for individuals and healthcare systems. That healthcare systems as well as individuals benefit from self-medication emphasizes the need for clear policies by national governments. Those policies should recognize the positive role played by products specifically intended for self-medication and should meet their citizens' desires to take an active role in their health.

1.28 Regulations

- Classifying products (determined on the basis of safety, efficacy and local need, and subject to regular review of the classifications and regulations);
- Ensuring quality assurance of all medicinal products (for example, by supporting and using known reliable sources of supply only);
- Ensuring that protocols and performance standards (with standardized measures) are followed;
- Ensuring that pharmacy premises reflect the professional nature of pharmacy; see IPF, 1996);
- Ensuring that supervision and training (whether this be of the pharmacist, pharmacy technician or counter staff) are adequate;
- Contributing to enforcement and implementation of laws and regulations in cooperation with national authorities;
- Helping to ensure controls on advertising of medicinal products are enforced.

1.29 The role of international organizations

- Process for development of protocols and methodologies (inter-country studies involving patient and treatment outcomes);
- Development and testing of guidelines;
- Dissemination of materials;

- Exchange of information and experiences;
- Operational research for evaluation of changing self-medication practices.

1.30 The role of national organizations

- Adaptation of self-medication protocols, reference materials and training activities to meet local needs;
- Implementation of training and support activities for organization members;
- Participation in curriculum development for training of pharmacists and paraprofessionals' training;
- Encouraging members to participate in teaching in academic and practice settings;
- Monitoring professional performance in response to self-medication needs of the public, according to national benchmarks, and including recognition of superior performance;
- Providing input for self-care and self-medication policies established by governments and policy-makers;
- Collaboration with pharmacy students and recent graduates regarding research aspects of self-care and self-medication; educating the public about self-medication in collaboration with consumer groups, self-medication industry and other stakeholders based on good standards of practice.

1.31 Formation of partnerships national pharmaceutical associations, the self-medication industry and consumer organizations

Encouraging the self-medication industry and related organizations to contribute to publication of high-quality information materials on self-medication, and contributing to training of pharmacy staff on self-medication issues;

- Seeking financial support from governments and third-party payers for self-care and self-medication initiatives;

Forming partnership among national pharmaceutical associations, the self-medication industry and consumer organizations to identify potential areas of collaboration, agreeing upon goals and joint financing.

1.32 Antibiotics

Antibiotics or antibacterials are a type of antimicrobial used in the treatment and prevention of bacterial infection. They may either kill or inhibit the growth of bacteria.

The Greek word *anti* means "against", and the Greek word *bios* means "life" (bacteria are life forms). [8]Before bacteria can multiply and cause symptoms, the body's immune system can usually destroy them. We have special white blood cells that attack harmful bacteria. Even if symptoms do occur, our immune system can usually cope and fight off the infection. There are occasions, however, when it is all too much and some help is needed from antibiotics.Penicillin was the first antibiotic. Ampicillin, amoxicillin and benzylpenicilllin are other antibiotics of Penicillin group widely used today to treat a variety of infections - these antibiotics have been around for a long time. Antibiotics are effective in bacterial infections not in viral infections. In 1928, Alexander Fleming identified penicillin, the first chemical compound with antibiotic properties. Fleming was working on a culture of disease-causing bacteria when he noticed the spores of little green mold in one of his culture plates. He observed that the presence of the mold killed or prevented the growth of the bacteria. This had brought revolution in medical science saved many lives .There is several dosages form like

1. Oral antibiotics – tablets, pills and capsules or a liquid can be drunk (most common).
2. Topical antibiotic – creams, lotions, sprays or drops, which are often used to treat skin infections.
3. Injections of antibiotics – these can be given as an injection or infusion through a drip directly into the blood or muscle, and are usually reserved for more serious infections.

1.33Types of antibiotics

There are now hundreds of different types of antibiotics, but most of them can be broadly classified into six groups. These are outlined below.

- Penicillin – widely used to treat a variety of infections, including skin infections, chest infections and urinary tract infections. (Garrod, 1960a and Garrod, 1960b)
- Cephalosporins – can be used to treat a wide range of infections including more serious infections, such as septicaemia and meningitis.

- Aminoglycosides – tend to only be used to treat very serious illnesses such as septicaemia, as they can cause serious side effects, including hearing loss and kidney damage; they break down quickly inside the digestive system, so they have to be given by injection, but are also used as drops for some ear or eye infections. (Finberg et al., 2004)
- Tetracyclines – can be used to treat a wide range of infections; commonly used to treat moderate to severe acne and rosacea, which causes flushing of the skin and spots. (Harvey and Champe, 2008)
- Macrolides – can be particularly useful for treating lung and chest infections; can also be a useful alternative for people with a penicillin allergy or to treat penicillin-resistant strains of bacteria. (Giguère, Prescott, and Dowling, no date)
- Fluoroquinolones – broad-spectrum antibiotics that can be used to treat a wide range of infections. (MacDougall et al., 2005)

1.34 What is antibiotic resistance?

Antibiotic resistance occurs when an antibiotic has lost its ability to effectively control or kill bacterial growth; in other words, the bacteria are "resistant" and continue to multiply in the presence of therapeutic levels of an antibiotic.

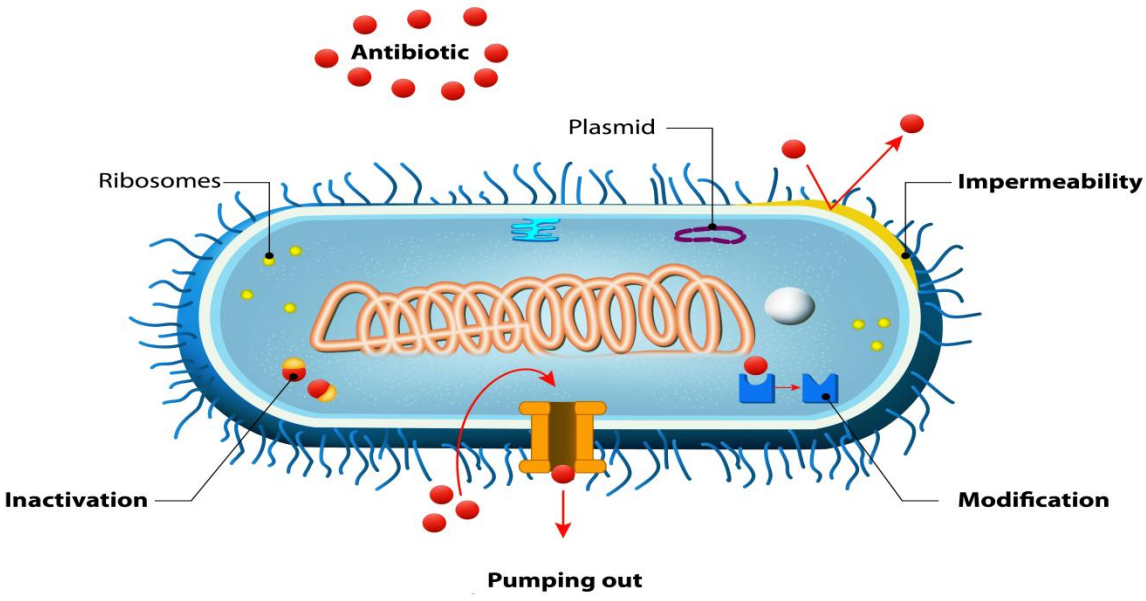

Figure1.2: Antibiotic resistance mechanisms. (Juignet, Farah, and Kadam, 2016)

1.35 How does antibiotic resistance spread?

Genetically, antibiotic resistance spreads through bacteria populations both "vertically," when new generations inherit antibiotic resistance genes, and "horizontally," when bacteria share or exchange sections of genetic material with other bacteria. Horizontal gene transfer can even occur between different bacterial species. Environmentally, antibiotic resistance spreads as bacteria themselves move from place to place; bacteria can travel via airplane, water and wind. People can pass the resistant bacteria to others; for example, by coughing or contact with unwashed hands.

The introduction of antimicrobials transformed human and animal health systems by revolutionizing our weaponry in the war against infectious diseases, resulting in improved survivability for both humans and their domestic animals. However, this health triumph was immediately ebbed by the subsequent realization that bacterial populations could quickly modify themselves to resist antimicrobials, propagate these resistance traits, and even share resistance genes with other contemporary bacteria within their environment. Such abilities have seriously compromised the usefulness of antibiotics in the war against microbes and warn of a future when antimicrobials may have very limited usefulness to control bacterial infection. Antimicrobial resistance is the ability of a microorganism to survive and multiply in the presence of an antimicrobial agent that would normally inhibit or kill this particular kind of organism. Antimicrobial resistance is just one of the many adaptive traits that resilient bacterial subpopulations may possess or acquire, enabling them to out-compete and out-survive their microbial neighbors and overcome host strategies aimed against them. This phenomenon is nearly as old as the discovery of antimicrobials themselves, having been described by pioneers like Ehrlich for trypanosomes8 and Fleming for staphylococci10. What is most alarming today is the rate at which antibiotic resistance often develops and how quickly it spreads across the globe and among different species of bacteria.

Furthermore, as a result of sequential, cumulative acquisition of resistance traits against different antibiotics, more bacterial pathogens withmultiple-drug resistance are being reported worldwide. As a consequence, many bacterial organisms, including major human and animal pathogens such as Mycobacterium and Salmonella species, have become resistant to antibiotics which were previously quite efficacious.

Table 1.10: Mechanisms of resistance against different antimicrobial classes. (Alekshun and Levy, 2007)

Antimicrobial class	Mechanism of Resistance	Specific means to achieve resistance	Examples
Beta-lactams Examples: Penicillin, Ampicillin, Mezlocillin, Peperacillin, Cefazolin, Cefotaxime, Ceftazidime, Aztreonam, Imipenem	Enzymatic destructtion	Destruction of beta-lactam rings by beta-lactamase enzymes. Then, the antibiotic will no longer have the ability to bind to PBP (Penicillin-binding protein), and interfere with cell wall synthesis.	Resistance of staphylococci to penicillin; Resistance of enterobacteriaceae to penicllins, cephalosporins and aztreonam
	Altered target	Mutational changes in original PBPs or acquisition of different PBPs will lead to inability of the antibiotic to bind to the PBP.	Resistance of staphylococci to methicillin and oxacillin
	Decreased uptake	Porin channel formation is decreased. Since this is where beta-lactams cross the outer membrane to reach the PBP of Gram-negative bacteria, a change in the number or character of these channels can reduce beta-lactam uptake.	Resistance of *Enterobacteraerogenes*, *Klebsiellapneumoniae and Pseudomonas aeruginosa* to imipenem
Glycopeptides Example: Ancomycin	Altered target	Alteration in the molecular structure of cell wall precursor components decreases binding of Vancomycin so that cell wall synthesis is able to continue.	Resistance of enterococci to Vancomycin

To be continued.

Aminoglyco-sides Examples: Gentamicin, Tobramycin, Amikacin, Netilmicin, Streptomycin, Kanamycin	Enzymatic modifica-tion	Modifying enzymes alter various sites on the Aminoglycoside molecule so that the ability of this drug to bind the ribosome and halt protein synthesis is greatly diminished or lost entirely.	Resistance of many Gram-positive and Gram negative bacteria to Aminoglycosides
	Decreased uptake	Change in number or character of porin channels (through which Aminoglycosides cross the outer membrane to reach the ribosomes of gram-negative bacteria) so that Aminoglycoside uptake is diminished.	Resistance of a variety of Gram-negative bacteria to Aminoglycosides
	Altered target	Modification of ribosomal proteins or of 16s rRNA reduces the ability of Aminoglycoside to successfully bind and inhibit protein synthesis	Resistance of *Mycobacterium* spp to streptomycin
Quinolones *Examples: Ciprofloxacin, Levofloxacin, Norfloxacin, Lomefloxacin*	Decreased uptake	Alterations in the outer membrane diminishes uptake of drug and/or activation of an "efflux" pump that removes Quinolones before intracellular concentration is sufficient for inhibiting DNA metabolism.	Resistance of Gram negative and staphylococci (efflux mechanism only) to various Quinolones
	Altered target	Changes in DNA gyrase subunits decrease the ability of Quinolones to bind this enzyme and interfere with DNA processes	Gram negative and Gram positive resistance to various Quinolones

To survive in the presence of an antibiotic, bacterial organisms must be able to disrupt one or more of the essential steps required for the effective action of the antimicrobial agent.

The intended modes of action of antibiotics may be counter-acted by bacterial organisms via several different means. This may involve preventing antibiotic access into the bacterial cell or perhaps removal or even degradation of the active component of the antimicrobial agent. No single mechanism of resistance is considered responsible for the observed resistance in a bacterial organism. In fact, several different mechanisms may work together to confer resistance to a single antimicrobial agent.

Resistance is 2 types:

A. Intrinsic resistance

B. Acquired resistance

1.36.1 Intrinsic resistance

Intrinsic resistance is the innate ability of a bacterial species to resist activity of a particular antimicrobial agent through its inherent structural or functional characteristics, which allow tolerance of a particular drug or antimicrobial class. This can also be called "insensitivity" since it occurs in organisms that have never been susceptible to that particular drug due to lack of affinity of the drug for the bacterial target.

1.36.1.1 Preventing access

Antimicrobial compounds almost always require access into the bacterial cell to reach their target site where they can interfere with the normal function of the bacterial organism. Porin channels are the passageways by which these antibiotics would normally cross the bacterial outer membrane. Some bacteria protect themselves by prohibiting these antimicrobial compounds from entering past their cell walls. For example, a variety of Gram-negative bacteria reduce the uptake of certain antibiotics, such as Aminoglycosides and beta lactams, by modifying the cell membrane porin channel frequency, size, and selectivity. Prohibiting entry in this manner will prevent these antimicrobials from reaching their intended targets that, for Aminoglycosides and beta lactams are the ribosomes and the penicillin-binding proteins (PBPs), respectively.

This strategy has been observed in:

- *Pseudomonas aeruginosa* against imipenem (a beta-lactam antibiotic)

- *Enterobacteraerogenes and Klebsiella* spp. against Imipenem

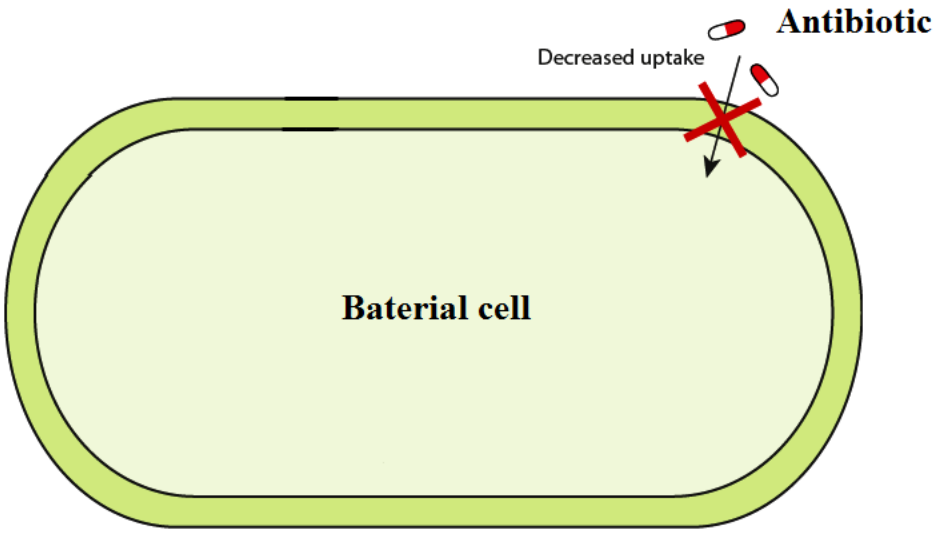

Figure1.3: Decreased permeability of antibiotics. (Resistance mechanisms in bacteria, no date)

- Vancomycin intermediate-resistant *S. aureus* or VISA strains with thickened cell wall trapping Vancomycin
- Many Gram-negative bacteria against Aminoglycosides
- Many Gram-negative bacteria against Quinolones

1.36.1.2 Eliminating antimicrobial agents from the cell with expulsion via efflux pumps.

To be effective, antimicrobial agents must also be present at a sufficiently high concentration within the bacterial cell. Some bacteria possess membrane proteins that act as an export or efflux pump for certain antimicrobials, extruding the antibiotic out of the cell as fast as it can enter. This results in low intracellular concentrations that are insufficient to elicit an effect.
Some efflux pumps selectively extrude specific antibiotics such as macrolides, lincosamides, streptogramins and tetracyclines, whereas others (referred to as multiple drug resistance pumps) expel a variety of structurally diverse anti-infectives with different modes of action.
This strategy has been observed in:

- E. coli and other enterobacteriaceae against Tetracyclines.
- Enterobacteriaceae against Chloramphenicol.

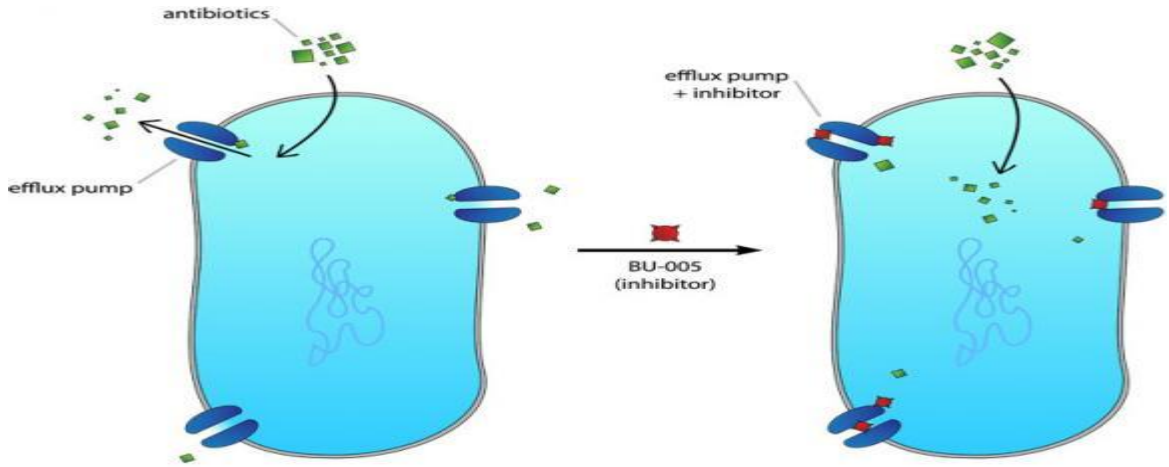

Figure1.4: Eliminating antimicrobial agents via efflux pumps. (Brown, 2011)

- Staphylococci against macrolides and streptogramins.
- *Staphylococcus aureus* and *Streptococcus pneumoniae* against fluoroquinolones.

1.36.1.3 Inactivation of antimicrobial agents via modification or degradation

Another means by which bacteria preserve themselves is by destroying the active component of the antimicrobial agent. A classic example is the hydrolytic deactivation of the beta-lactam ring in penicillins and cephalosporins by the bacterial enzyme called beta lactamase. The inactivated penicilloic acid will then be ineffective in binding to PBPs (penicllin binding proteins), thereby protecting the process of cell wall synthesis.

This strategy has also been observed in:

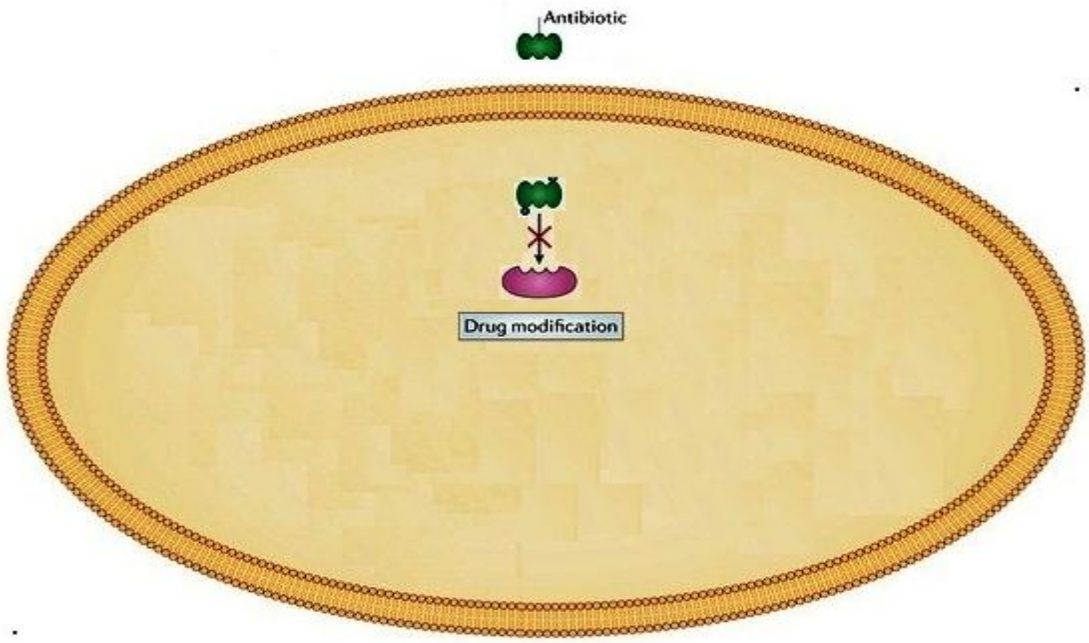

Figure1.5: Inactivation of antibiotic. (Wilson, 2013)

- Enterobacteriaceae against Chloramphenicol (acetylation).
- Gram negative and Gram positive bacteria against Aminoglycosides (phosphorylation, adenylation and acetylation).

1.36.1.4 Modification of the antimicrobial target

Some resistant bacteria evade antimicrobials by reprogramming or camouflaging critical target sites to avoid recognition. Therefore, in spite of the presence of an intact and active antimicrobial compound, no subsequent binding or inhibition will take place.
This strategy has been observed in:

- Staphylococci against Methicillin and other beta-lactams (Changes or acquisition of different PBPs that do not sufficiently bind beta-lactams to inhibit cell wall synthesis.)
- Enterococci against Vancomycin (alteration in cell wall precursor components to decrease binding of Vancomycin)

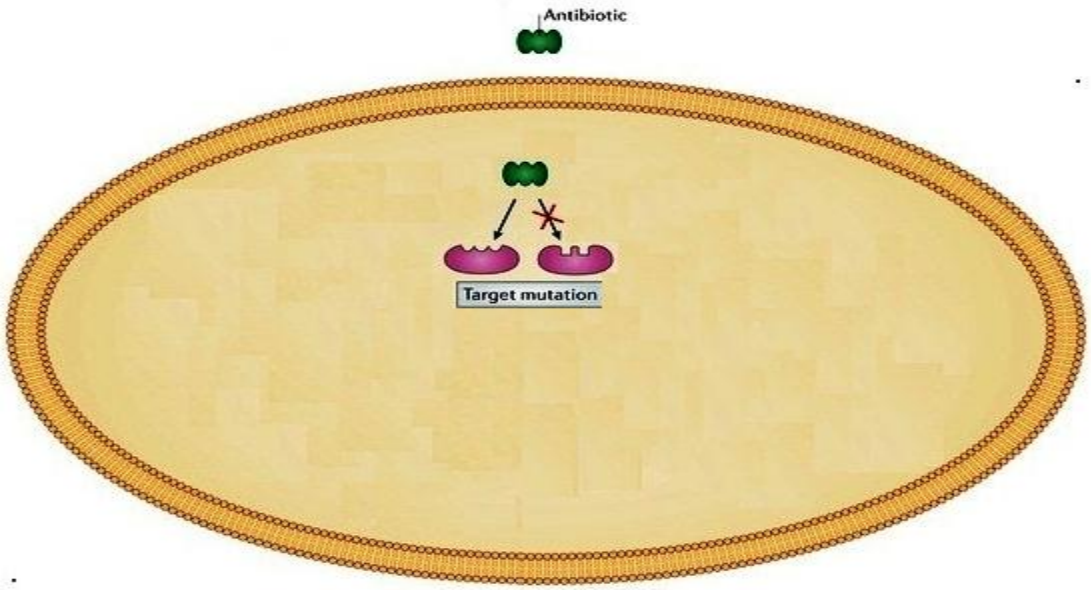

Figure1.6: Modification of target site of antibiotic. (Wilson, 2013)

- Mycobacterium spp. against streptomycin (modification of ribosomal proteins or of 16s rRNA)
- Mutations in RNA polymerase resulting in resistance to the Rifamycins;
- Mutations in DNA gyrase resulting in resistance to Quinolones.

Some Examples of Bacterial resistance due to target site modification :

- Alteration in penicillin-binding protein (PBPs) leading to reduced affinity of beta-lactam antibiotics (Methicillin-Resistant Staphylococcus *aureus*, *S. pneumoniae*, *Neisseria gonorrheae*, Group A streptococci, *Listeria monocytogenes*)
- Changes in peptidoglycan layer and cell wall thickness resulting to reduced activity of Vancomycin: Vancomycin-resistant *S.aureus*
- Changes in Vancomycin precursors reducing activity of Vancomycin: *enterococcus faecium* and *E. faecalis*
- Alterations in subunits of DNA gyrase reducing activity of Fluoroquinolones:
- Many Gram-negative bacteria
- Alteration in subunits of topoisomerase IV leading to reduced activity of Fluoroquinolones: many gram positive bacteria, particularly *S.auerus and Streptococcus pneumoniae*

- Changes in RNA polymerase leading to reduced activity of Rifampicin*: Mycobacterium tuberculosis*

1.36.2 Acquired resistance

Acquired resistance is said to occur when a particular microorganism obtains the ability to resist the activity of a particular antimicrobial agent to which it was previously susceptible. This can result from the mutation of genes involved in normal physiological processes and cellular structures, from the acquisition of foreign resistance genes or from a combination of these two mechanisms. Unlike intrinsic resistance, traits associated with acquired resistance are found only in some strains or subpopulations of each particular bacterial species. Laboratory methods are therefore needed to detect acquired resistance in bacterial species that are not intrinsically resistant. Acquired resistance results from successful gene change and/or exchange that may involve: mutation or horizontal gene transfer via transformation, transduction or conjugation.

Table 1.11: Examples of acquired resistance through mutation and horizontal gene transfer. (Alekshun and Levy, 2007)

Acquired resistance through	**Resistance observed**	**Mechanism involved**
Mutations	*Mycobacterium tuberculosis* resistance to Rifamycins	Point mutations in the Rifampin-binding region of *rpoB*
	Resistance of many clinical isolates to Luoroquinolones	Predominantly mutation of the Quinolone-resistance-determining-regiont (QRDR) of GyrA and ParC/GrlA
	E.coli, Hemophiliusinfluenzae resistance to Trimethoprim	Mutations in the chromosomal gene specifying Dihydrofolatereductase
Horizontal gene transfer	*Staphylococcus aureusresistance* to Methicillin (MRSA)	Via acquisition of mecA genes which is on a mobile genetic element called "staphylococcal cassette chromosome" (SCCmec) which codes for Penicllin binding proteins (PBPs) that are not sensitive to ß-lactam inhibition
	Many pathogenic bacteria against sulfonamides	Mediated by the horizontal transfer of foreign *fol*P genes or parts of it
	Enterococcus faeciumand E. faecalisresistance to Vancomycin	Via acquisition of one of two related gene clusters Van A and Van B, which code for enzymes that modify peptidoglycan precursor, reducing affinity to Vancomycin.

1.36.2.1 Mutation

A mutation is a spontaneous change in the DNA sequence within the gene that may lead to a change in the trait which it codes for. Any change in a single base pair may lead to a corresponding change in one or more of the amino acids for which it codes, which can then

change the enzyme or cell structure that consequently changes the affinity or effective activity of the targeted antimicrobials.

In prokaryotic genomes, mutations frequently occur due to base changes caused by exogenous agents, DNA polymerase errors, deletions, insertions and duplications. For prokaryotes, there is a constant rate of spontaneous mutation of about 0.0033 mutations per DNA replication that is relatively uniform for a diverse spectrum of organisms. The mutation rate for individual genes varies significantly among and within genes.

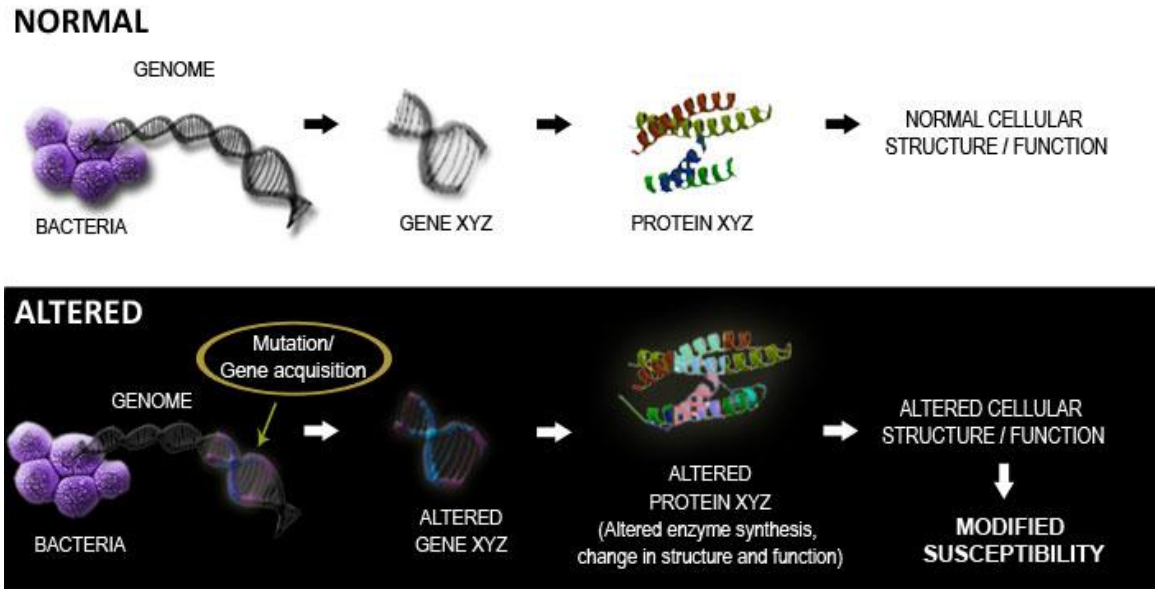

Figure1.7: Mutation of bacteria. (Mutation — Antimicrobial resistance learning site for veterinary students, 2011)

1.36.2.2 Horizontal gene transfer

Horizontal gene transfer, or the process of swapping genetic material between neighboring "contemporary" bacteria, is another means by which resistance can be acquired. Many of the antibiotic resistance genes are carried on plasmids, transposons or integrons that can act as vectors that transfer these genes to other members of the same bacterial species, as well as to bacteria in another genus or species. Horizontal gene transfer may occur via three main mechanisms: transformation, transduction or conjugation.

Transformation involves uptake of short fragments of naked DNA by naturally transformable bacteria. Transduction involves transfer of DNA from one bacterium into another via

bacteriophages. Conjugation involves transfer of \DNA via sexual pilus and requires cell –to-cell contact. DNA fragments that contain resistance genes from resistant donors can then make previously susceptible bacteria express resistance as coded by these newly acquired resistance genes.

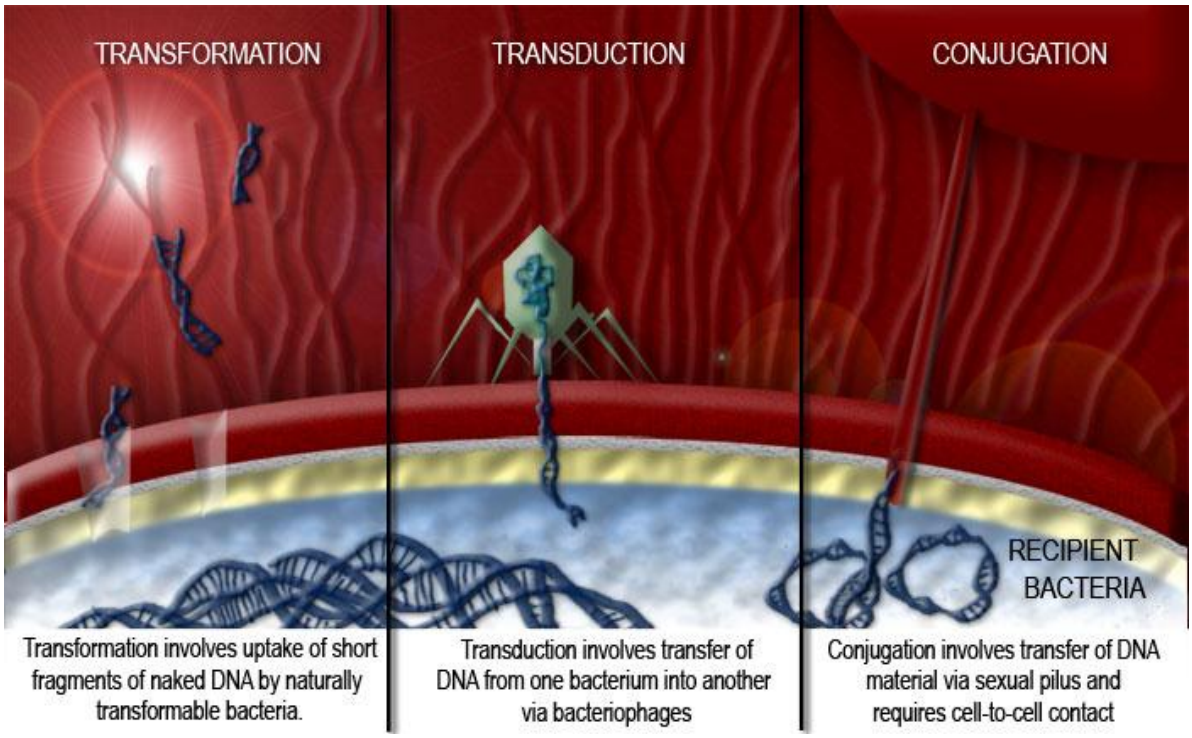

Figure1.8: Horizontal gene transfer in bacteria. (Mutation — Antimicrobial resistance learning site for veterinary students, 2011)

1.37 What is causing resistance?

The inappropriate use and prescribing of antibiotics is causing the development of resistance.

Inappropriate use includes:

- Not taking your antibiotics as prescribed.
- Skipping doses of antibiotics. (Pechère, 2001)
- Not taking antibiotics at regular intervals. (McCormack and Allan, 2012)
- Saving some for later.
- Sharing antibiotics with others.

Inappropriate prescribing includes:

- Unnecessary prescription of antibiotics.

- Unsuitable use of broad-spectrum antibiotics. (McNulty et al., 2007)
- Wrong selection of antibiotics.
- Inappropriate duration or dose of antibiotics.

1.38 Objective of the study

The aims and objectives of this study were to:

- Determining the prevalence and pattern of self-medication practices in Dhaka city.
- Determining parents‟ knowledge, attitude and practice of self-medication to their children’’.
- Correlating the factors such as the educational status and income level of the parents, type andseverity of tendency to self-medicate their children.
- Finding out parent perception of severity of their children’s disease condition.
- Estimating the educational status of the parents and income level of the family which are related to knowledge about the medicines and afford to buy medicines.
- Determining the prevalence of self-medication in children with various diseases by parents
- Finding out and understanding the reasons of self-medicating their children.

Chapter 2: Literature review

2. Literature review

There have been numerous studies on various aspects of self-medication of antibiotic and the knowledge about antibiotic use and resistance in different countries. A number of them are introduced below in order of years:

2.1Self-medication practices among parents in Italy

Luca Garofalo and Gabriella Di did a survey on the prevalence, the determinants, and the reasons of oral medication use without the prescription of a physician among a random sample of 672 parents of students attending randomly selected public schools in Italy. A total of 69.2% practiced self-medication at least once. The odds of having performed a self-medication were higher in females, in younger population, and in those who have had a health problem in the preceding year and were lower in respondents with a middle or lower school level of education. Among those reporting experience of self-medication, 53.4% have practiced at least once in the last year and this was more likely for those who have had a health problem. Non-steroidal anti-inflammatory drugs were more frequently used without a prescription in the last year. Two-thirds inappropriately self-medicated in the last year at least once. Of those who did not report a self-medication, 13.1% were willing to practice it. Females were more willing and those with a secondary school level of education less willing to practice self-medication. The frequency of oral self-medication quite high and in most cases inappropriate with a potential impact on the health status and educative programs are needed.(Luca Garofalo and Gabriella Di, 2015)

2.2 People's knowledge, attitude and practices about self-medication and its implications in ilala municipality, dares salaam

The prevalence of self- medication was found to be 68.8% and 71.5% for under five years old children and for persons aged 5 years and above respectively despite the negative attitude towards the practice. Community pharmacies were found to be the major source of medicines used for self-medication. Thus, 80% (12) of the males self -medicated the under 5 years old child while for females it was 71.6%. The AOR was 1.9 with CI of 1.76- 4.76. Thus, females are nearly 2 times more likely to self-medicate their children than males. It was also revealed that

there is lack of knowledge about self-medication and its implications with an association between age and knowledge about self-medication. The AOR was 1.8 with CI of 1.87-3.52; implying that older people are almost 2 times more likely to be knowledgeable about self-medication and its implications than the young ones. The study has also depicted an association between keeping medicines at home and age of the respondents. The AOR was 3.07 with CI of 1.29-7.29; implying that older people are 3 times more likely to keep medicines at home than the young ones.

2.3 A systematic review and meta-analysis of misuse of antibiotic therapies in the community

Kardas P showed in a study that mean compliance with antibiotics was 62.2% (95% confidence interval (CI), 56.4–68.0%) and mean use of leftover antibiotics was 28.6% (95% CI, 21.8–35.4%). Although variation in the methods resulted in substantial heterogeneity in the estimates, results were generally consistent by region and measurement technique. Patient education and simpler antibiotic regimens should be encouraged to promote responsible use of antibiotic therapy. (Kardas P, 2015)

2.4 Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates

Abasaeed A found that self-medication with antibiotics may increase the risk of inappropriate use and the selection of resistant bacteria. The objective of the study was to estimate the prevalence of self-medication with antibiotics in Abu Dhabi. Eight hundred sixty questionnaires were completed, with a respondent rate of 86%, consisting of 66% males and 34% females. Among the 860 participants, 485 (56%) reported the use of antibiotics within the last year. Amoxicillin was the antibiotic most commonly used (46.3%). The survey showed a significant association between antibiotics used and age group ($p<0.001$). Of the participants surveyed, 393 (46%) stated that they intentionally use antibiotics as self-medication without a medical consultation, a behavior that is significantly affected by educational levels ($p<0.001$). Two hundred forty-five (28%) participants stored antibiotics at home. These antibiotics were mostly acquired from community pharmacies without prescriptions ($p<0.001$). (Abasaeed A, 2009)

2.5 Self-medication among children and adolescents in Germany: results of the National Health Survey for Children and Adolescents (KiGGS)

Du Y, and KnopfH. found that during the previous week 25.2% of participants had used self-medication (17.0% used over-the-counter drugs and 9.9% other-sources drugs). Self-medication accounted for 38.5% of total medicine use and included all medication classes. These clustered among drugs acting on the respiratory system (32.1%), alimentary tract and metabolism (21.6%), skin (14.2%) and nervous system (11.3%), as well as homoeopathic preparations (8.6%). Vitamin preparations were most frequently used with a weighted user prevalence of 4.7% (5.2%vs. 4.1%, $P < 0.001$, boys vs. girls), followed by cough and cold medicines (CCMs) 4.4% (4.3 vs. 4.5, $P > 0.05$) and analgesics 3.7% (3.0% vs. 4.4%, $P < 0.001$, both boys vs. girls). Overall use of aspirin among children <12 years old was 0.3%; use of CCMs was substantial (4.4%), particularly among children <6 years old. Use of self-medication was closely related to older adolescent ages of between 14 and 17 years (odds ratio 1.16; 95% confidence interval 1.00, 1.33), children with a poor health status (1.29; 1.10, 1.52), with no immigration background (1.55; 1.33, 1.80), from families with a higher household income (1.23; 1.06, 1.42) and with mothers with a higher educational level (1.37; 1.19, 1.57). (Du Y, Knopf H., 2009)

2.6 Antibiotic use in a periurban community in Mexico: A household and drugstore survey

Calva J, Bojalil R. foundin developing countries, antibiotics are the most common drugs sold, and some data suggest that they are frequently misused. In order to describe the pattern of antibiotic use in a periurban community in Mexico City, 1659 randomly-selected households were visited and an interview with the housewife was carried out. Six local drugstores also were selected at random. Of 8279 individuals, 425 (5%) said that they had used at least one antimicrobial in the preceding 2 weeks and antibiotics were the majority (29%) of the drug sales. The main perceived reasons for drug use were acute respiratory tract ailments and gastroenteritis. Interviewees reported that antibiotic therapy was given in 27% of respiratory diseases and in 37% of all diarrheal episodes. The drugs most commonly reported were: penicillins, erythromycin, metronidazole, neomycin, cotrimoxazole and tetracyclines. While self-medication and drug purchases without medical prescription were common, the majority of antibiotics were

prescribed by a physician. Approximately two thirds of individuals using an antibiotic said they had used it for less than 5 days and 72% of the purchases were for insufficient quantities of drugs. (Calva J, Bojalil R., 1996)

2.7 Improving antibiotic use in low-income countries: an overview of evidence on determinants

Radyowijati A, Haak H. found that the inappropriate use of antibiotics has often been identified as a problem in effective health care delivery. High levels of antibiotics use, often clinically unnecessary, have led to a steady increase in drug resistance. Low-income countries, home to the majority of the world's population, are believed to have an important role in this phenomena. Effective intervention in these practices is often constrained by the paucity of information on determinants of antibiotic use. This review provides information from studies on the factors that influence the use of antibiotics by health providers, dispensers and community members in low-income countries. A proper understanding of these factors should be seen as a precondition for the development of more effective policies and programmes to address inappropriate antibiotic use. The review encompasses physicians' practices, the role of drug dispensers, and the influences on patterns of drug use across community members. Although a set of papers with useful research data was identified, probably the most important finding of the review was the scarcity of research.(Radyowijati A, Haak H. 2003)

2.8The use of antimicrobial drugs in Nagpur, India. A window on medical care in a developing country

Dua V, Kunin CM, White LV. Found that the study showed that drugs were dispensed without prescription despite prohibition by the Indian Pharmaceutical Act. Sales of antimicrobial drugs accounted for 17.5% of 511 purchases and 23.3% of expenditures for drugs. Proprietary brands of penicillins, co-trimoxazole and tetracyclines were dispensed most often (64.8%). The most common indications were upper respiratory, gastrointestinal and nonspecific complaints. The median number of units obtained was 5.0 (95% range 1–20), at a median cost of $0.50 per purchase, usually taken for less than five days. Repeat purchases were made without consulting a

physician. Almost two thirds of purchases (63.9%) were for males, mainly under the age of ten years. (Dua V, Kunin CM, White LV. 1994)

2.9 Antibiotic prescription and prevalence rate in the outpatient paediatric population: analysis of surveys published during 2000–2005

Rossignoli A, Clavenna A, Bonati M. that in the overall child and adolescent population (≤19 years), prevalence varied from 14 to 57% (mean 34%), and the prescription rate from 0.2 to 1.3 prescriptions/person per year. Relevant inter-country qualitative and quantitative differences in antibiotic prescribing were apparent, although these were observed in only a few countries: prevalence was higher in Italy and Canada (prevalence range 42–57%) and lower in the Netherlands and the United Kingdom (prevalence range 14–21%). Penicillins were the most prescribed antibiotics in all cases (40–70% of antibiotic prescriptions), followed by macrolides (16–45%), while cephalosporins accounted for a large proportion of the prescriptions in Italy (30–40%) and Canada, but were practically absent in North European prescriptions. (Rossignoli A, Clavenna A, Bonati M. 2007)

Chapter 3: Methodology

3.1 Type of Study

This is a questionnaire survey based study.

3.2 Study Population

In this study, parents were the study population, who self-medicated to their children for any diseases during last 6 months. The age group of children was 0-12 years.

3.3 Study design

This study involved a simple questionnaire survey based study. Total 36 questions were divided into three segments.

3.4 Study period

The study was conducted from December 2015 to May 2016.

3.5 Study Area

The study was conducted in three different areas in Bangladesh. And we collected data from Dhaka.

3.6 Sample size

There were 500 parents of children who participate in the survey. The question was filled up by father or mother or guardian of child.

3.7 Sampling Technique

In this study random sampling was followed.

3.8 Inclusion Criteria

The only inclusion criteria for the subjects were to be parent's of child administered antibiotics within last six months.

3.9 Exclusion Criteria

The exclusion criteria for the subjects were not being a parent's child.

3.10 Data Collection Tools

The tools used for the survey were a questionnaire.

3.10.1 Questionnaire

The questionnaire comprised of questions regarding demographic information, child's disease and medication usage information, parental perception and their understanding of antibiotic use, and status of parental understanding of antibiotic resistance.

3.11 Data Collection method

The data was collected through questionnaire that is formed in English language. It is a questionnaire consists of multiple choice type questions. The data was collected by both face to face interview and by questionnaire supply.

3.12 Data Analysis

After collecting, the data were checked and analyzed with the help of Microsoft Excel 2013. The result was shown in bar, pie and column chart and different variables were calculated in percentages.

3.13 Sample questionnaire

Bangladeshi parents' practice, knowledge and attitudes of self-medication to their children (Department of Pharmacy, East West University)

(All the questions asked are used for research purpose only and all the information is kept confidential)

Place of Interview: _____ Date of Survey: _____

Place a tick (√) on your choice of answer

1. Parent filling up the questionnaire: □ Father □ Mother

□ Other_____

2. Education level: □ Primary school □School certificate (class 10 equivalent) □ High school (class 12 equivalent) □ Non-university diploma □ Bachelors (university) □ Post graduate (university)

3. Gender of child: □ Male □ Female

4. Child (who is medicated) is: □ 1st born □ 2nd born □ 3rd born

□Others_____

5. Did the child suffer from any disease, disorder or injury in the past 6 months that required use of medication? □ Yes □ No

6. How did you respond when your child suffered from the disease, disorder or injury? □consulted a doctor and medicated according to prescription □ consulted a non-prescribing health care professional □ waited until the disease, disorder or injury relieved itself □ self-medicated

□Others _____

8. Name the drug prescribed for your child._____

9. Do you agree with the treatment schedule provided by the doctor? □ Yes □ No

10. Did you ask the doctor to prescribe any drugs for your child? □ Yes □ No

11. Did you ask the doctor to prescribe any specific drug for your child? □ Yes □ No

12. Do you think doctors prescribe drugs to children too easily? □ Yes □ No

13. Did you discontinue the drug therapy before the standard length of therapy? □ Yes □ No

15. Has your child suffered from any side effects due to the use of medication (such as allergy/ diarrhea/ pain etc)? □ Yes □ No (skip question 30)

Chapter 4: Result

4 Result

4.1 Demographic Information

4.1.1 Parent filling up the questionnaire

Table 4.1: Parent filling up the questionnaire.

	Number	%
Father	32	6.40
Mother	455	91
Other	13	2.60
Total	500	100

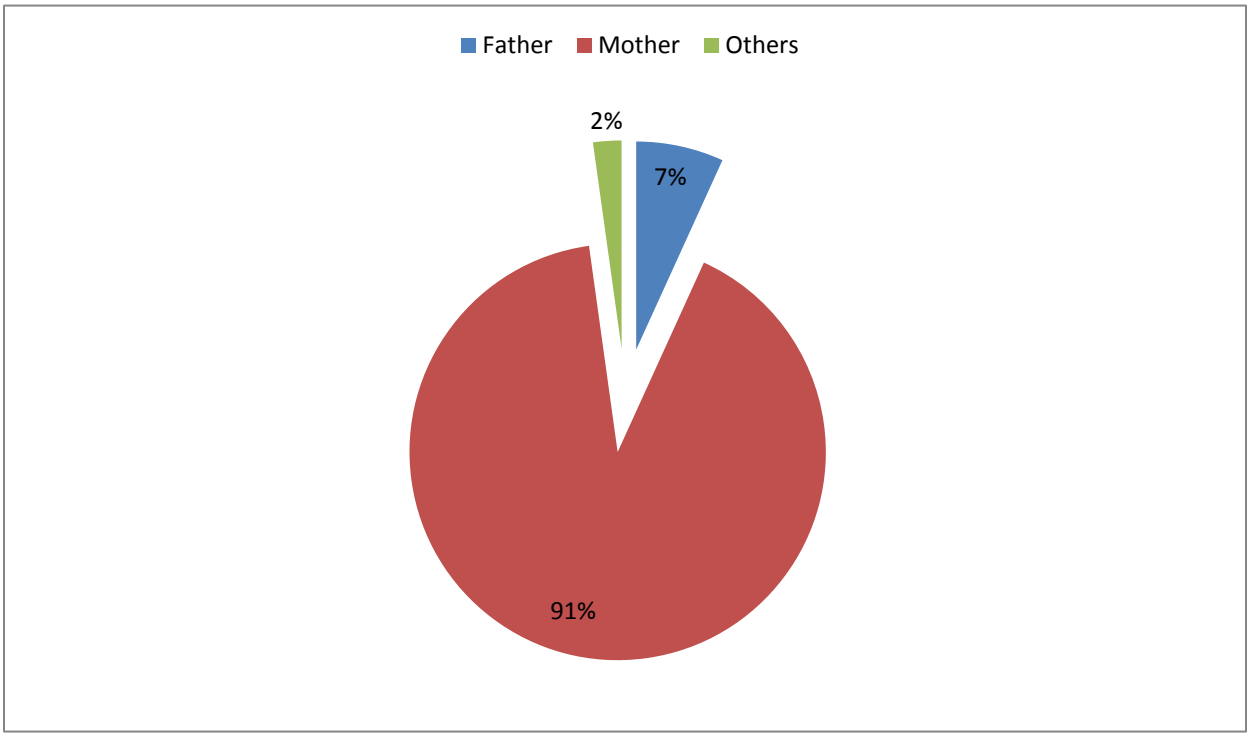

Figure 4.1: Parent filling up the questionnaire.

From the above pie chart we can see that majority of the respondents are mother, another respondents are other family members like elder brother, sisters or other relatives. This pie chart has formed against the question on medication provider.

4.1.2 Education level of parent filling up the questionnaire

Table 4.2: Education Level of parent filling up the questionnaire.

	Number	%
No education	213	42.60
Primary school	186	37.20
Class 10 equivalent	47	9.40
Class 12 equivalent	22	4.40
Non-university diploma	7	1.40
Bachelors	19	3.80
Post graduate	6	1.20
Total	500	100

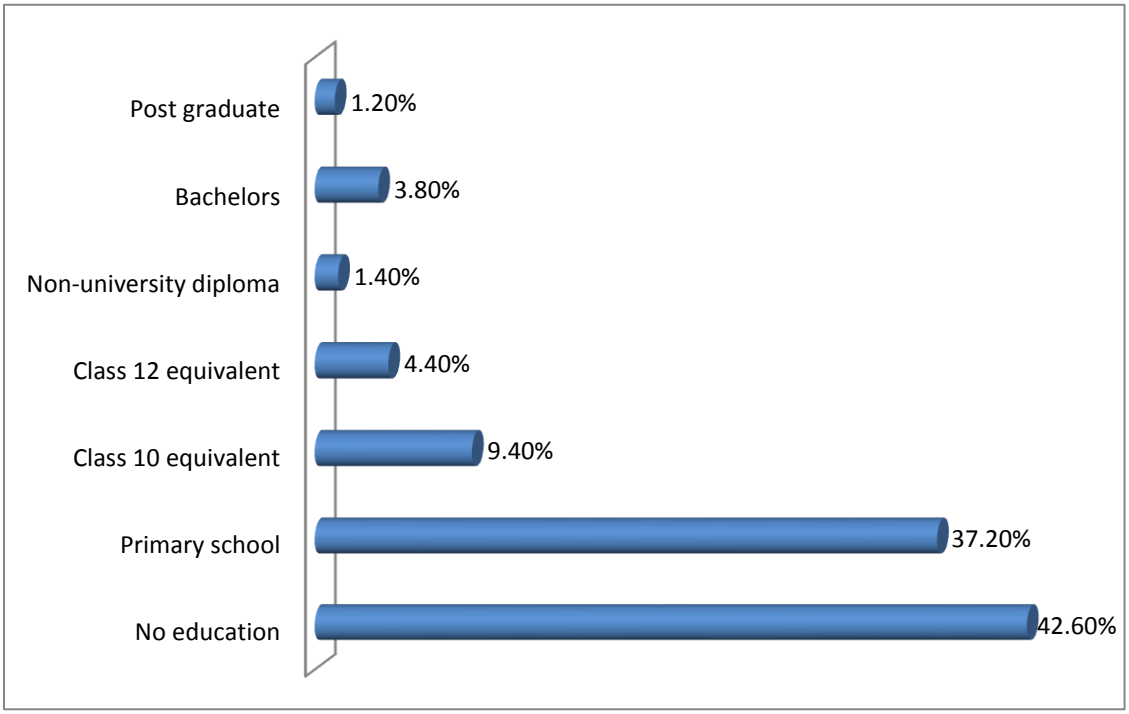

Figure 4.2: Education Level of parent filling up the questionnaire.

From the above figure we can see the education level of medication provider. We can see that most of the respondent's education level was below or up to class 12 equivalent. Very few respondents have higher educational qualification.

4.1.3 Occupation of parent filling up the questionnaire

Table 4.3: Occupation of Parent filling up the questionnaire.

	Number	%
Studing	2.60	16
Homemaker	82.40	412
Healthcare professional	0.00	0
Unemployed	0.00	0
Service holder	1.80	9
Business	4.60	23
Other	0.80	40
Total	500	100

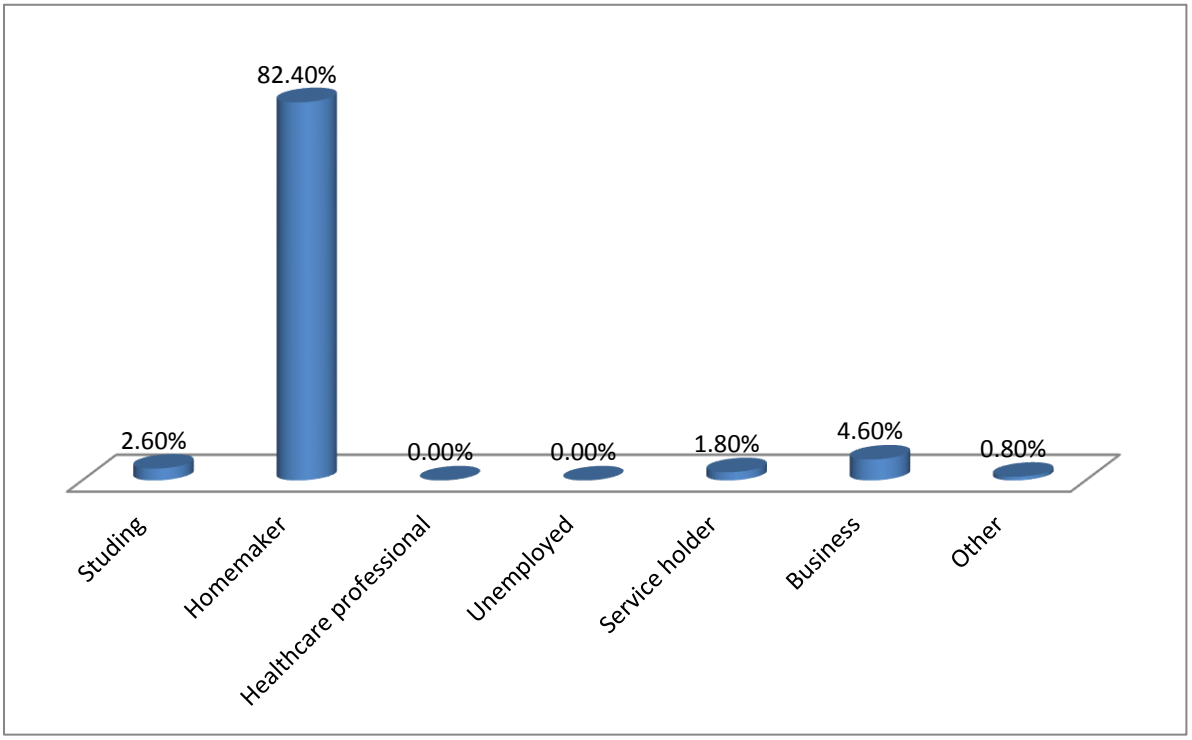

Figure 4.3: Occupation of Parent filling up the questionnaire.

Majority of the respondents are homemaker. Other respondents are service holder and businessman. No respondents are healthcare professionals like doctors, nurse or pharmacist.

4.1.4 Net household income (in BDT) of Parent filling up the questionnaire

Table 4.4: Net household income (in BDT) of Parent filling up the questionnaire.

	Number	%
<Tk 5000	12.20	61
Tk 5000-10,000	67.80	339
Tk 10,000-30,000	8.80	44
Tk 30,000 <	3.00	15
Do not want toDiscuss	7.80	39
Total	500	100

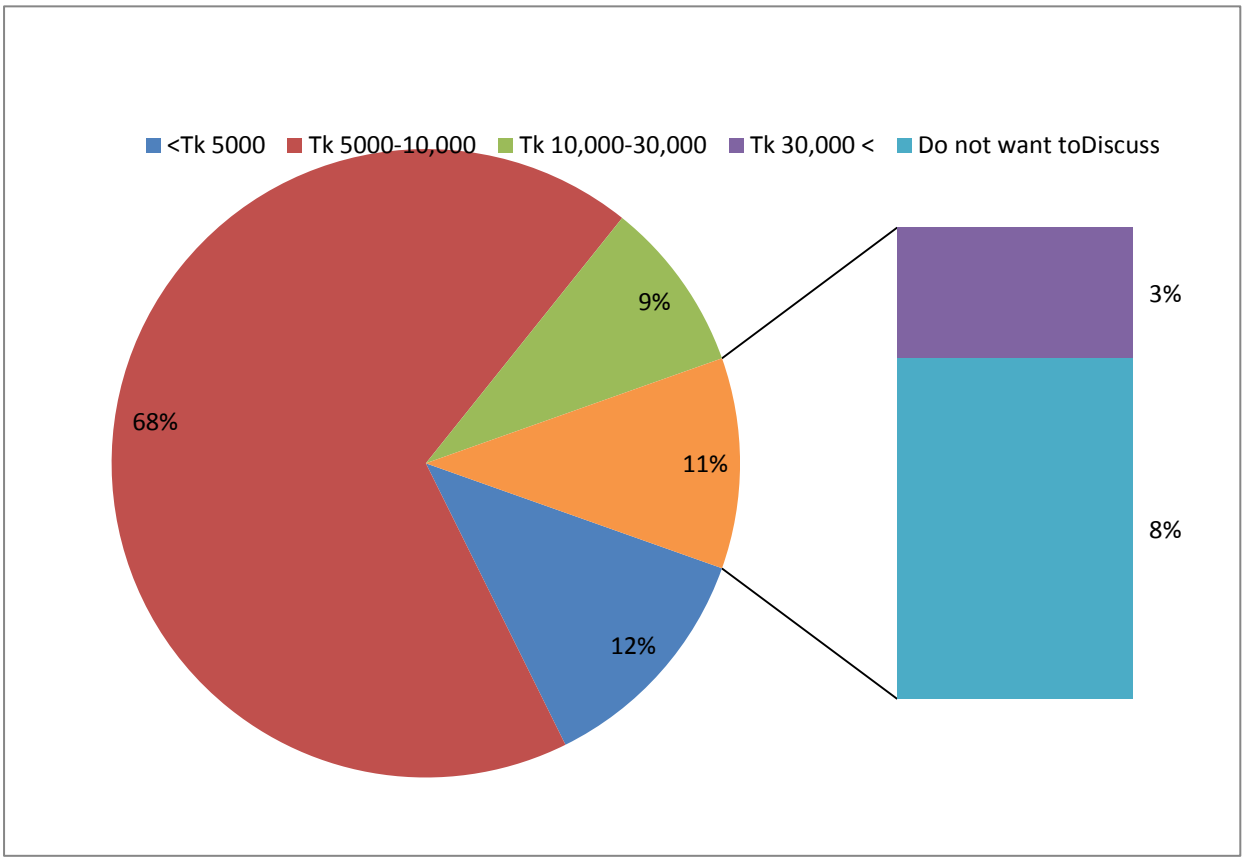

Figure 4.4: Net household income (in BDT) of Parent filling up the questionnaire.

Among 500 respondents, majority respondents family have net household income is in the range of Tk 5000-10,000. There are also few respondents whose net household income is below Tk 5000. There are many who did not want to reveal their income status.

4.1.5 Number of child in the family

Table 4.5: Number of child in the family of responders.

	Number	%
1	158	31.60
2	198	39.60
3	61	12.20
More	83	16.60
Total	500	100

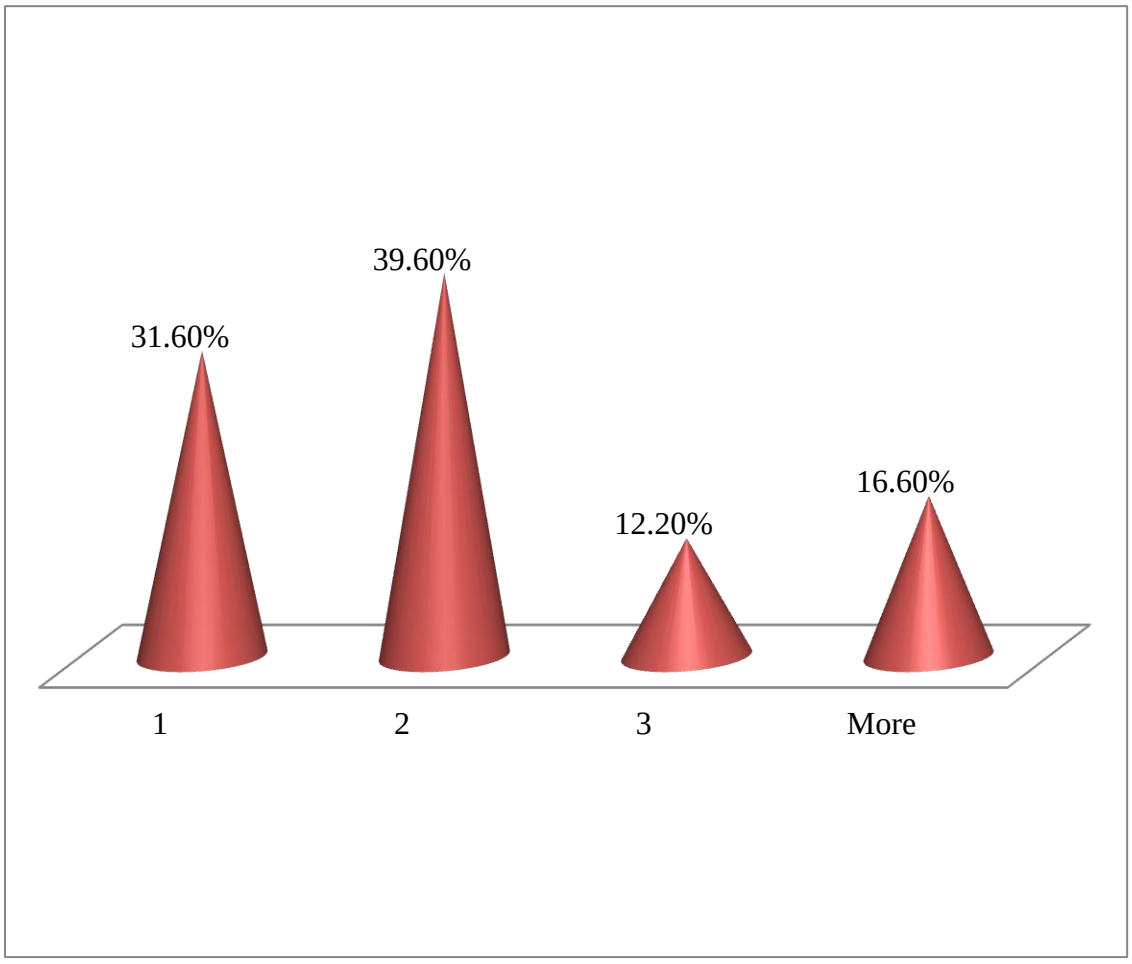

Figure 4.5: Number of child in the family of responders.

Among 500 respondents, almost half of the familieshave two children. Family have one,two and three more than three children are more than half of the responants families.

4.1.6 Health care degree of the Parent filling up the questionnaire

Table 4.6: Health care degree.

	Number	%
Yes	0	0
No	500	100
Total	500	100

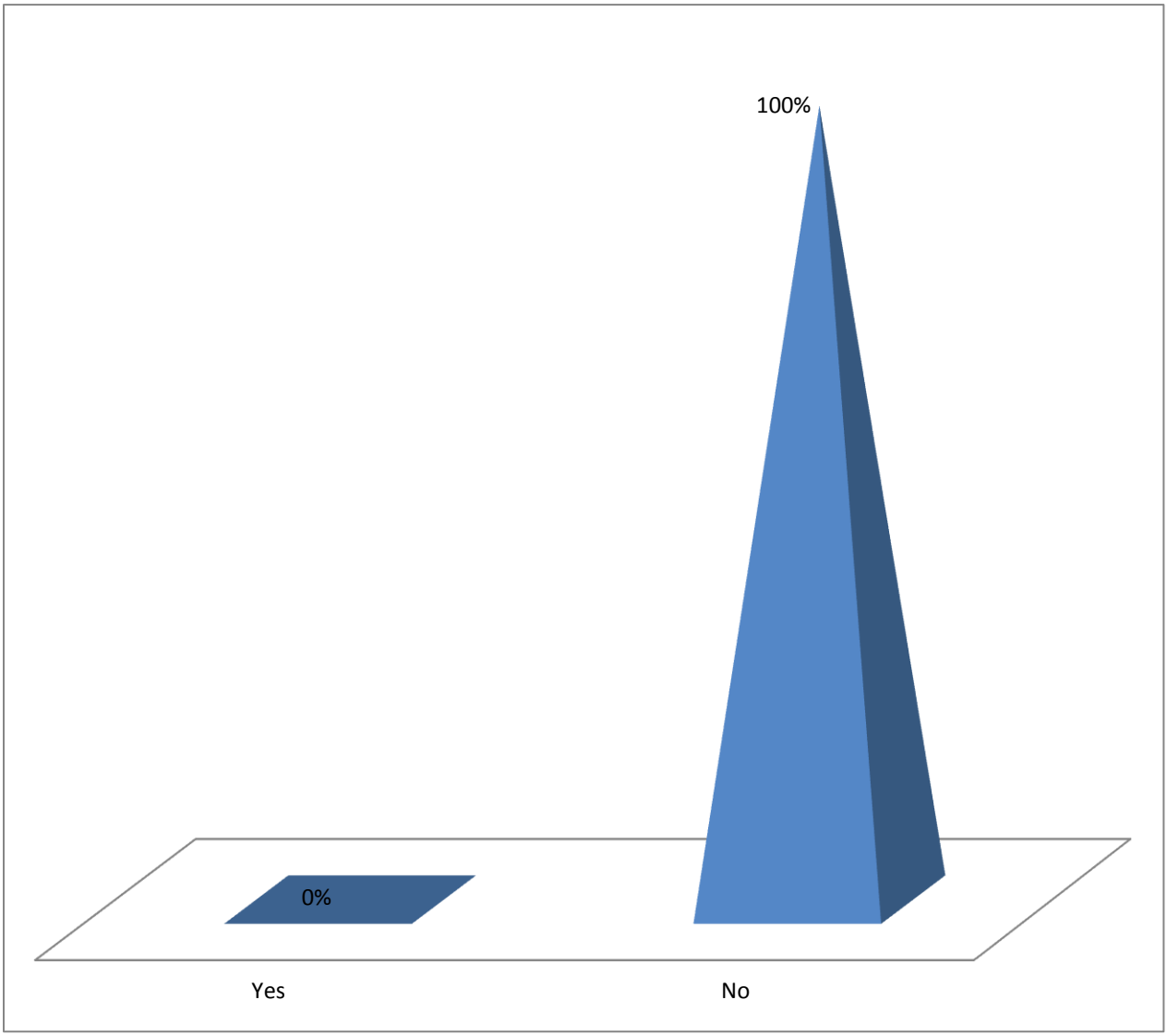

Figure 4.6: Health care degree.

Among 500 respondents, no respondents have any health care degree.

4.1.7 Age of child (who is medicated)

Table 4.7: Age of child (who is medicated).

	Number	%
< 3 Months	76	15.20
3 Months-1 Yr	102	20.40
1-5 Yrs	206	41.20
5-12 Yrs	116	23.20
Total	500	100

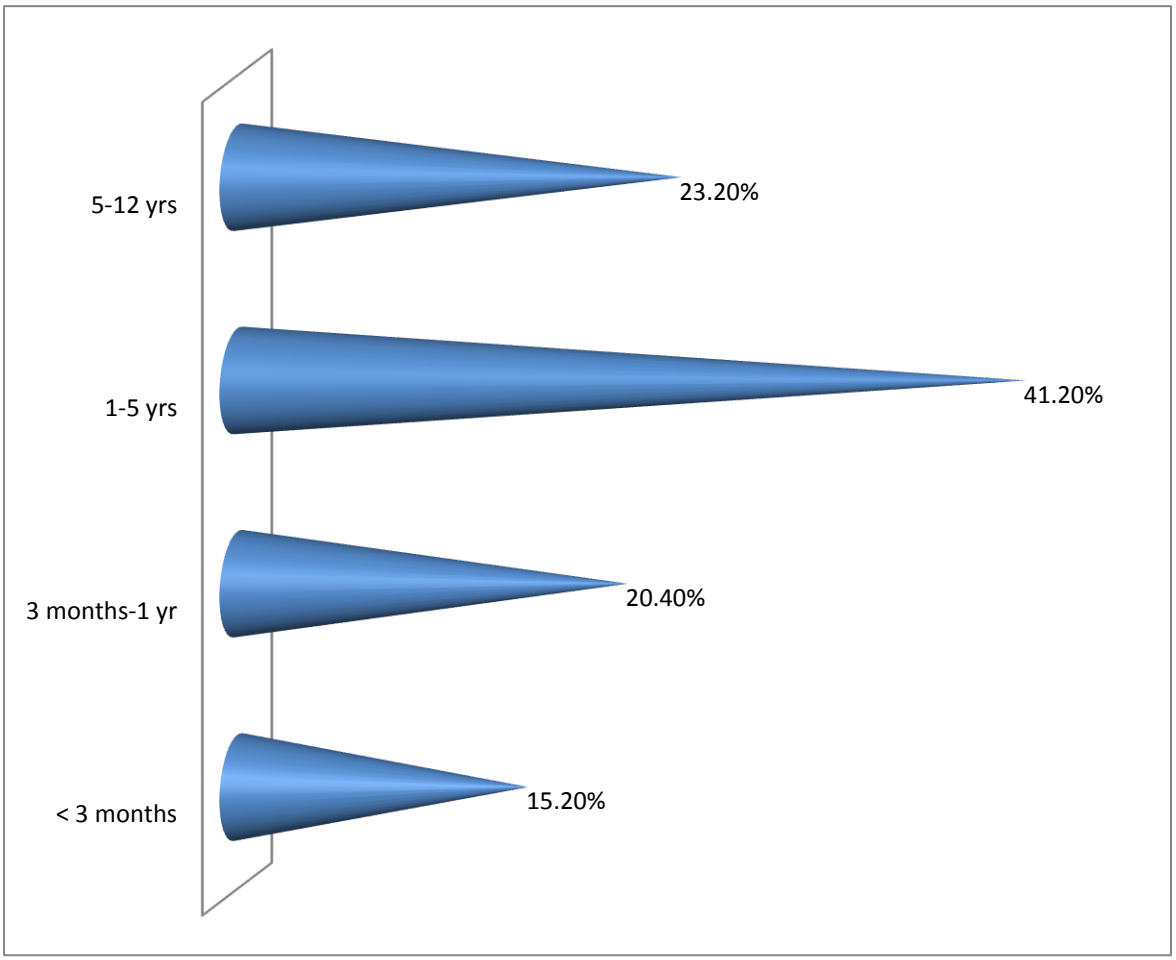

Figure 4.7:Age of child (who is medicated).

The above figure shows that highest number of child's age was in 1-5 years. Number of the childrendecreased as the order 5-12 years range,3 months-1 years range and< 3 months.

4.1.8 Gender of child

Table 4.8: Gender of child.

	Number	%
Male	267	53.40
Female	233	46.60
Total	500	100

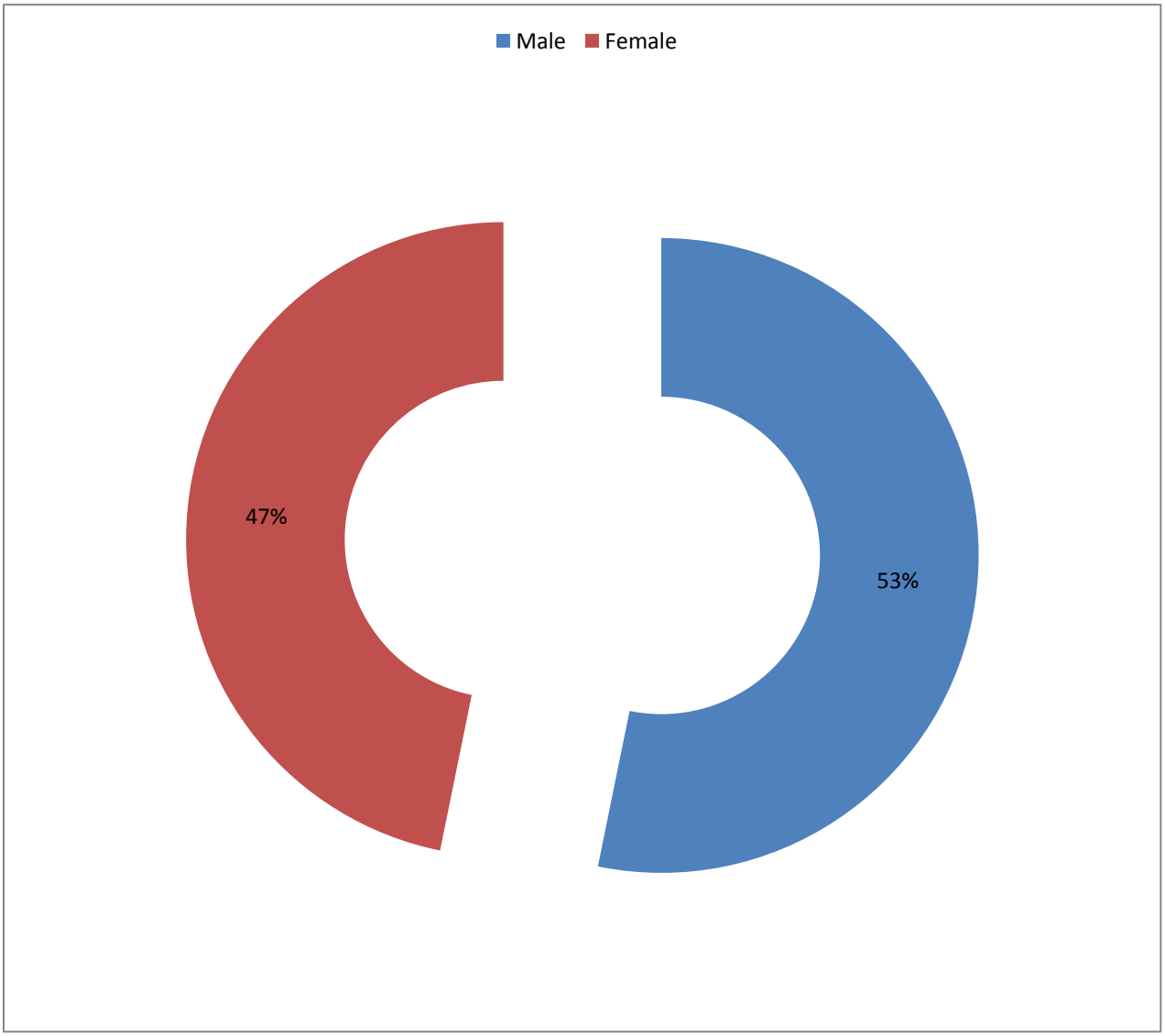

Figure 4.8: Gender of child.

There are almost equal percentages of male and female child who is medicated by their parents.

4.1.9 Child who is medicated

Table 4.9: Child who is medicated.

	Number	%
1st Born	258	51.20
2nd Born	188	37.60
3rd Born	41	8.20
More than 3	15	3.00
Total	500	100

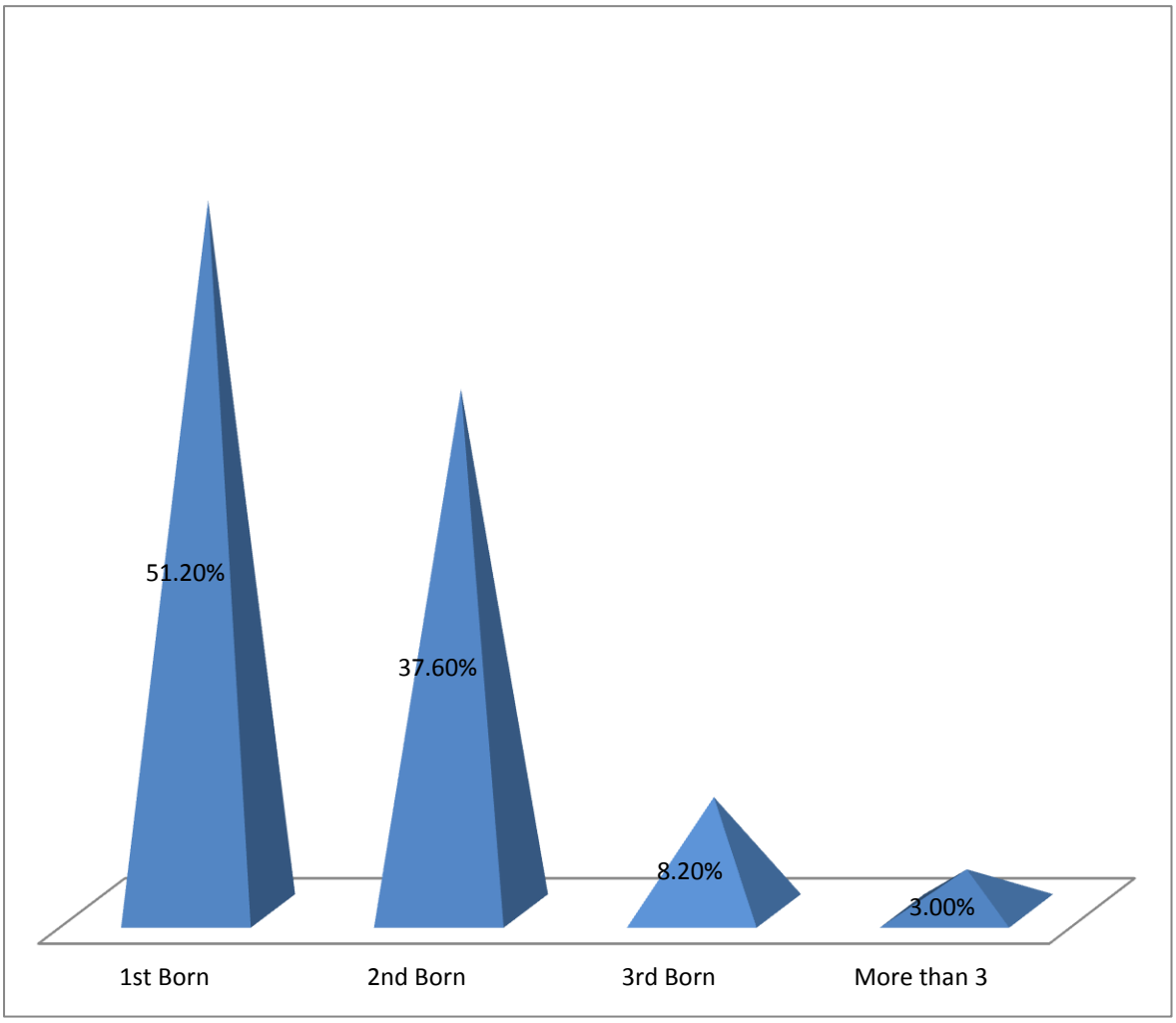

Figure 4.9: Child who is medicated.

Among all respondents, most of the children were either 1st or 2nd born who is medicated.

4.2 Child's disease during and medication usage information

4.2.1 Nature of diseases in child

Table 4.10: Sort of diseases.

	Number	%
Respiratory	31	6.20
Gastrointestinal	66	13.20
Fever	277	55.40
Common Cold	84	16.80
Total	500	100

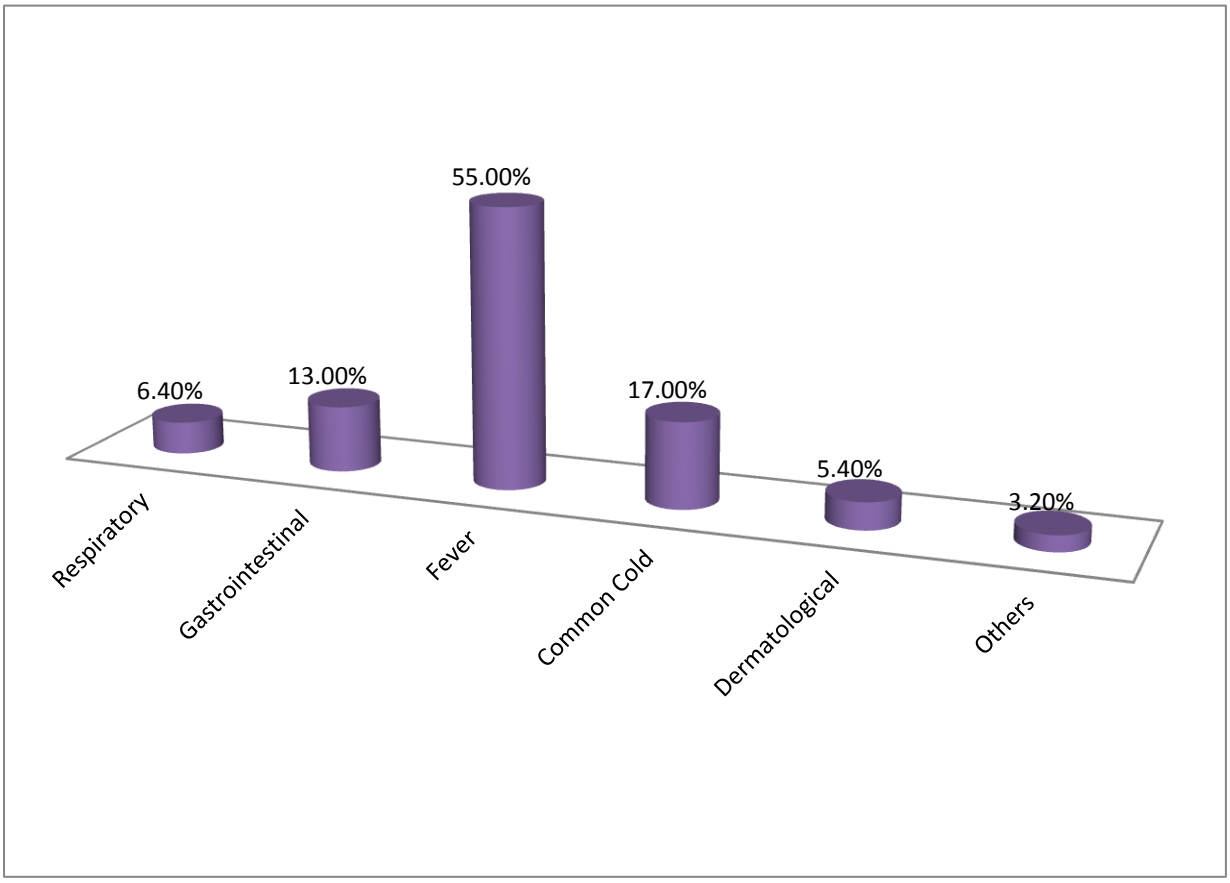

Figure 4.10: Sort of diseases.

Form this survey it has seen that majority of the child had suffered from fever during last 6 months. Common cold and gastrointestinal disease were two other important diseases.

4.2.2 Perception of parents about health status of child

Table 4.11: Perception of parents about health status of child.

	Number	%
Good	12	2.40
Fairly Good	84	16.80
Moderate	212	42.40
Fairly poor	124	24.80
Poor	68	13.60
Total	500	100

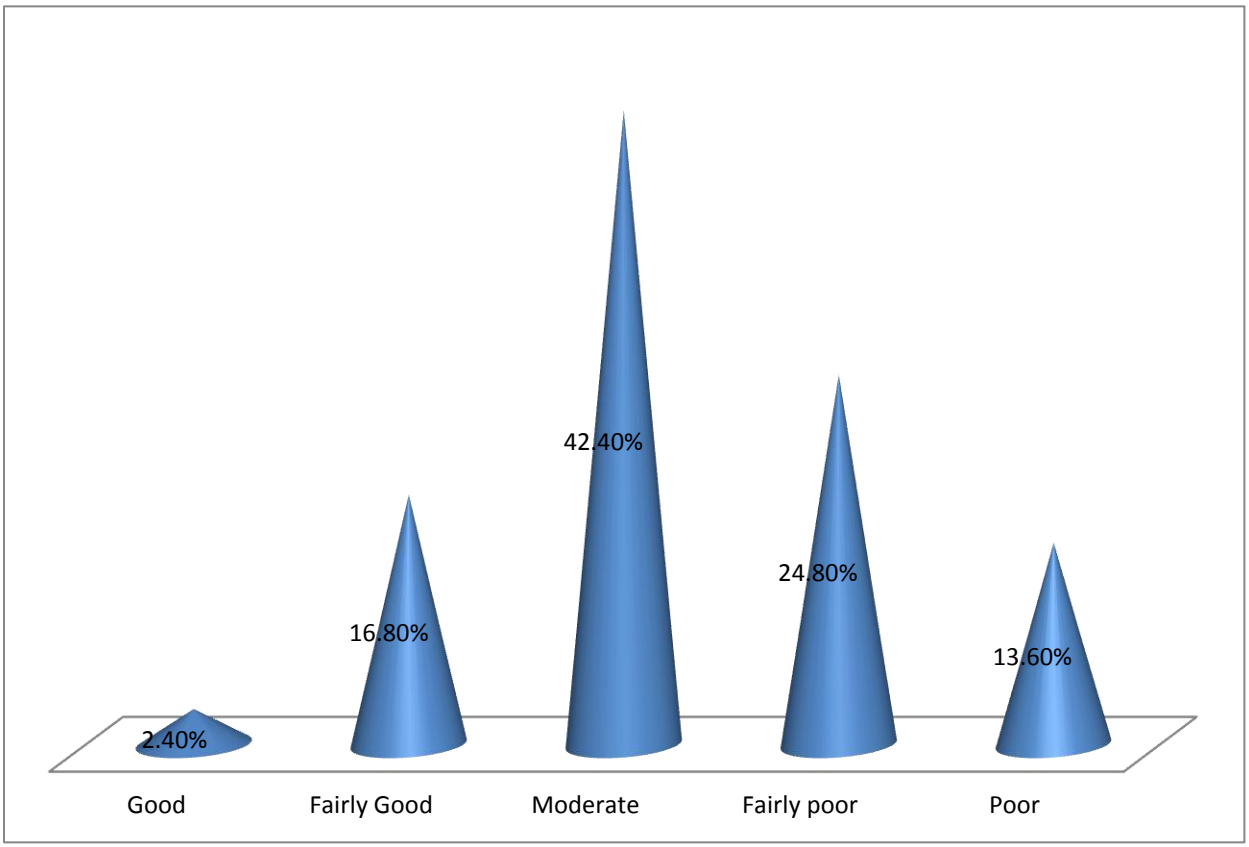

Figure 4.11: Perception of parents about health status of child.

Form this study it is seen that all the children suffered from various diseases during last 6 months but almost majority of the parents thought their child's health status was moderate. About one fourth of them though condition as fairly poor.

4.3 Parental perception and understanding of drug use

4.3.1 Response of parents when child suffered from disease

Table 4.12: Response of parents when child suffered from disease.

	Number	%
Consult a doctor and maintain prescription	202	40.40
Consulted a non prescribing health care professional	212	42.40
Waited until disease relieved itself	0	0.00
Self-medicated	71	14.20
Others	15	3.00
Total	500	100

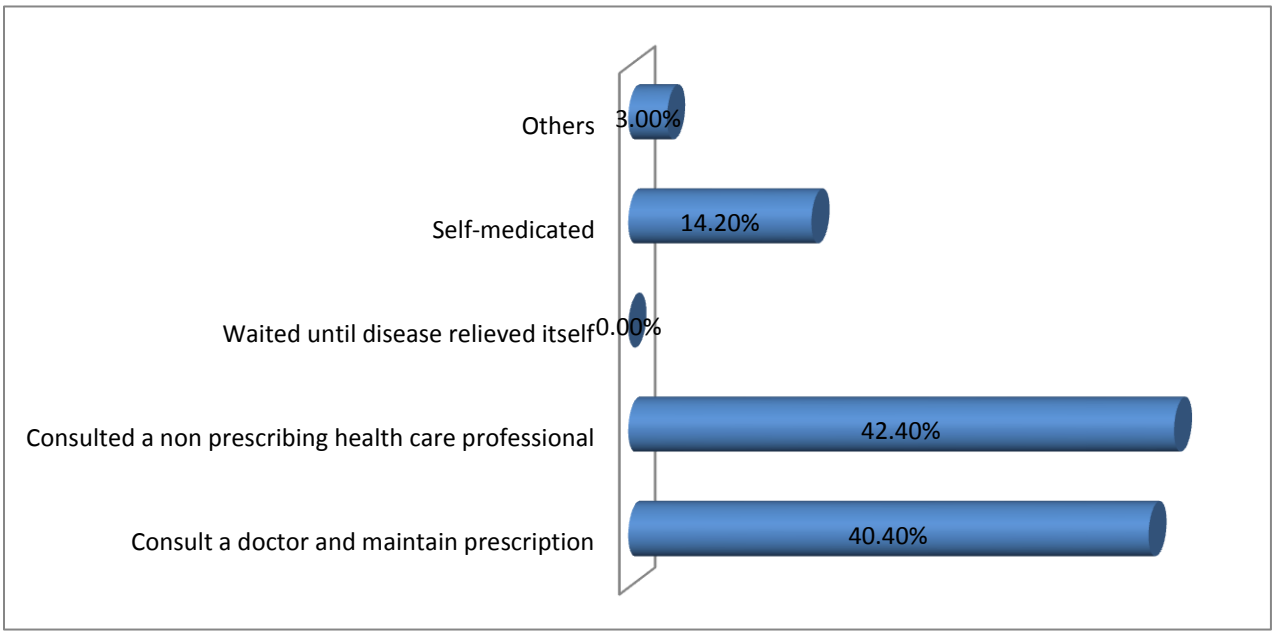

Figure 4.12: Response of parents when child suffered from disease.

From this survey it is found that few respondents had self-medicated their child when their child suffered from disease, a very large number of parents had consulted a doctor and maintain prescription. Almost equal number of respondentshad consulted a non-prescribing health care professional like homeopathy doctors, compounders, diploma degree containing pharmacist, paramedics.

4.3.2 Knowledge about self-medication safety

Table 4.13: Knowledge about self-medication.

	Number	%
Yes	21	4.20
No	313	62.60
vary disease to disease	79	15.80
Do not know	87	17.40
Total	500	100

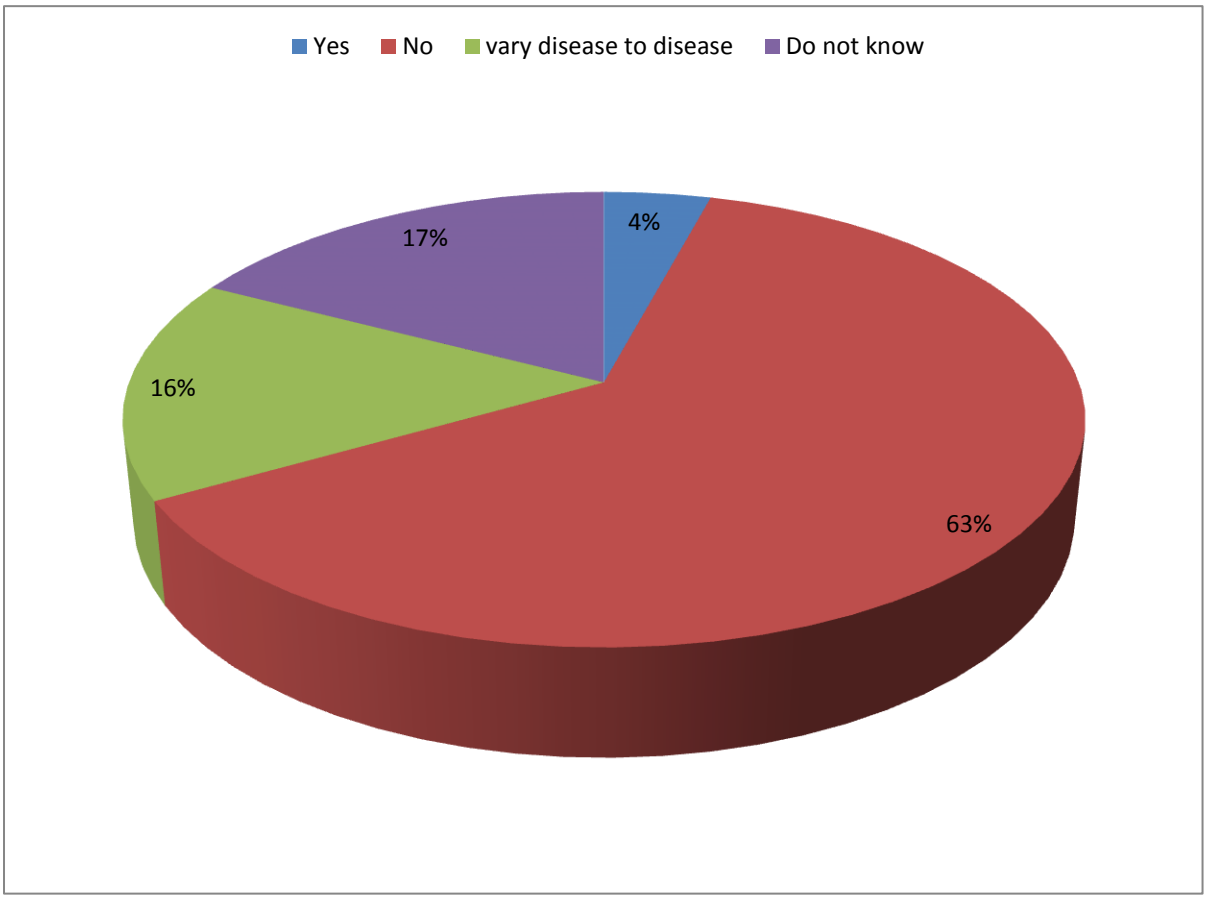

Figure 4.13: Knowledge about self-medication.

Majority of the respondents had no knowledge about self-medication whether it is safe or not.Few respondents revealed that depending on disease. The thing is that very few respondents think self-medication is safer than receiving medications upon consult a doctor.

4.3.3 Reasons behind self-medication

Table 4.14: Reasons behind self-medication.

	Number	%
Others	7	1.40
Considered ailment as minor	254	50.80
Self decision by parents	11	2.20
previous treatment by physician was unsuccessful	21	4.20
Long waiting time to avilable doctor	28	5.60
Asked doctor for a medication	0	0.00
Shortage of drug supply in stores	0	0.00
Previous prescription as reference for same illness	24	4.80
High cost of treatment	91	18.20
Taking child in inconvenient	64	12.80
Lack of nearby health care provider	0	0.00
Total	500	100

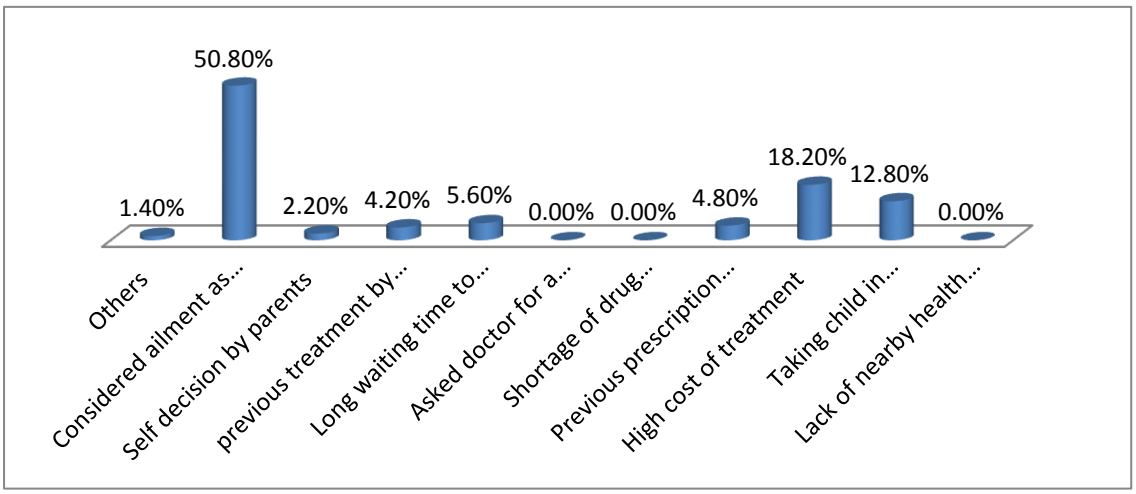

Figure 4.14: Reasons behind self-medication.

Half respondents considered ailment as minor. Taking the child inconvenient and high cost of treatment were also revealed.Long waiting time, previous prescription and other reasons also had reported as the reasons behind self-medication.

4.3.4 Persons who self-medicated

Table 4.15: Persons who self-medicated.

	Number	%
Yes	8	0.02%
No	492	98.40%

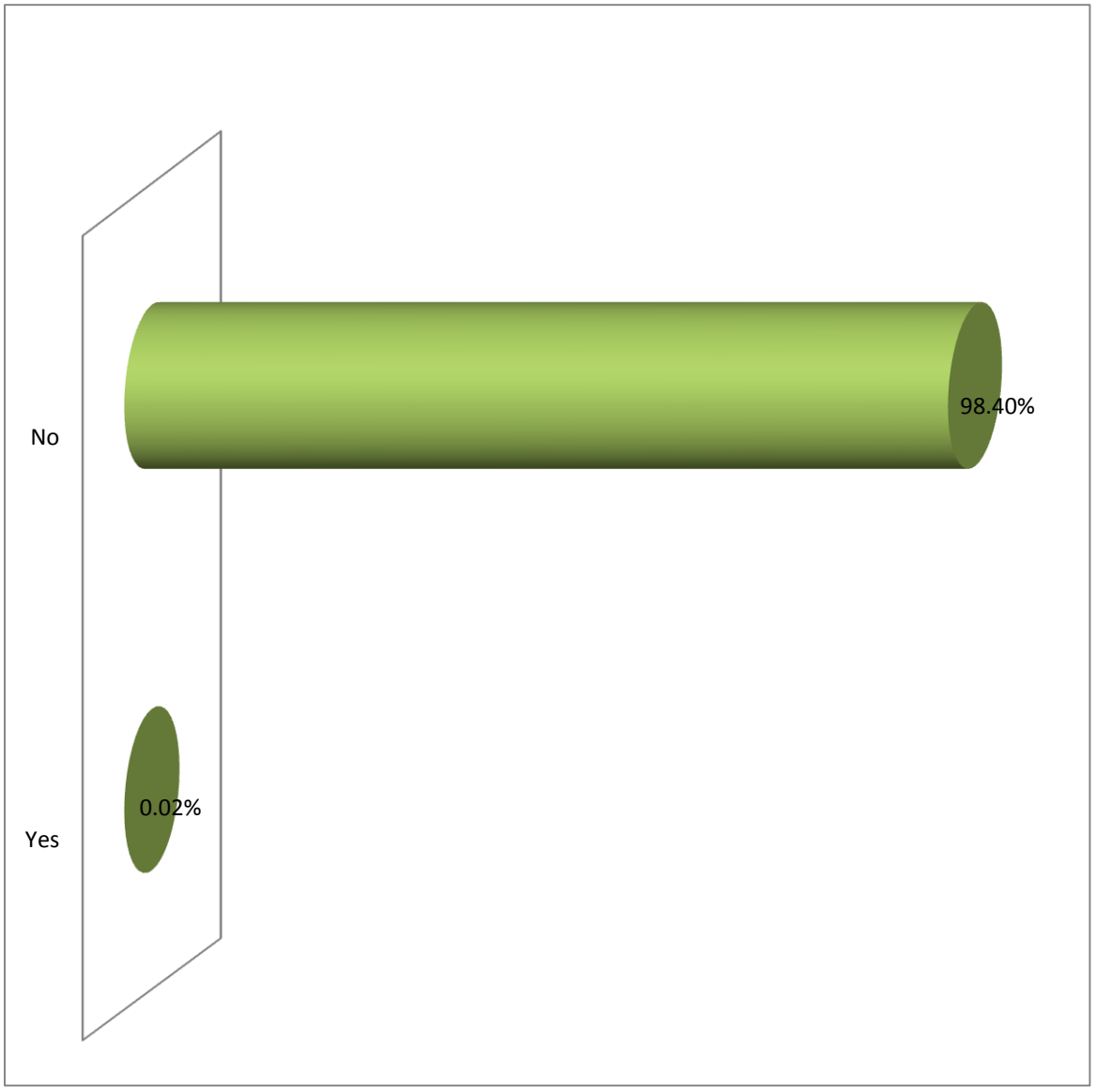

Figure 4.15: Medication history.

The self-medication prevalence is very low.

4.3.5 Conscious about side effect of the drug prior to administration in child

Table 4.16: Conscious about side effect of the drug.

	Number	%
Yes	235	47.00%
No	265	53.00%
Total	500	100

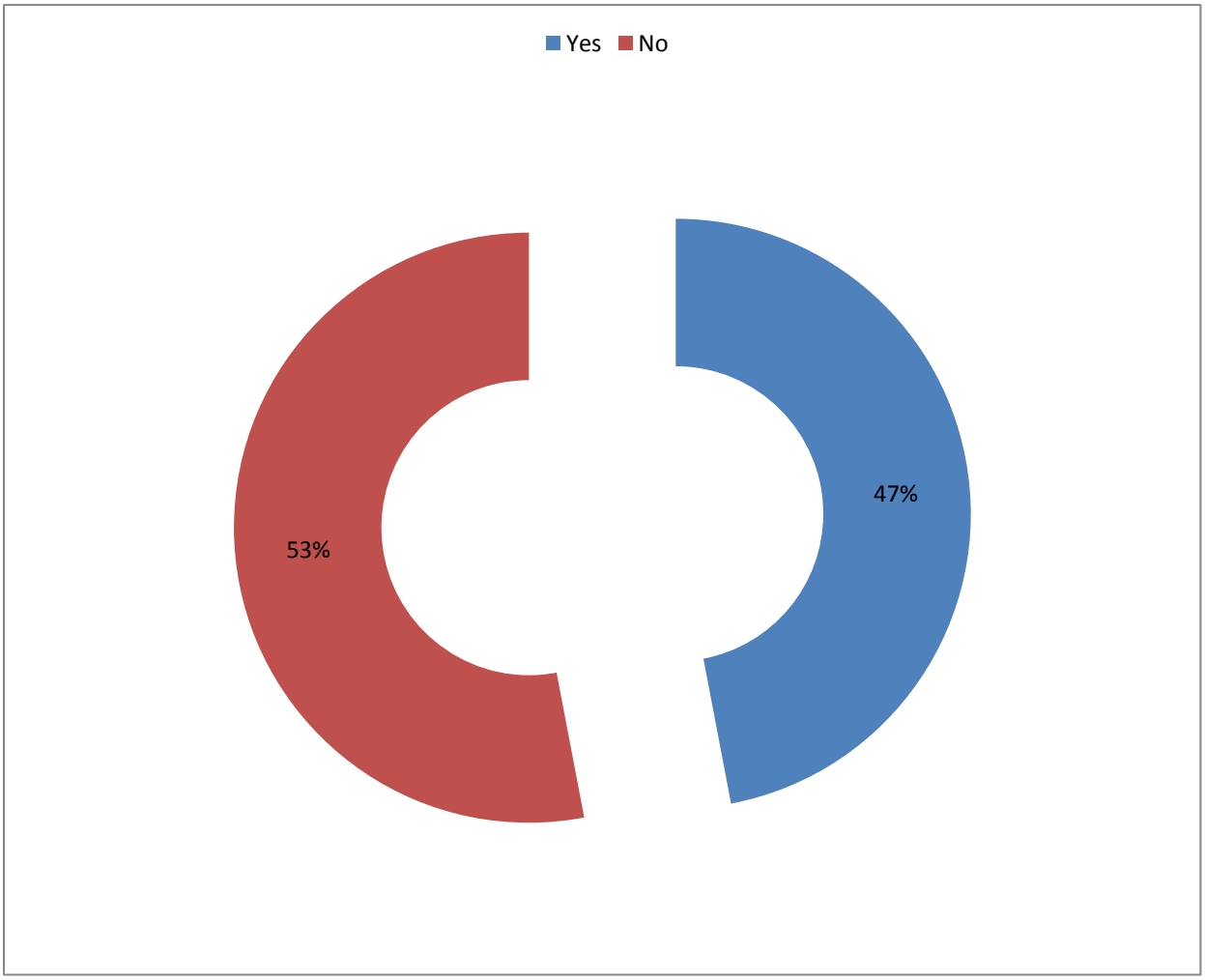

Figure 4.16: Conscious about side effect of the drug.

Among all the respondents, more thanhalf of the respondents are not conscious about the side effect of the drug and rest half (less) respondents said that they are conscious about the side effect of the drug.

4.3.6 Knowledge about drug before administering that to child

Table 4.17: Knowledge about drug literature.

	Number	%
Yes	166	33.20
No	334	66.80
Total	500	100

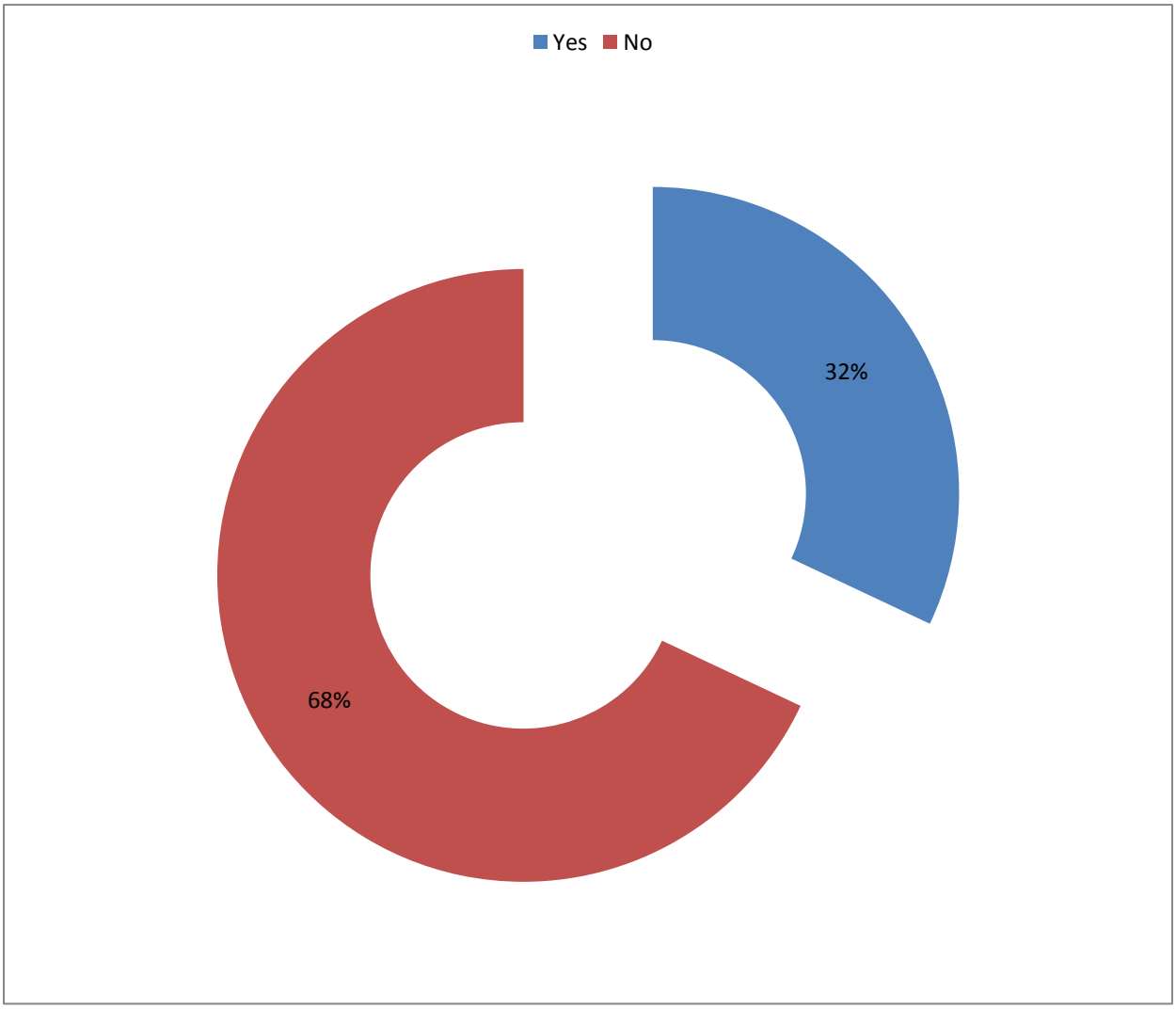

Figure 4.17: Knowledge about drug literature.

Majority of the respondents have no knowledge about drug literature and almost one third respondents have the knowledge about the drug before administering that drug to their child.

4.3.7 Source of Information regarding the drugs

Table 4.18: Source of Information regarding the drugs.

	Number	%
Health care professionals	223	44.60
Media	0	0.00
Patient info leaflet	0	0.00
Family and friends	48	9.60
Drug sellers	321	46.20
Total	500	100

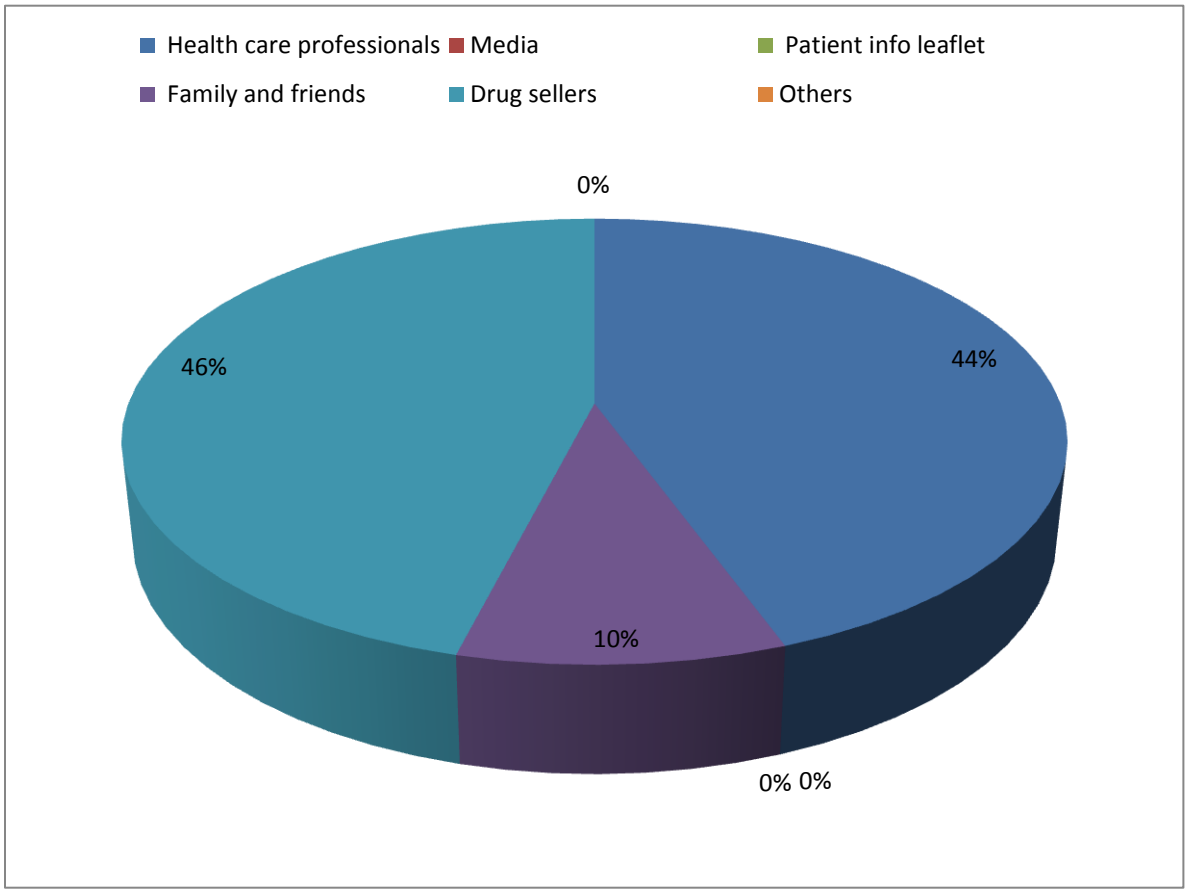

Figure 4.18: Source of Information regarding the drugs.

Knowledge about drug from drug sellers and health care professionals were reported almost equal. Family and friends were the source of drug information was reported only by one tenth.

4.3.8 Medication source

Table 4.19: Medication source.

	Number	%
OTC from dispensaries	473	94.60
Healthcare professionals	6	1.20
Friends and family	14	2.80
Family medicine cabinet	7	1.40
Others	0	0.00
Total	500	100

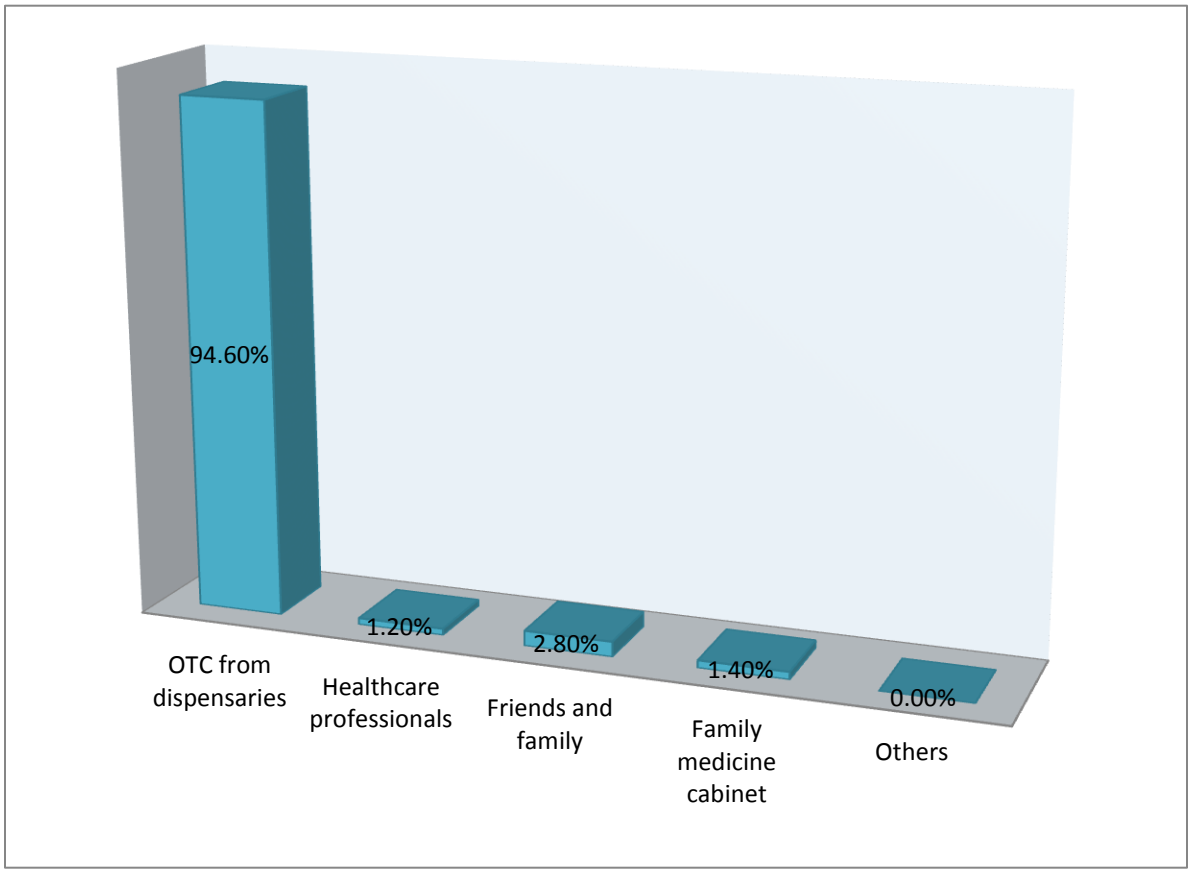

Figure 4.19: Medication source.

Main sources of drugwere pharmacy dispensaries.Family and friends, family medicine cabinet and healthcare professionals were also indicated as source of medicine.

4.3.9 Name of the prescribed drug

Table 4.20: Name of the prescribed drug.

	Number	%
Paracetamol	139	27.80
Cefixime	28	8.00
Sulbutamol	19	4.80
Amoxicillin/penicillin	25	6.00
Homeopathy	0	0.00
Oral Saline	0	0.00
Metronidazole	10	2.00
Tetracycline	57	16.00
Desloratadine/Fexofenadine	0	0.00
Do not remember	186	0.00
Total	500	100

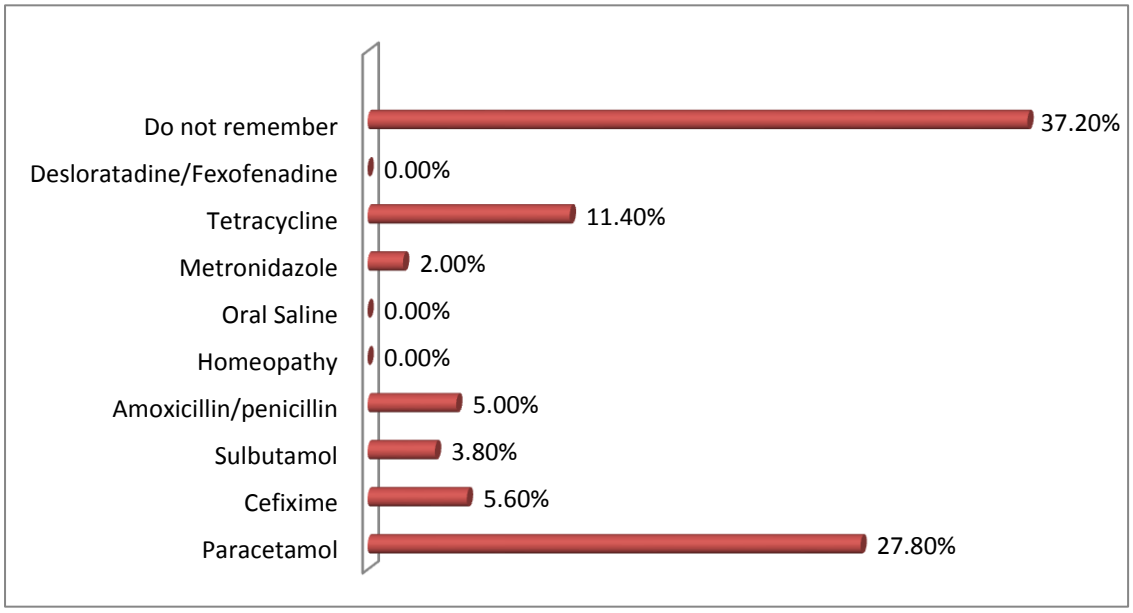

Figure 4.20: Name of the prescribed drug.

Like self-medicated drugs, paracetamol is occupied maximum area of the above pie chart as well. Then second highest prescribed drug is Tetracycline.

4.3.10 Agreement to treatment schedule provided by physician

Table 4.21: Agreement to treatment schedule provided by physician.

	Number	%
Yes	85	97.00
No	15	3.00
Total	500	100

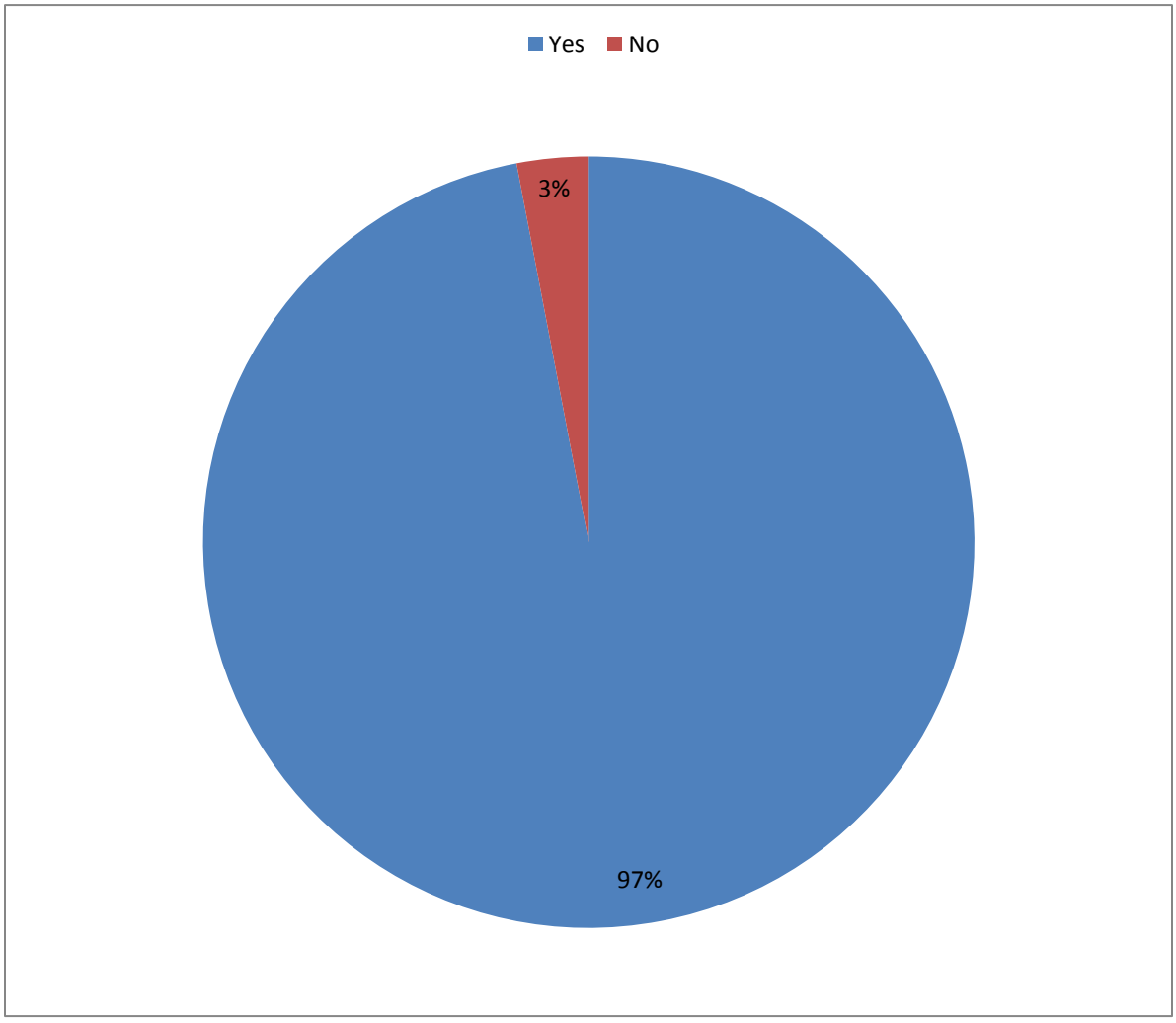

Figure 4.21: Agreement to treatment scheduleprovided by physician.

Almost all respondents agreed to the treatment schedule provided by the doctors and very small portion did not disagreed to the treatment schedule.

4.3.11 Request for medication from physician

Table 4.22: Request for medication from physician.

	Number	%
Yes	6	1.20
No	484	98.80
Total	500	100

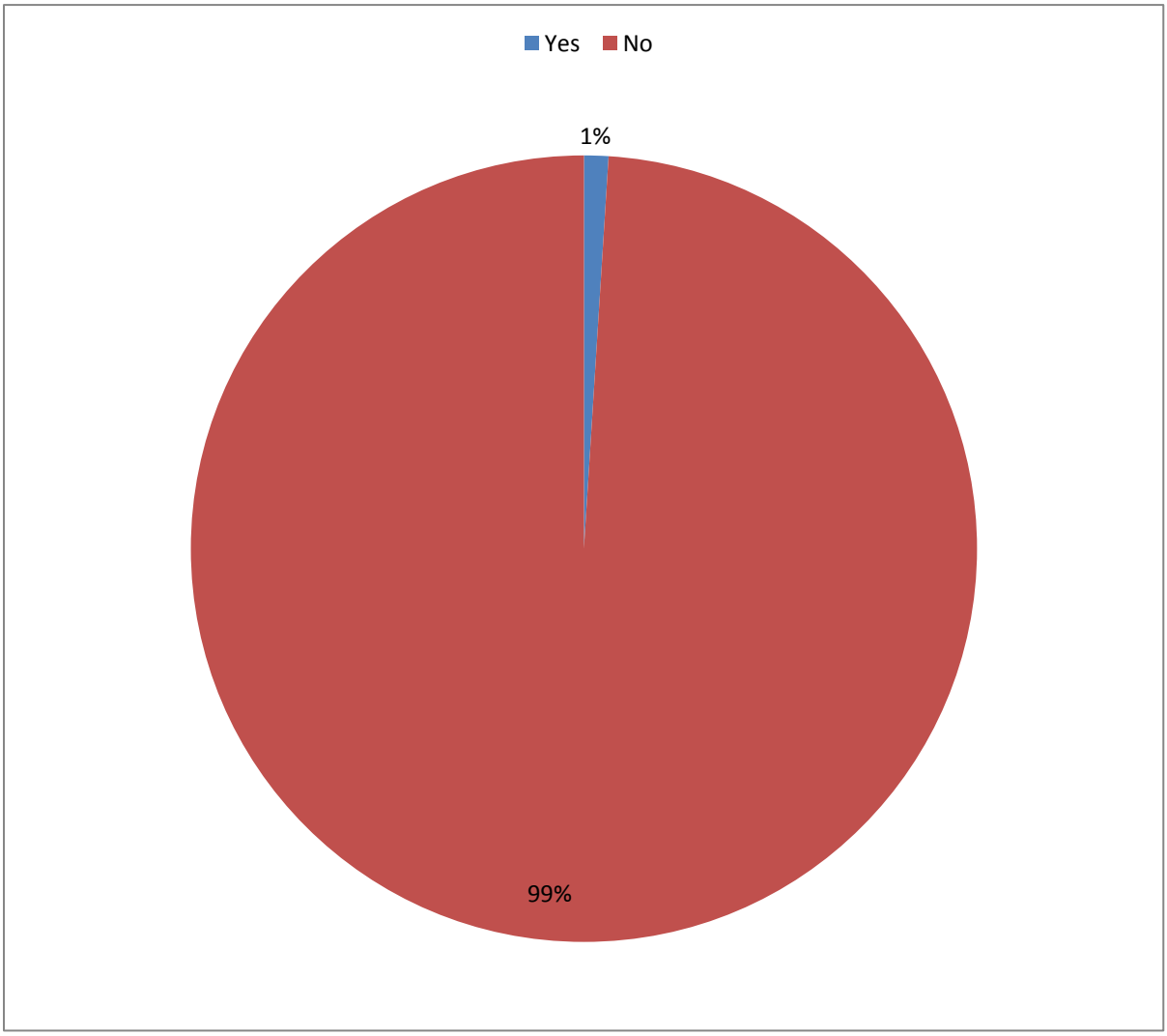

Figure 4.22: Request for medication from physician.

Major portion of respondents do not give suggestion to doctor about medication for their child but only a few percent respondents are ask doctors to prescribed drugs.

4.3.12 Request for specific medication from physician

Table 4.23: Request for specific medication from physician.

	Number	%
Yes	0	0.00
No	500	100.00
Total	500	100

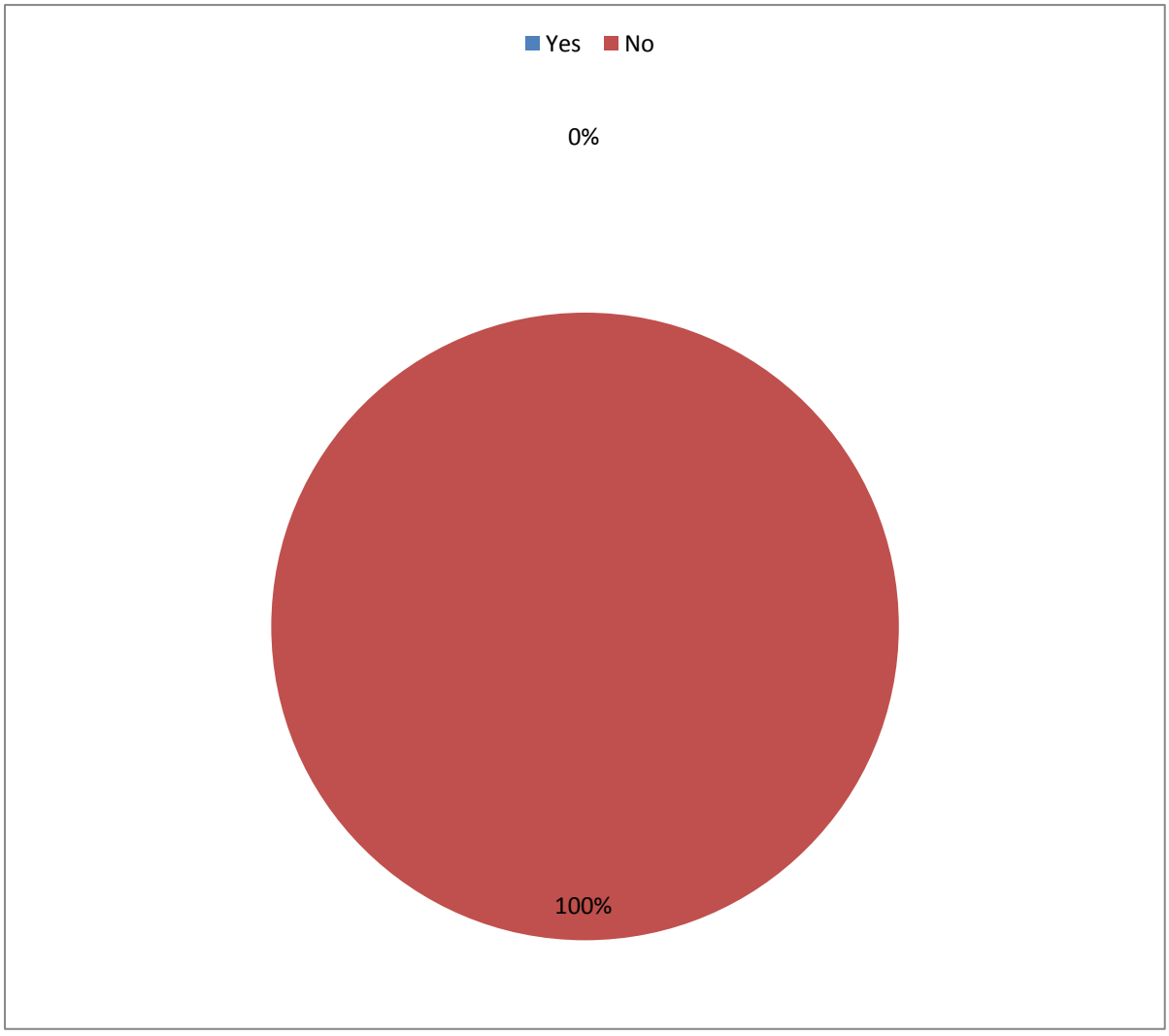

Figure 4.23: Request for specific medication from physician.

Not a single respondent does give suggestion to doctor about specific medication for their children.

4.3.13 Opinion of patients regarding prescribing tendency of physician

Table 4.24: High tendency of prescribing medication.

	Number	%
Yes	332	64.00
No	168	36.00
Total	500	100

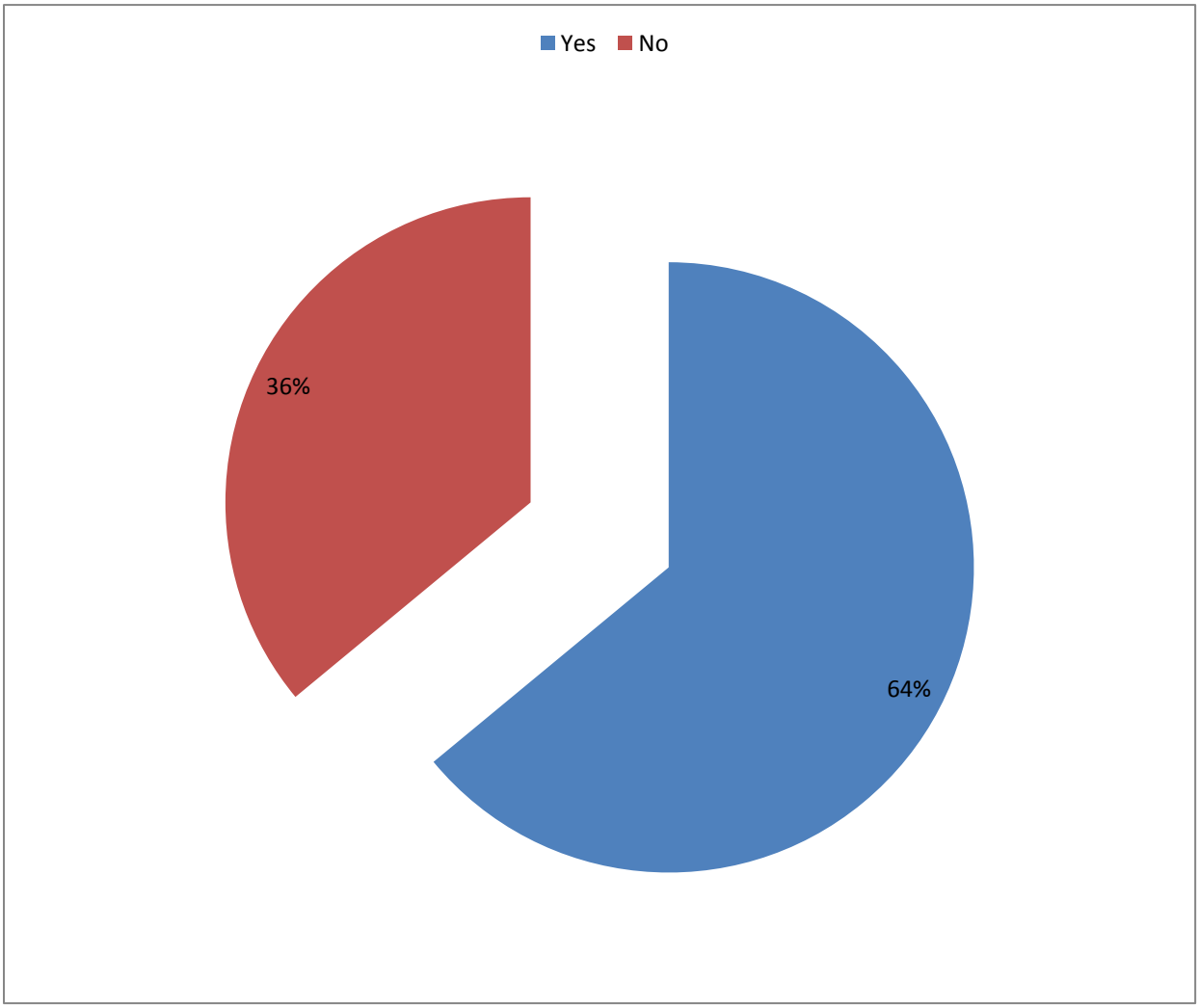

Figure 4.24: High tendency of prescribing medication.

Maximum respondent thought and believed that doctors have high tendency of prescribing medication but nearly one third of the responants did not think so.

4.3.14 Discontinuation of the drug therapy

Table 4.25: Discontinuation of the drug therapy.

	Number	%
Yes	167	33.40
No	333	66.60
Total	500	100

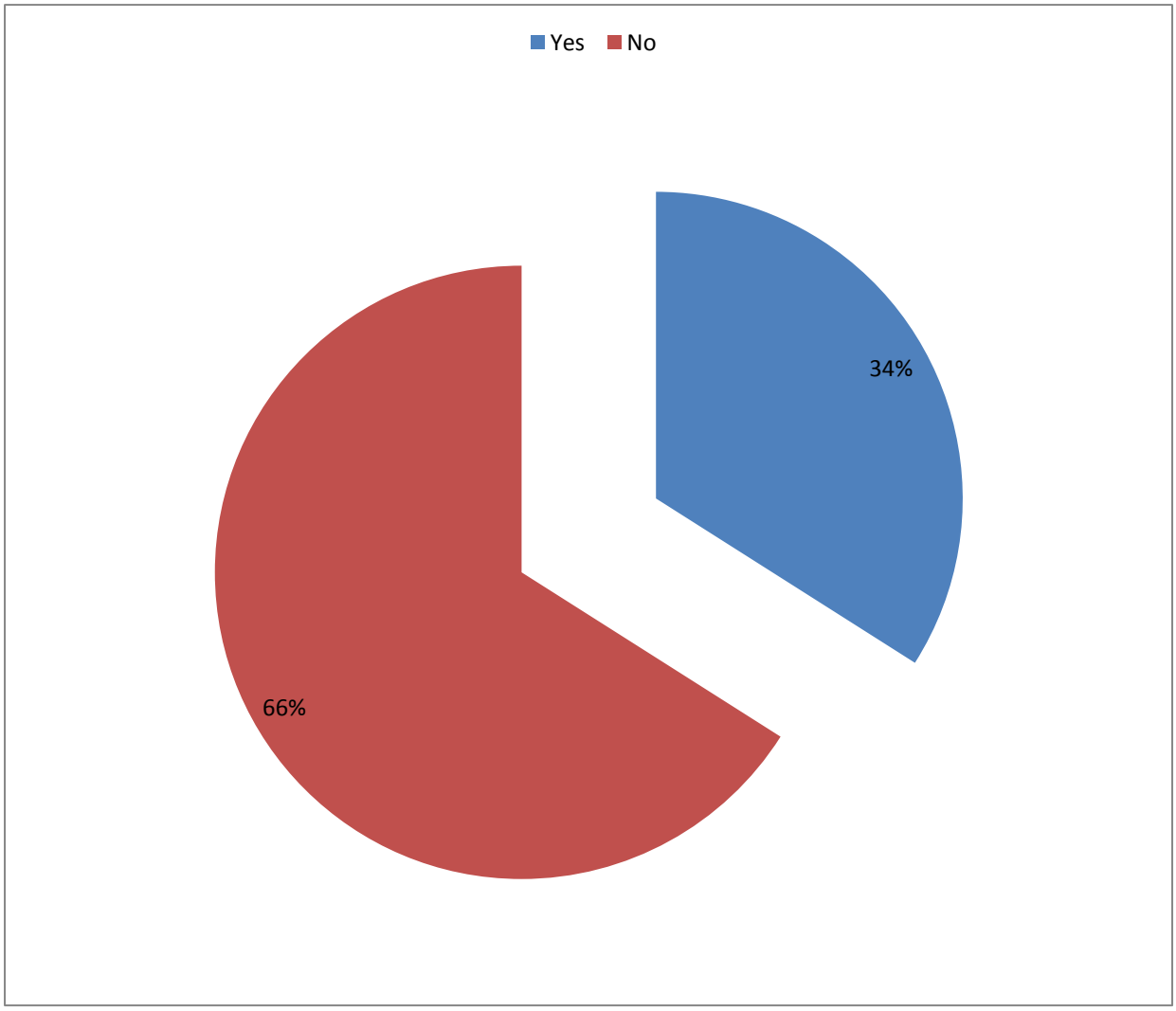

Figure 4.25: Discontinuation of the drug therapy.

All most two third of the respondents did not discontinue the drug therapy whereas another one third of the respondents discontinued the therapy.

4.3.15 Reasons behind discontinuation of the therapy

Table 4.26: Reasons behind discontinuation of the therapy.

	Number	%
symptoms have disappeared	94.00%	470
drugs ran out	0.00%	0
side effects appeard	6.00%	30
child was unwilling to take medication	0.00%	0
Others	0.00%	0
Total	500	100

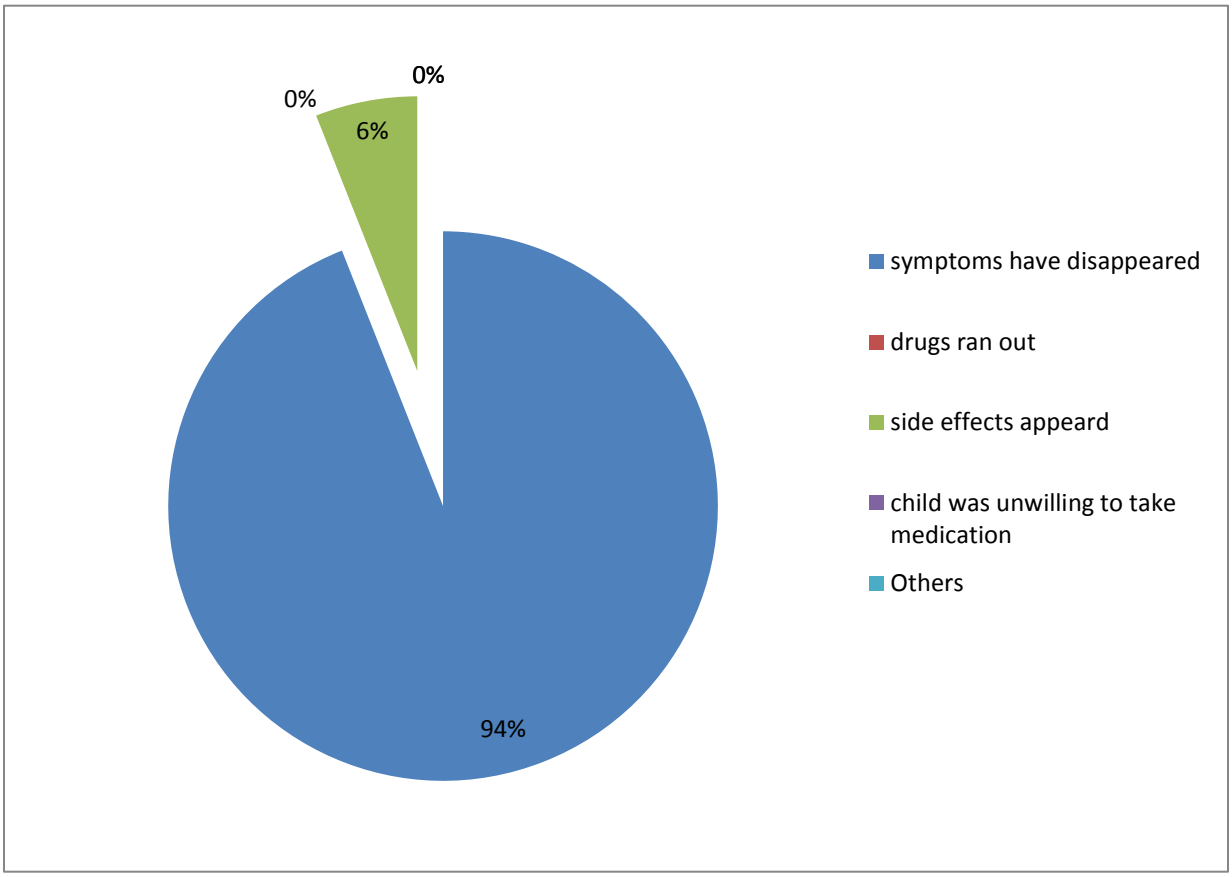

Figure 4.26: Reasons behind discontinuation of the therapy.

All the respondents who discontinued drug therapy said that they discontinued because their symptoms had disappeared. Some also did so for the appearance of side effect.

4.3.16 Suffering from side effect

Table 4.27: Suffering from side effect.

	Number	%
Yes	95	19.00
No	405	81.00
Total	500	100

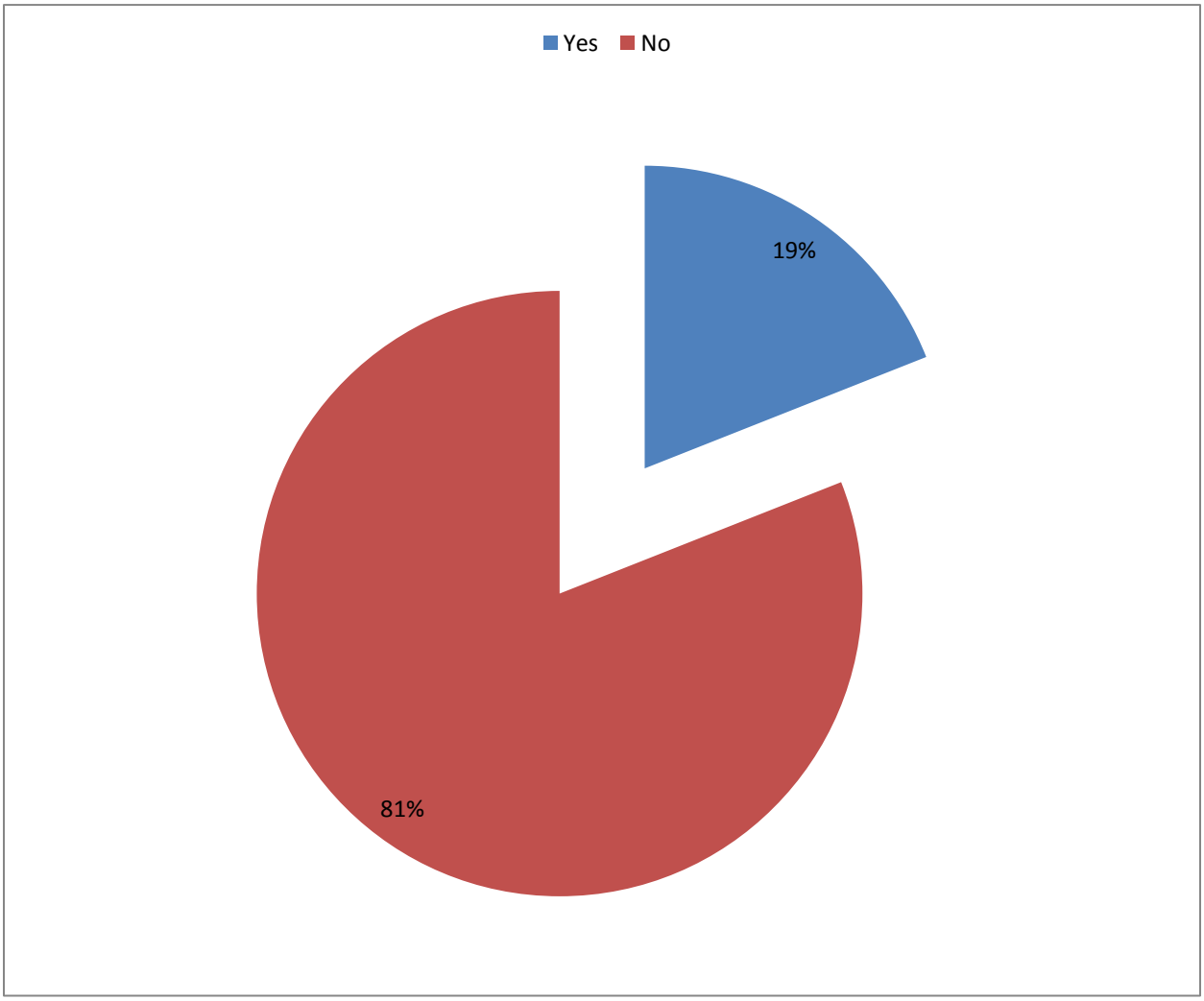

Figure 4.27: Suffering from side effect.

Nearly one fifth of the respondents were suffering from side effect due to use of medication both prescribed and self-medicated medicines.

4.4 Status of parental understanding of antibiotic use and resistance

4.4.1 Knowledge about antibiotic resistance

Table 4.28: Knowledge about antibiotic resistance.

	Number	%
Agree	9	1.80
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	491	98.20
Total	500	100

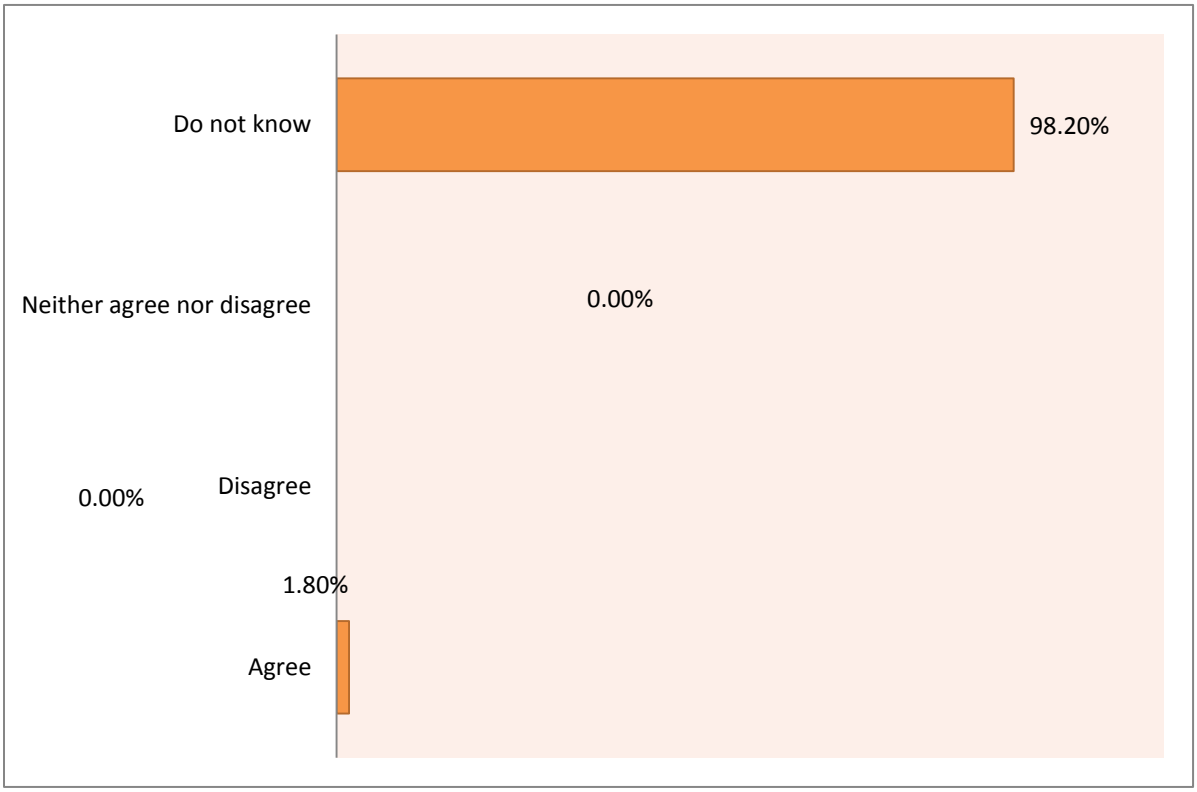

Figure 4.28: Knowledge about antibiotic resistance.

Maximum portion of the respondents said that they did not have any idea on antibiotic resistance. They do not know whether antibiotic resistance builds up or not if the antibiotics are used when they are not needed. Only a few respondents agreed on that statement of antibiotics resistance.

4.4.2 Antibiotic resistance is promoted by not completing full course of antibiotics

Table 4.29: Antibiotic resistance is promoted by not completing full course of antibiotics.

	Number	%
Agree	12	2.40
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	488	97.60
Total	500	100

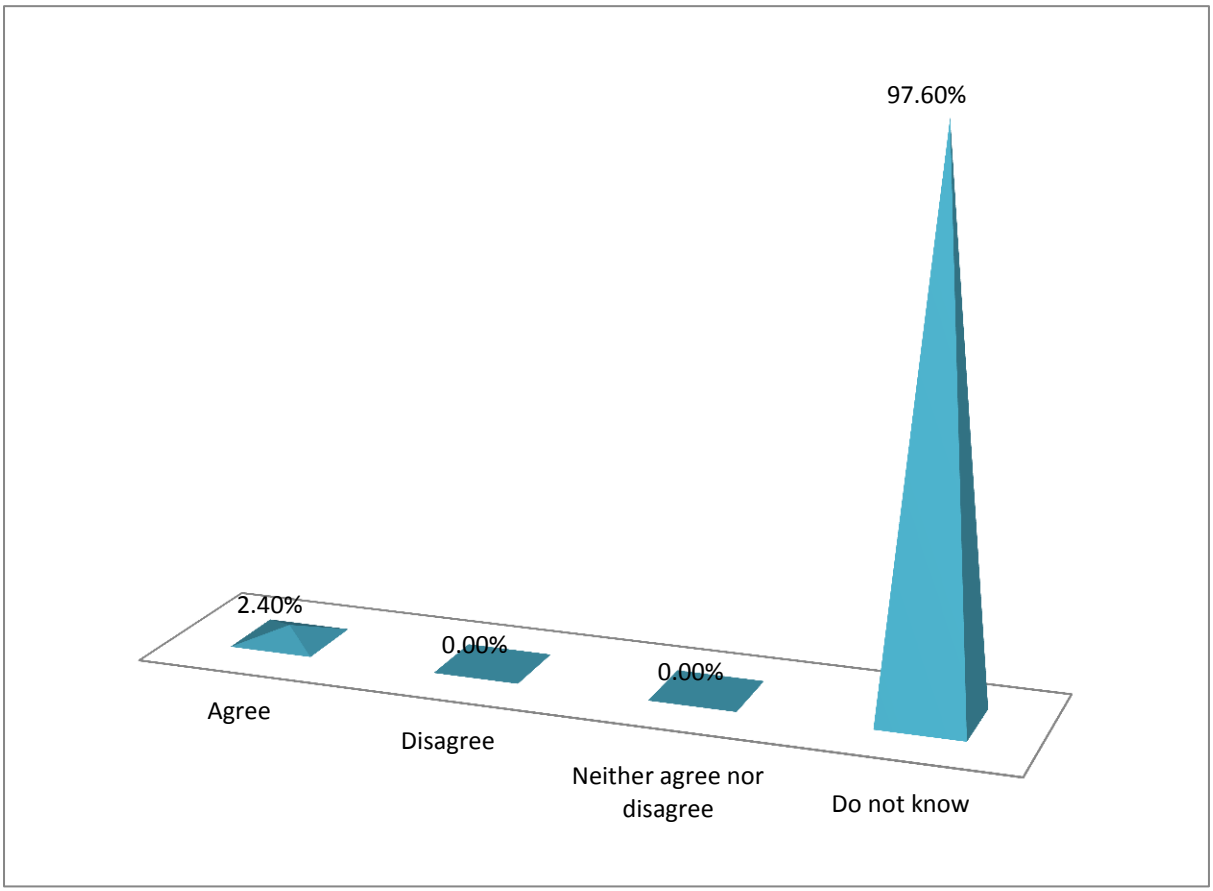

Figure 4.29: Antibiotic resistance is promoted by not completing full course of antibiotics.

Maximum portion of the respondents said that they did not know whether antibiotic resistance builds up or not in case of the full course of antibiotic is not taken. Only a few respondents agreed on that statement of antibiotics resistance.

4.4.3Antibiotic resistance due to self-medication of antibiotics

Table 4.30: Antibiotic resistance due to self-medication of antibiotics.

	Number	%
Agree	8	1.60
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	492	98.40
Total	500	100

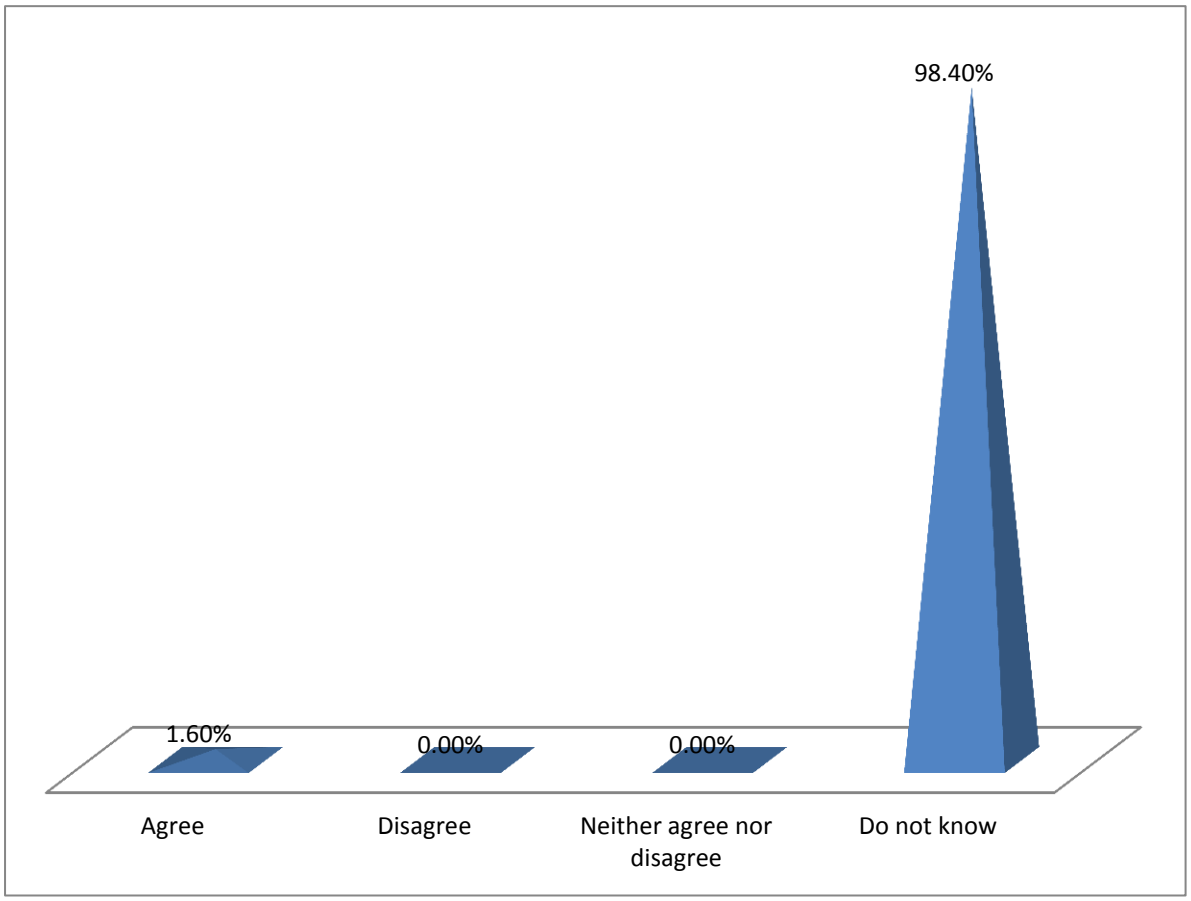

Figure 4.30: Antibiotic resistance due to self-medication of antibiotics.

Majority of the respondents said that they did not know whether antibiotic resistance builds up or not in case of the self-medication of antibiotics. Only a few respondents agreed on that statement of antibiotics resistance.

4.4.4 Antibiotic resistance is promoted by using antibiotics by using antibiotics with other drugs

Table 4.31: Antibiotic resistance is promoted by using antibiotics by using antibiotics with other drugs.

	Number	%
Agree	20	0.40
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	480	99.60
Total	500	100

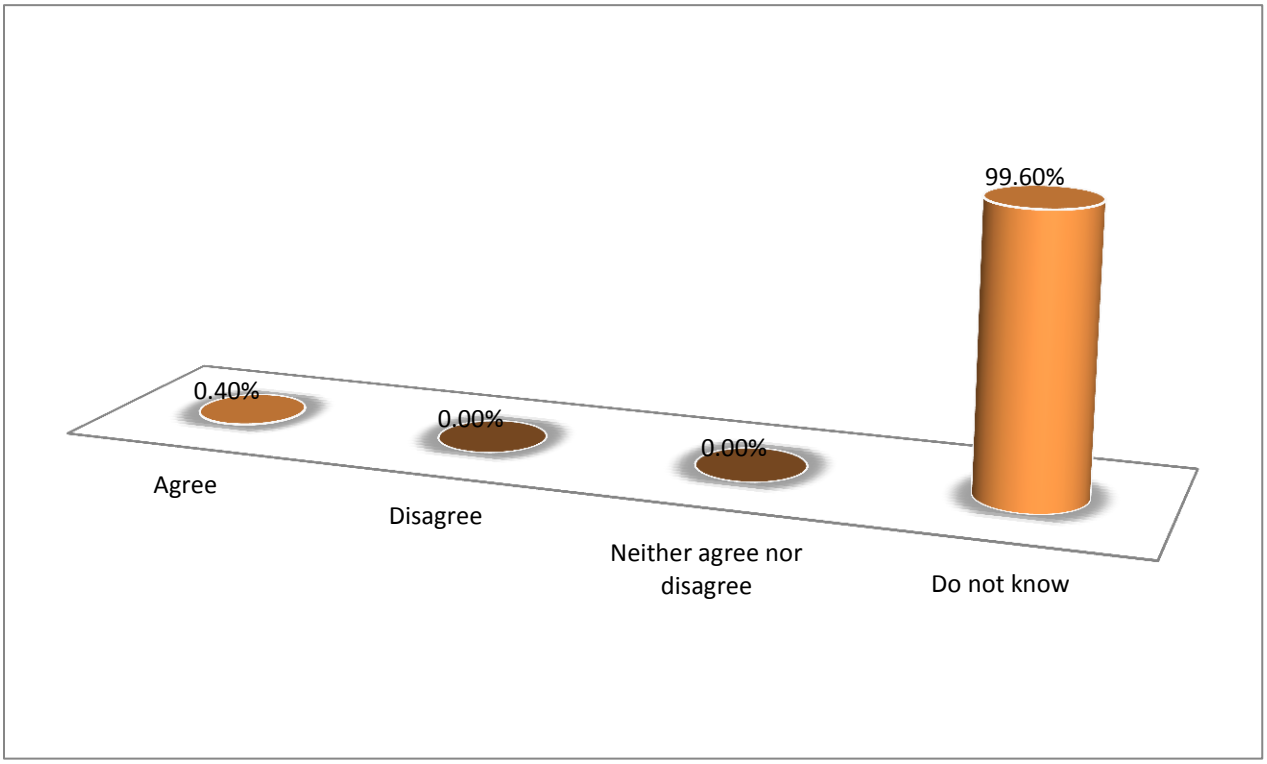

Figure 4.31: Antibiotic resistance is promoted by using antibiotics by using antibiotics with other drugs.

Majority of the respondents did not know whether antibiotic resistance is promoted by using antibiotics with other drugs or not.

4.4.5 Viral infection with fever should be treated with antibiotics

Table 4.32: Viral infection with fever should be treated with antibiotics.

	Number	%
Agree	350	70.00
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	150	30.00
Total	500	100

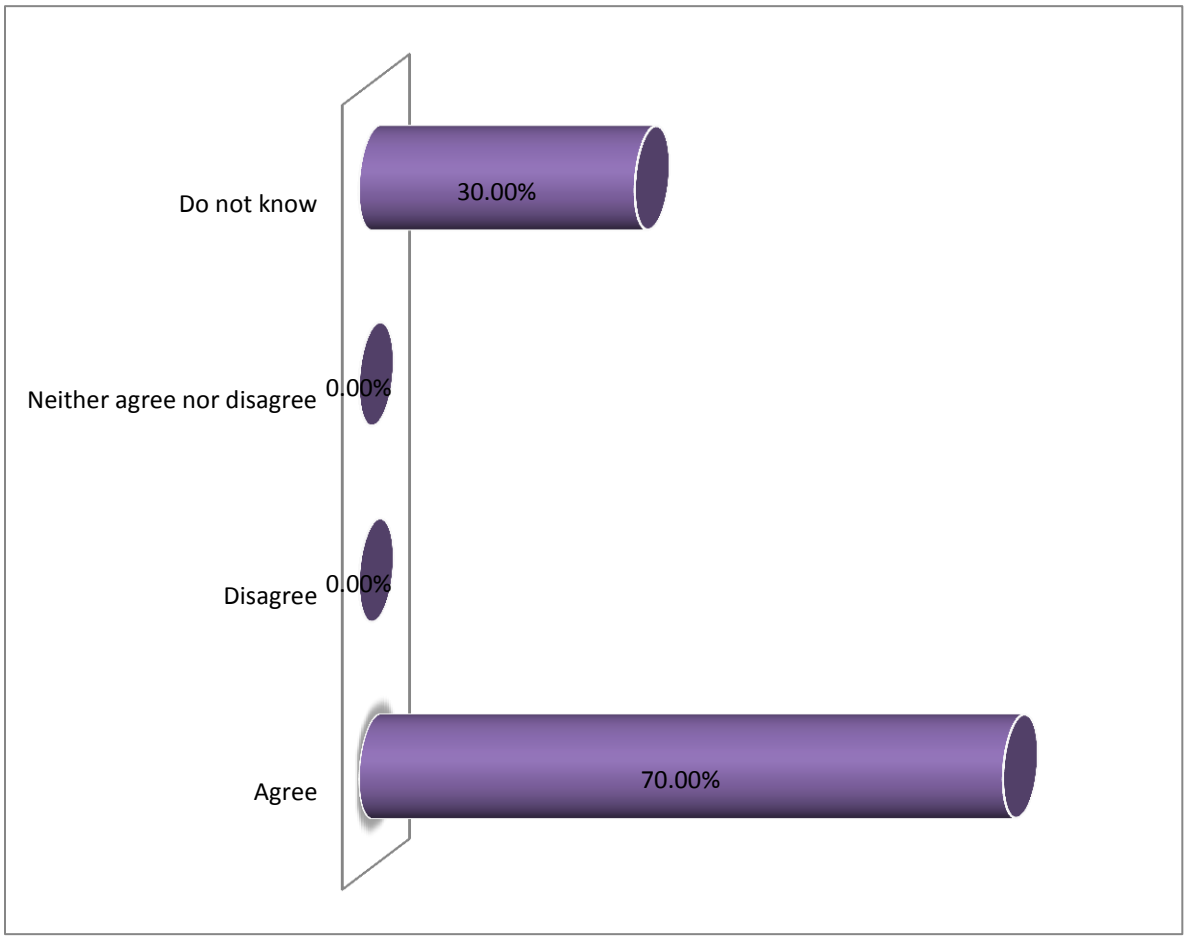

Figure 4.32: Viral infection with fever should be treated with antibiotics.

Nearly three fourth of the respondents have said that viral fever should be treated with antibiotics. Another onerespondent said they have no idea about this statement.

4.4.6 Effectiveness of antibiotics in the treatment of same infection in future

Table 4.33: Effectiveness of antibiotics in the treatment of same infection in future.

	Number	%
Agree	478	95.60
Disagree	0	0.00
Neither agree nor disagree	0	0.00
Do not know	22	4.40
Total	500	100

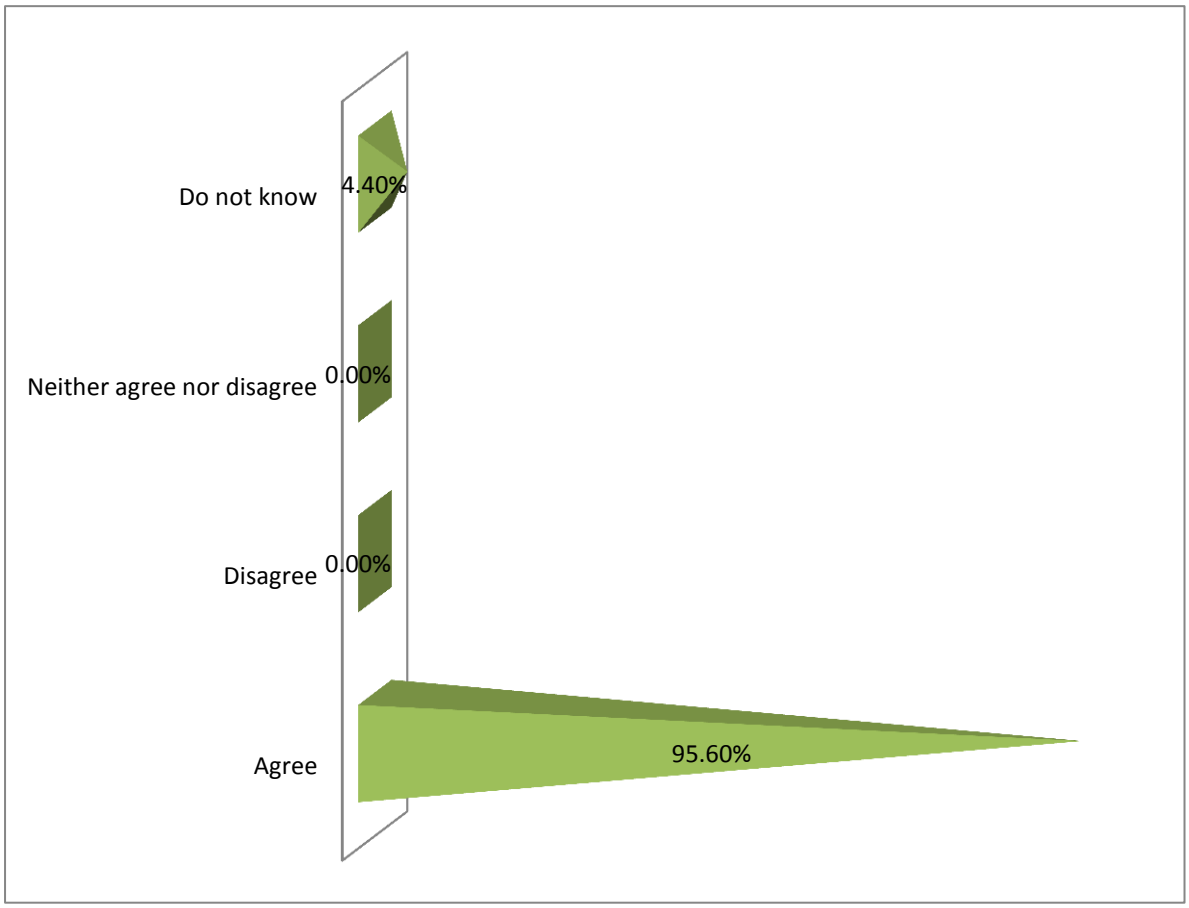

Figure 4.33: Effectiveness of antibiotics in the treatment of same infection in future.

A few of the respondents said that they did not know about the effectiveness of antibiotics in the treatment of same infection in future. But majority of the respondents said confidently that antibiotics will always be effective.

Chapter 5: Discuss and Conclusion

5 Discuss and Conclusion

A study was done on Bangladeshi parents' practice, knowledge and attitudes of self-medication to their children in the Rajshahi city. According to that study we have been able to obtain an overview on parental attitude of self-medication and the tendency of self-medication among children. After the study it has come out that self-medication tendency of parents to their children varies on age, previous experience, sort of disease and monthly net house hold income.

From the study we can see that mother has played an important role in the medication administration on children. Father has also a little contribution in this matter but other family member's contribution is very poor. Among the respondents 40.40% and 42.40% parents consulted a doctor and maintain prescription; consulted a non-prescribing health care professional respectively.

As a large portion of the people of this study had no education or very low level education even not in medical field, they did not able to know about the side effect of drugs. They also did not understand the disease and the treatment schedule they just try to as the doctor or a drug seller had told them to do. As the money is a big factor to poor people they always tried to find out an economic way in case of treatment which is contracting a drug seller most commonly seen.

Many people discontinued the therapy after symptomatic relief. They thought that as the child is no more ill then no need to medicate him anymore. This is the indication of poor adherence.

Most of the respondents (97%) were satisfied with the treatment schedule of the doctor through a little portion 3% did not agree. The reason behind that was their children did not become well fast.

Many people though that doctors prescribe drugs very easily and sometime they prescribe more drugs than necessary in real. Some people also reveal that doctors sometimes prescribe more drugs and even sometimes high price drugs which costs a lot for lower income people. Some people also said that doctor are to prescribe drugs where necessary and if the drugs costs high price what can do a doctor here.

The most common source of drugs is the pharmacy. It should be said that in Bangladesh there is no implication of rules for drug dispensing. Drug seller was an important source of drugs for common people.

A very few people know about antibiotic resistance. Almost no people know about it. When they were said that it is the failure of therapy due to unable to kill the bacteria because of their protecting activity against the antibiotics some people agreed with it. Only 1.80% people know about the antibiotic resistance. 70% of the study people agreed that the viral infection can be treated with antibiotics other 30% had no knowledge about it. Though more than 6.40% of the study people were highly educated they had almost no idea about it.

The thing which made me shock most that 27.80% people addressed Paracetamolas an antibiotic in real which is an NSAID. 37.20% people also could not remember the name of the drug prescribed for their children. Tetracycline and Cefixime were the most prescribed antibiotics in this study.

The study may not all kinds of people in the city, may be any particular kind of people is taken in consideration more and some are deprived. It should be said that the study was more city centered than the rural of the city also. The question answering was not done correctly also. Many of the people answered artificially or the wrong answer willingly because of their hurry, sick child or other reasons.

Self- medication may be an important aspect primary health care but inappropriate practice of self-medication may cause serious health hazard. Self-medicator should have a degree of knowledge in the medical field whereas according to this study the fundamental education level is found very low level let alone knowledge in particular field like medicine. The inappropriate antibiotic self-medication is accelerating the antibiotic resistance that’s why it should be discouraged.

Chapter 6: References

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