IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ASSESSMENT OF MISUSE OF ANTIBIOTICS: A COMMUNITY-BASED OBSERVATIONAL STUDY

Sonali S Kulkarni[1], Shashank BC[1], David Lalrinmawia[1], Sonat Sunny[1]
Vaishnavi Prasannan*

[1] Pharm D, Acharya & BM Reddy College of Pharmacy, Bengaluru-560090, Karnataka, India.

* Assistant Professor, Department of Pharmacy Practice, Acharya & BM Reddy College of Pharmacy, Bengaluru -560090, Karnataka, India.

ABSTRACT

The word "antibiotics" has become a common term that is understood, although incorrectly perceived by laymen. Overuse and misuse of antibiotics have led to antibiotic resistance. According to a study conducted by the Indian Council of Medical Research, cephalosporins (60%) and fluoroquinolones (41.5%) were found to have maximum resistance in the Indian population. **Objectives:** We aimed to assess the misuse of antibiotics in the community; the category of antibiotic being misused, patient compliance to antibiotic course, to observe side effects, and to identify any relation between socio-economic status and self-medication of antibiotics. **Materials and Methods:** This was an observational study. The subject's demographic details and responses were collected with the help of a standardized questionnaire which were then entered in Microsoft Excel and appropriate statistical analysis was performed. **Results:** A total of 287 participants were recorded of which 154 were females, the mean age was 30.75 ± 11.13 years, and majority belonged to the upper-middle class. Self-medication of antibiotics was seen in 66.20% of participants wherein it was nil in the lower class and 100% in the upper class. "Disease was not serious", "previous successful experience" and "to get quick relief" were the most common reasons. A macrolide, azithromycin (34%) was the most commonly misused antibiotic. Majority (30.72%) stopped taking antibiotics after the symptoms resolved which indicated poor patient compliance. Loss of appetite (19.35%) and nausea (19.35%) were the most common side effects experienced. **Conclusion:** Preventive measures must be implemented by the respective regulatory authorities and corrective measures must be taken by the healthcare professionals.

Keywords: Antibiotics, Antibiotic resistance, Antimicrobial resistance, Misuse, Self-medication.

INTRODUCTION

The word "antibiotics" has become a common term that is understood, although incorrectly perceived by laymen. The definition of antibiotic, according to Webster's Third International Dictionary, is a chemical produced by a microorganism (such as a bacterium or fungus) capable of inhibiting or killing another microbe in a dilute solution (such as a disease germ).[1]

Antibiotics have been the groundwork of clinical medicine and have been used in the treatment of a large number of life threatening bacterial infections after the second half of the 20th Century.[2] According to the State of the World's Antibiotics 2021 report, antibiotic consumption in India has risen sharply, with around 30% increase in their per capita use during the past decade. Washington-based Centre for Disease Dynamics, Economics and Policy (CDEEP) reported a percentage change in total use between 2010 and 2020 of about 48%.[3]

Antibiotic consumption per capita increased nearly 40% worldwide between 2000 and 2015, primarily driven by increases in low- and middle-income countries (LMICs) where lack of access to antibiotics exists alongside overuse. In an effort to balance appropriate access to antibiotics and stewardship across countries, the WHO, in 2017, introduced the Access, Watch and Reserve (AWaRe) framework which classifies antibiotics based on their resistance potential.[4]

Antibiotics are only effective against bacterial infections and are ineffective against any type of viral infections such as cold, flu, runny nose or sore throat.[5] Most antibiotics work according to either of the 5 following mechanisms: inhibition of cell wall synthesis, inhibition of protein synthesis, inhibition of nucleic acid synthesis, alteration of cell membranes, and antimetabolite activity.[6]

Like all medicines, antibiotics also have certain side effects, most of which are related to the digestive tract. Around 1 in 10 people experience nausea, vomiting, diarrhea, bloating, indigestion, abdominal pain and loss of appetite. These effects are usually mild and reduce once the antibiotic course is completed. Around 1 in 15 people have an allergic reaction to antibiotics (mostly to penicillins and cephalosporins). In most cases, the reaction is mild to moderate that causes hives, coughing, wheezing and breathing difficulty. However, in rare cases antibiotics may cause an anaphylactic reaction that could be fatal if not managed in time. Antibiotics like tetracycline may cause sensitivity to light and fluoroquinolones may cause severe aches and pains and heart problems.[7]

When infections cannot be cured by first-line antibiotics, it becomes necessary to switch to a more expensive second-line of antibiotics. Prolonged duration of treatment and hospital stay results in increased overall healthcare costs which furthermore puts more economic burden on the society. Antibiotic resistance occurs when antibiotics are taken too often, for the wrong reasons, and due to incompletion of antibiotic course.[8]

Ever since the discovery of antibiotics, there has been discovery and acknowledgement of resistance alongside the new antibiotics. Germs will always find ways to survive and resist new drugs. From 1942 to 1967, various penicillin-resistant strains were observed such as *Staphylococcus aureus* and penicillin-resistant *Streptococcus pneumonia*. Various other antibiotic-resistant strains were identified in the subsequent years, including vancomycin-resistant *Staphylococcus aureus*, azithromycin-resistant *Neisseria gonorrheae*, daptomycin-resistant methicillin-resistant *Staphylococcus aureus* and many more.[9]

Overuse and misuse of antibiotics are the leading causes of ABR.[8] A major risk factor for the development of resistance is thought to be the inappropriate use of antibiotics. For infections with penicillin-non-susceptible *Streptococcus pneumonia* (PNSP), studies have demonstrated that at the individual level, previous use of beta-lactam antibiotics (like penicillins) is an important risk factor. In children, co-trimoxazole and erythromycin have also been associated with selection of PNSP. Translated to population level, sales of beta-lactam antibiotics, co-trimoxazole, or macrolides in a given geographic region may be proportional to microbial resistance to penicillin.[10]

Misuse of antibiotics occurs when an individual is prescribed with a wrong antibiotic, a wrong dose of an antibiotic, an antibiotic for the wrong duration of time or when a person treats self without medical consultation (self-medication).[11]

According to the WHO findings, amoxicillin and amoxicillin-clavulanate are the most commonly used antibiotics worldwide and belong to the "Access" category of the WHO Model List of Essential Medicines.[12] Cephalosporins, quinolones and carbapenems have high potential to cause antibiotic resistance and are categorized as "Watch" antibiotics. "Reserve" antibiotics, also called as "last-resort" antibiotics that are used only for treatment of specific infections caused by multidrug-resistant bacteria.[13]

A study published by the Indian Council of Medical Research (ICMR) shows that cephalosporins (60%) and fluoroquinolones (41.5%) were found to have maximum resistance.[14] According to the Central Drugs Standard Control Organization (CDSCO), cefotaxime, ofloxacin, and cefixime are the most commonly used antibiotics in India. CDSCO has made it mandatory to insert a leaflet into drug packets that contains information about the adverse reactions of these medications.[15]

Antibiotic resistance (ABR) is one of the biggest growing problems worldwide that affects any individual of any age, in any country. The misuse of antibiotics is complicating the treatment of various infections (like tuberculosis, gonorrhea and pneumonia).[8] The Centers for Disease Control and Prevention (CDC) calls it "one of the world's most urgent public health problems.[16]

Interventions such as the enforcement of the policy that prohibits the sale of over-the-counter (OTC) antibiotics, the use of antibiotic stewardship programs, the active participation of clinicians in prescription audits, the promotion of delayed antibiotic prescribing strategies, the enhancement of communication skills with patients, and the performance of more pragmatic studies in primary care with outcomes that are of clinicians' interest, such as complications and clinical outcomes, must be undertaken.[17]

Educating the community thus becomes. Corrective measures by the regulatory authorities and preventive measures by the health care professionals will help combat this inevitable threat of ABR.

MATERIALS AND METHODS

Subjects for the study were identified by the investigators during community visits based on the inclusion and exclusion criteria. The patients were explained the purpose of the study and the informed consent was obtained. Relevant data (demographic details) was recorded, and the subjects were administered with other study tools to obtain relevant information. The data thus obtained was entered in a Microsoft Excel sheet and appropriate analysis was performed.

Study Site: The study was conducted in communities of Soldevanahalli and AGB Layout of Bengaluru for 6 months.

Study Design: This is a prospective observational study.

Study Criteria: A total of 287 subjects fulfilling the following criteria were included in the study.

Inclusion Criteria:

a. Participants above 18 years and below 60 years of age.
b. Participants taking antibiotics with or without a prescription.
c. Participants with or without co-morbidities.

d. Participants consenting to participate in the study.

Exclusion Criteria:

a. Pregnant women.

b. Participants with chronic diseases such as cardiovascular diseases, pulmonary diseases, chronic kidney diseases, hepatic diseases and cancer.

c. Participants who underwent surgical procedures.

Ethical Approval: The study was approved by Institutional Ethics Committee of Acharya and BM Reddy College of Pharmacy, Bengaluru-560090, Karnataka, India.

Data collection tools

1. Ateshim Questionnaire: A data collection form is designed to collect patient demographic and aspects regarding antibiotic use by the given community. This form enables the understanding of optimal antibiotic use by the people.
2. Patient Consent Form: Consent will be obtained using a self-designed patient consent form prior to data collection.
3. Modified Kuppuswamy Scale: To classify the community into various socio-economic classes based on a score of 3-29.
4. Personal Interviews: It is a research technique for gathering information through face-to-face contact with individuals. This study includes personal interviews in home settings of the given community.

Statistical Analysis

All recorded data were entered into MS Excel software. Descriptive statistics such as mean and standard deviation were computed for quantitative variables, and frequencies and percentages were calculated for categorical variables. Histogram and pie charts were applied to find the nature of data distribution.

RESULTS

The study was conducted in the communities of Soldevanahalli and AGB Layout, Bengaluru, which included 287 participants on the basis of inclusion and exclusion criteria.

Socio-Demographic Characteristics

a. Age distribution of participants:

Out of 287 participants, majority of the participants (144, 50.17%) belonged to the age group of 18-25 years while the least (25, 8.71%) were from the age group 42-49 years.

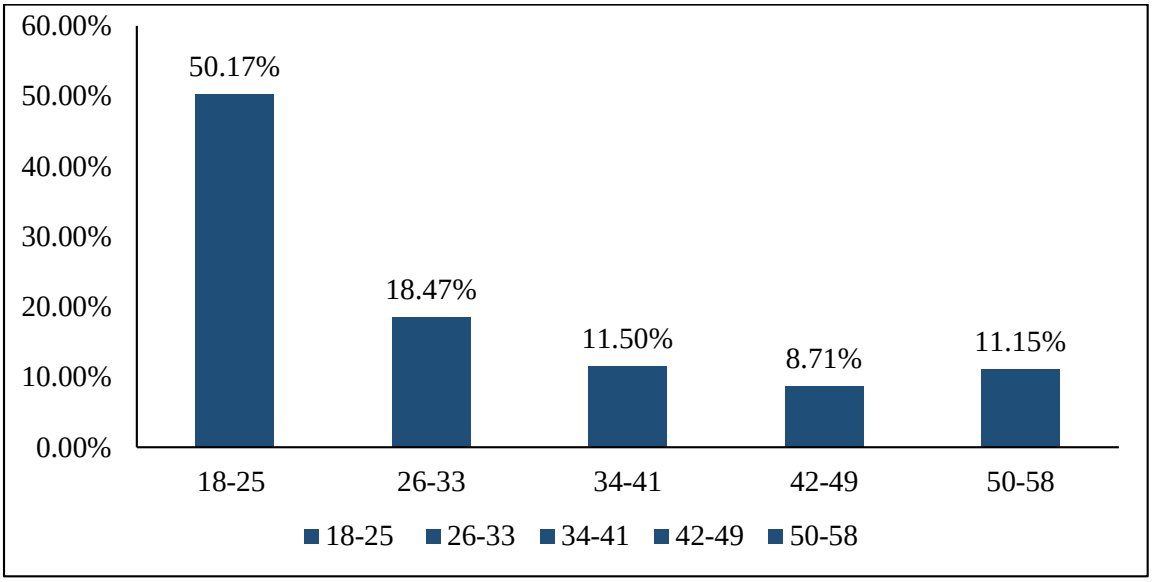


Figure 1: Age distribution of participants.

b. Distribution of Participants by Gender:

Out of 287 participants, majority (154, 55%) was females and the remaining (128, 45%) were males.

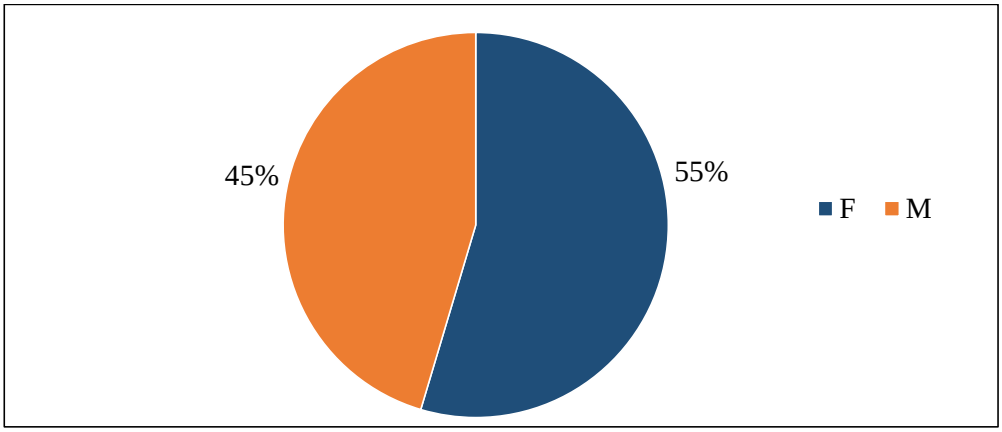


Figure 2: Gender distribution of participants.

c. Distribution based on occupation:

Out of 287 participants, majority was students (127, 44.25%) of various fields, followed by housewives (58, 20.21%), people working in private sector (49, 17.07%), and people who were self-employed (27, 9.41%). People with government jobs (14, 4.88%) and unemployed people (12, 4.28%) belonged to the lesser range of the subject population.

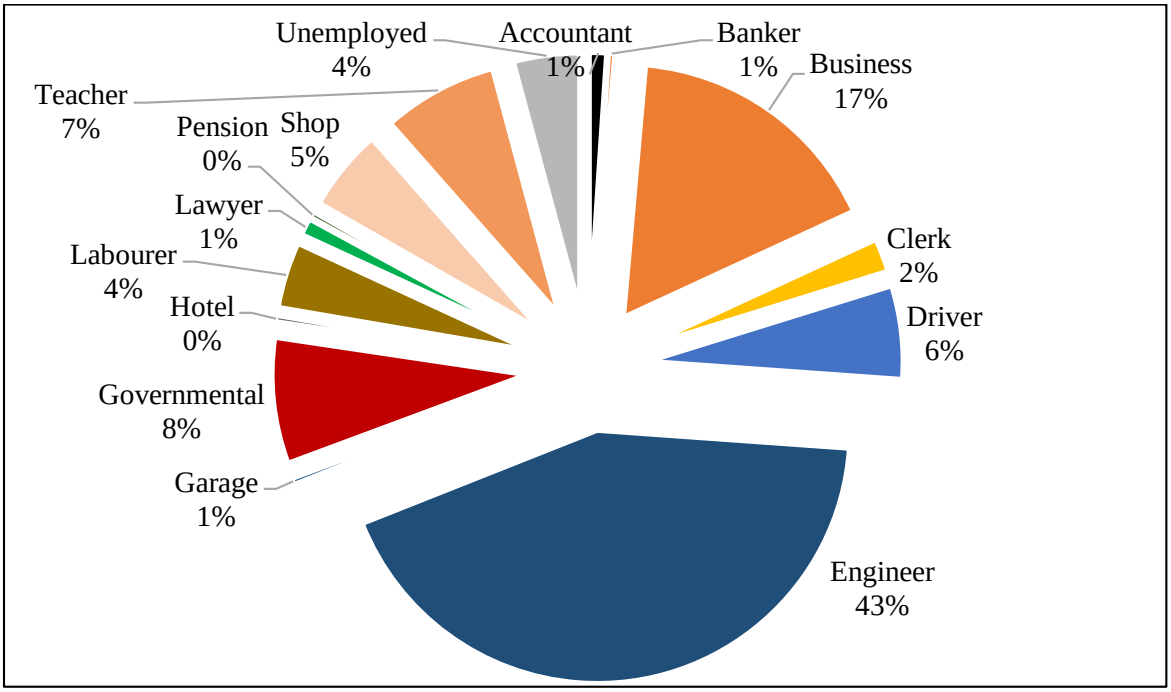


Figure 3: Distribution based on occupation.

d. Distribution based on Level of Education:

236 (82.23%) participants graduated from a college whereas 46 (16.03%) participants attended high school. 3 (1.05%) participants attended junior school whereas 2 (0.70%) of the participants attended primary school.

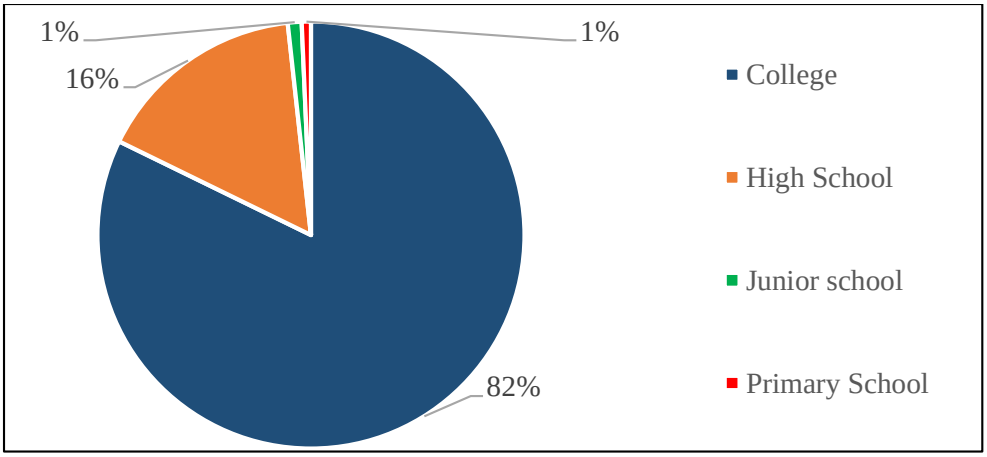


Figure 4: Distribution based on level of education.

e. Distribution based on Marital Status:

Of the 287 participants, 156 (54.36%) participants were single. Married people made up 41.81% (120) of the total, followed by participants with a partner (9, 3.14%). There was 1 (0.35%) divorced man and 1 (0.35%) widowed woman.

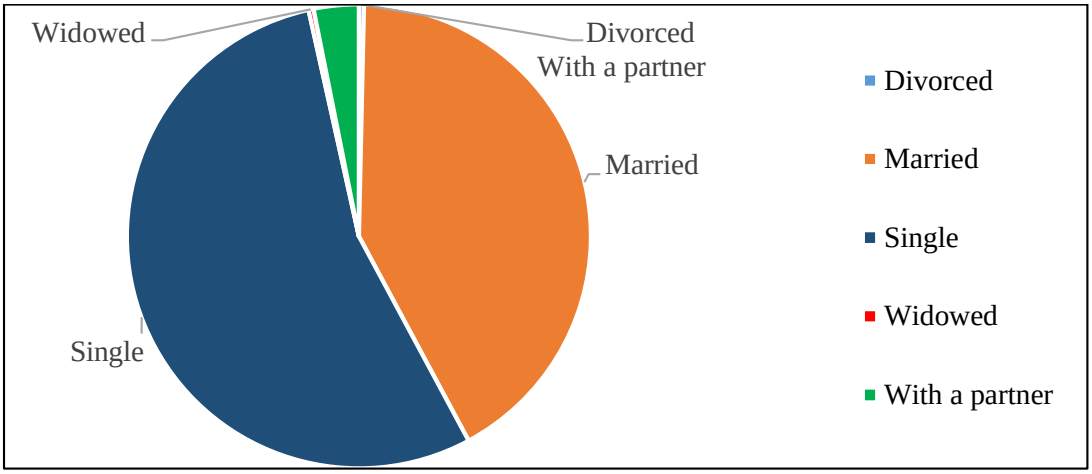


Figure 5: Distribution based on marital status.

f. Distribution based on Socio-economic status:

Participants from the upper middle class (211, 73.54%) dominated the group.

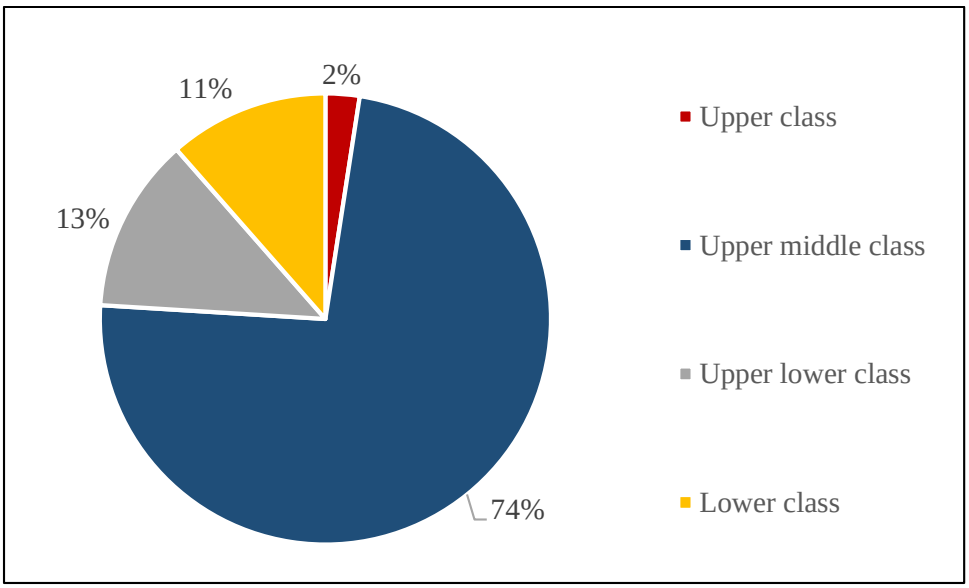


Figure 6: Distribution based on socio-economic status.

Ateshim Questionnaire

a. Most (235, 81.88%) of the respondents claimed that they know about antibiotics while 31 (10.80%) of them had no idea about antibiotics. 21 (7.31%) participants had a rough idea about antibiotics.

Table 1: Do you know what antibiotics are?

Knowledge on antibiotics	**Number of Participants**	**Percentage**
Yes	235	81.88%
A rough idea	21	7.31%
No	31	10.80%
Grand Total	**287**	**100.00%**

b. Majority (185, 64.45%) of the 287 participants chose bacterial infections when asked the following question. However, amongst these 185 participants, 55 (29.73%) of them selected others reasons too. 130 (70.27%) of them selected the reason for use of antibiotics as 'for bacterial infections only'. This data concludes that only 130 (45.29%) participants know the true use of antibiotics. Viral infections (81, 28.22%) and fungal infections (20, 6.90%) were chosen as the reason by next majority of the participants. 12 (4.18%) and 9 (3.13%) participants chose aches and pains, and fever as the reason for use of antibiotics.

Table 2: What are antibiotics used for?

Antibiotics are used for	**Number of Participants**	**Percentage**
Bacterial infections	185	64.45%
Viral infections	81	28.22%
Fungal infections	20	6.90%
Fever	9	3.13%
Aches and Pains	12	4.18%

c. Of the 287 participants, 128 (44.60%) of them selected 'yes' when presented with the following question. 119 (41.46%) of them selected 'no', while 40 (13.93%) respondents did not know if antibiotics could be used for common cold.

Table 3: Are antibiotics effective against common cold?

Antibiotics effective against common cold	**Number of participants**	**Percentage of participants**
Yes	128	44.60%
Do not know	40	13.93%
No	119	41.46%
Grand Total	**287**	**100.00%**

d. Although 78 (27.17%) and 38 (13.25%) participants had a misconception on self-medication with antibiotics, majority (171, 59.58%) of them agreed that it was an unacceptable practice.

Table 4: Is the practice of SMA acceptable?

Self-medication of antibiotics	**Number of Participants**	**Percentage**
Acceptable	78	27.17%
Do not know	38	13.25%
Not acceptable	171	59.58%
Grand Total	**287**	**100.00%**

e. Of all the study participants, 263 (91.64%) of them at least once in their life, took antibiotics either prescribed by a qualified clinician or self-prescribed. 14 (4.88%) of them had no idea whether or not they had taken an antibiotic before.

Table 5: Have you ever taken antibiotics?

Antibiotics taken before	**Number of Participants**	**Percentage**
Yes	263	91.64%
No	10	3.48%
Do not Know	14	4.88%
Grand Total	**287**	**100.00%**

f. 95 (33.10%) of the respondents claimed they never self-medicated themselves with antibiotics. However, the majority (192, 66.90%) of the participants had self-medicated with antibiotics for a frequency of 1 (29.62%) to 10 (0.35%) times.

Table 6: How often have you practiced SMA in the past year?

Frequency of self-medication	**Number of Participants**	**Percentage**
No	**95**	**33.10%**
0	95	33.10%
Yes	**192**	**66.90%**
1	85	29.62%
2	46	16.03%
3	30	10.45%
4	15	5.23%
5	10	3.48%
6	2	0.70%
7	1	0.35%
8	2	0.70%
10	1	0.35%
Grand Total	**287**	**100.00%**

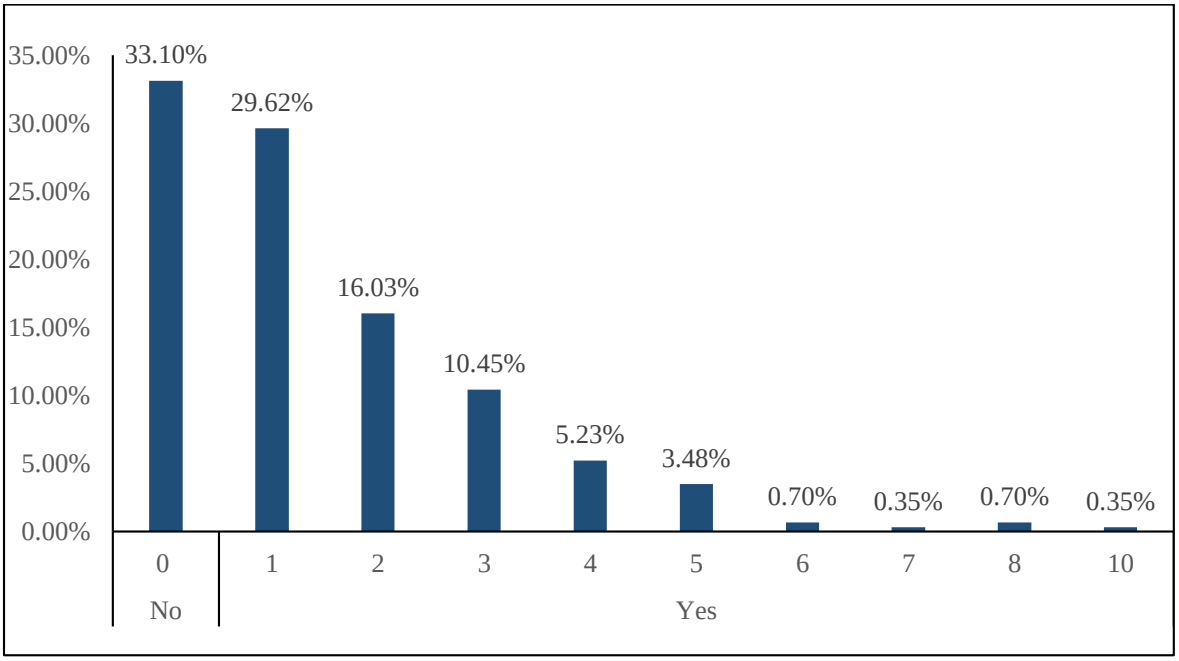


Figure 7: How often have you practiced SMA in the past year?

g. The following are the reasons for self-medication among the 192 participants that have self-medicated with antibiotics before. With 'disease was not serious' being the reason amongst the majority (51, 17.77%), the following major reasons are 'previous successful experience' and 'to get quick relief'. The least chosen reason was 'convenience of place' (3, 1.56%).

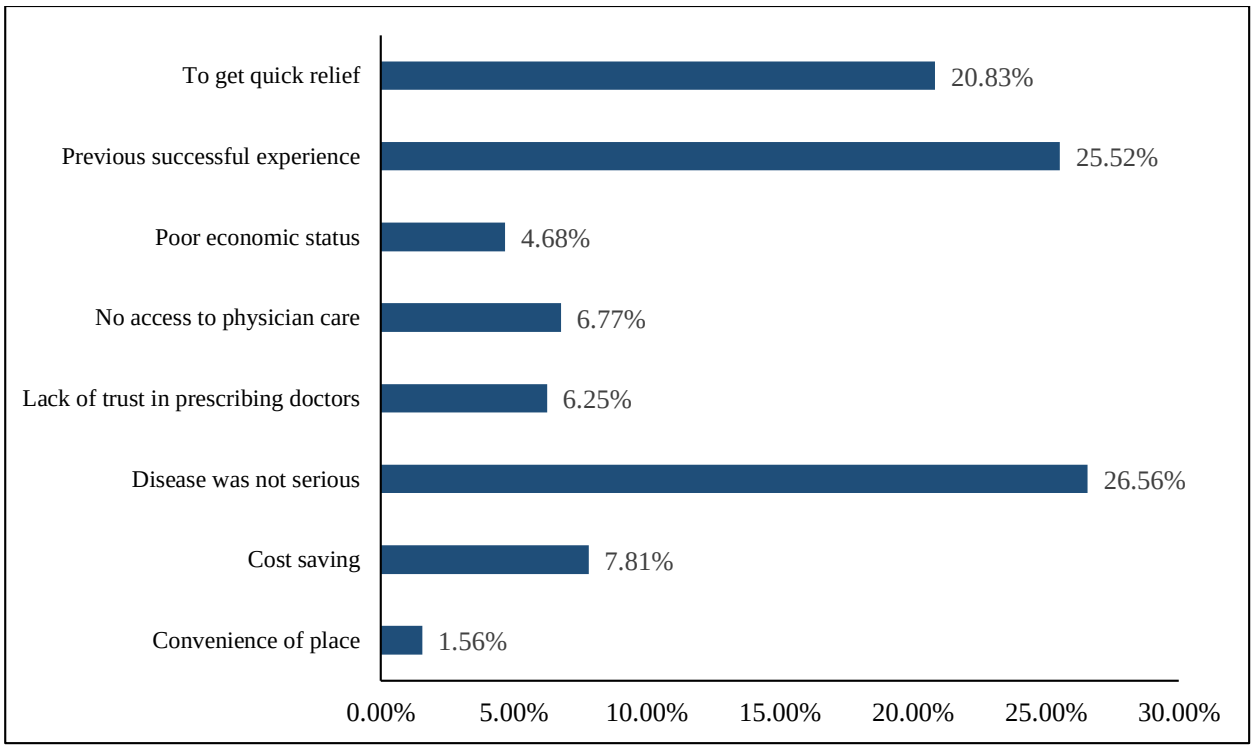


Figure 8: What were your reasons for SMA?

h. With respect to the particular complaint alone, the frequency of each complaint was tabulated along with the number of participants. It was found that majority of the people resorted to self-medication with antibiotics in case of fever (61, 31.77%). Cough (54, 28.12%), sore throat (43, 22.39%) and runny nose (42, 21.87%) were the next following reasons. Ear/eye infections (16, 8.33%), aches and pains (6, 3.12%), and vomiting (1, 0.52%) were the least common reasons for self-medication with antibiotics in these communities.

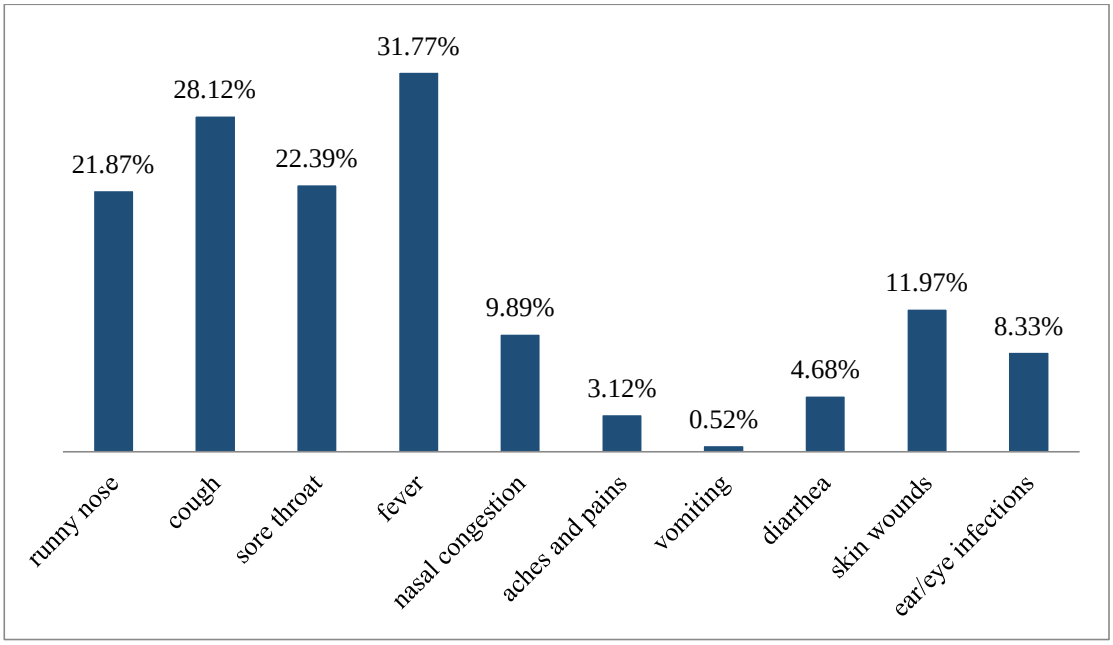


Figure 9: For which complaints have you practiced SMA?

i. Majority of the participants (57, 29.68%) selected the antibiotic after consulting a pharmacist. 37 (19.27%) and 36 (18.75%) participants selected the antibiotic after asking friends/family and based on previous doctor's prescription respectively. The least number of them consulted a physician (17, 8.85%) in this case.

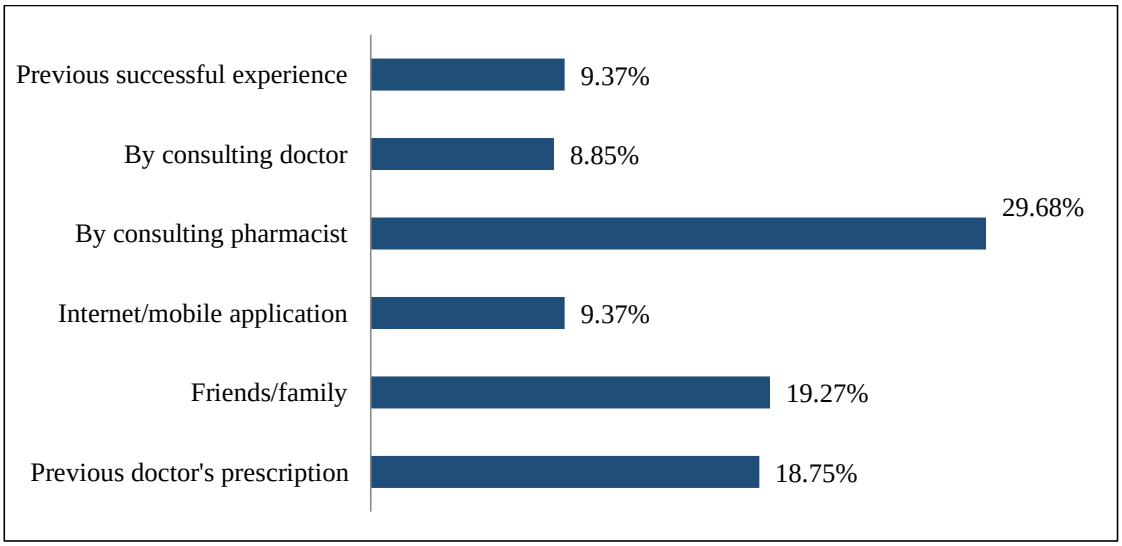


Figure 10: What was your selection of antibiotic based on?

j. Majority (68, 35.41%) of the participants claimed they consulted a pharmacist before consuming an antibiotic. However, the next majority (55, 28.64%) of them self-medicated based on their previous successful experience.

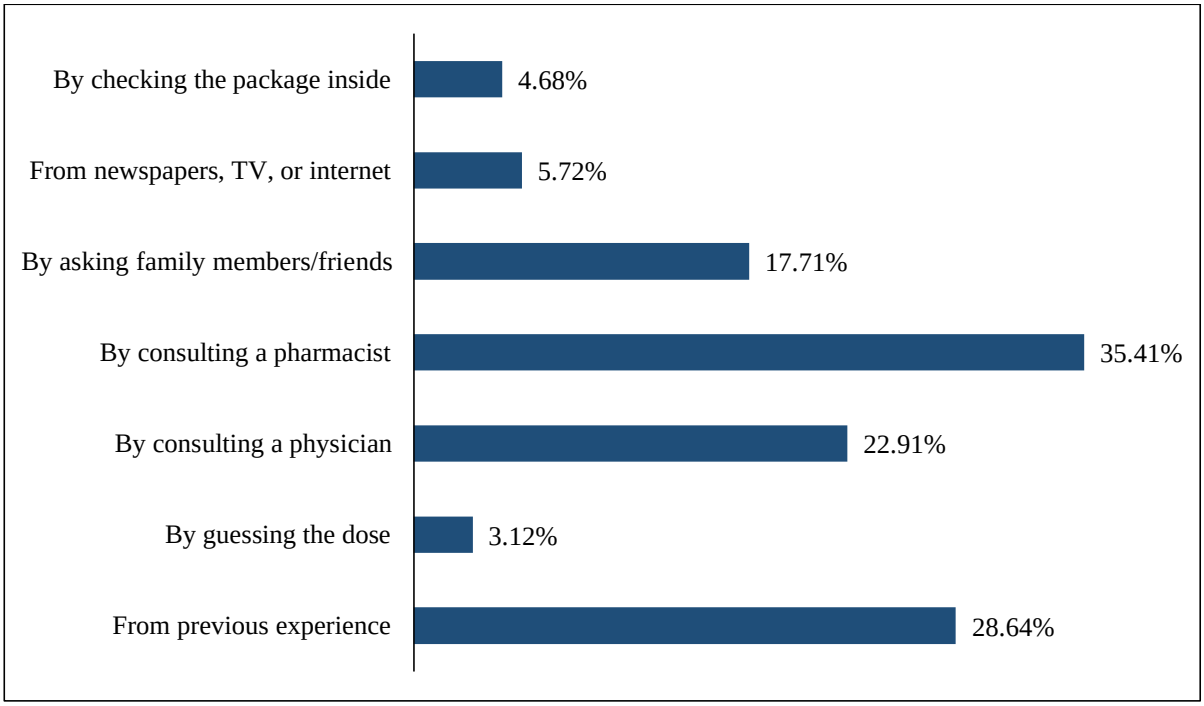


Figure 11: How did you know the dosage of antibiotics?

k. 125 (65.10%) of the participants did not change the dosage of antibiotic during the course. However, the next majority (63, 32.81%) of them did change the dosage. A very few of them (4, 2.08%) agreed to have deliberately changed the dosage every time they self-medicated with antibiotics.

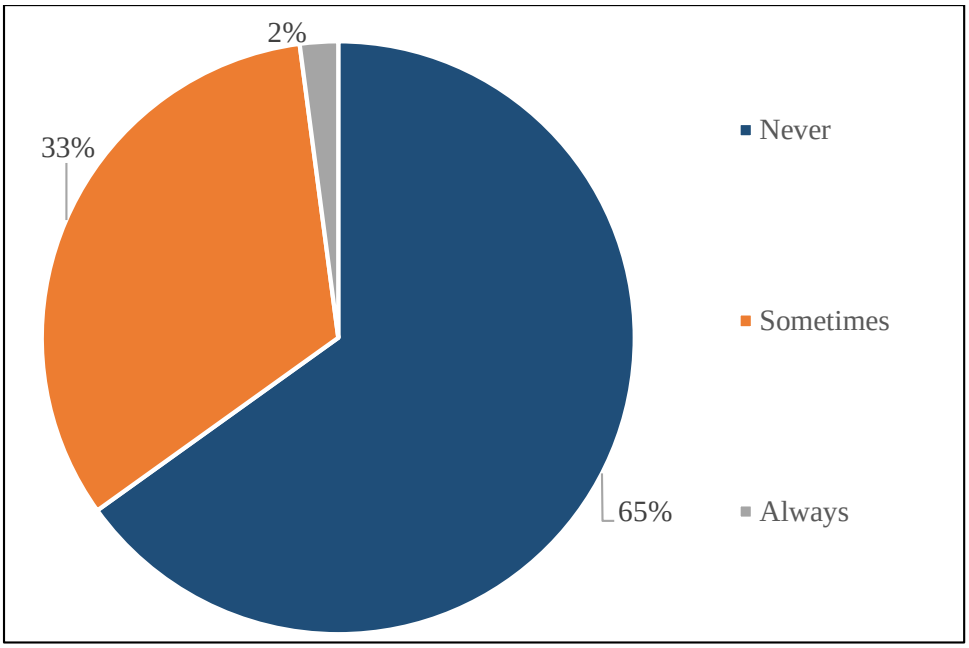


Figure 12: Have you ever deliberately changed the antibiotic dosage?

l. Of the 67 participants who deliberately changed the dosage of antibiotic during the course of self-treatment, improving condition (28, 41.79%) was the major reason. 14 (20.89%) of them did it to reduce adverse reactions and 13 (19.41%) of them changed the dosage due to worsening of their health condition.

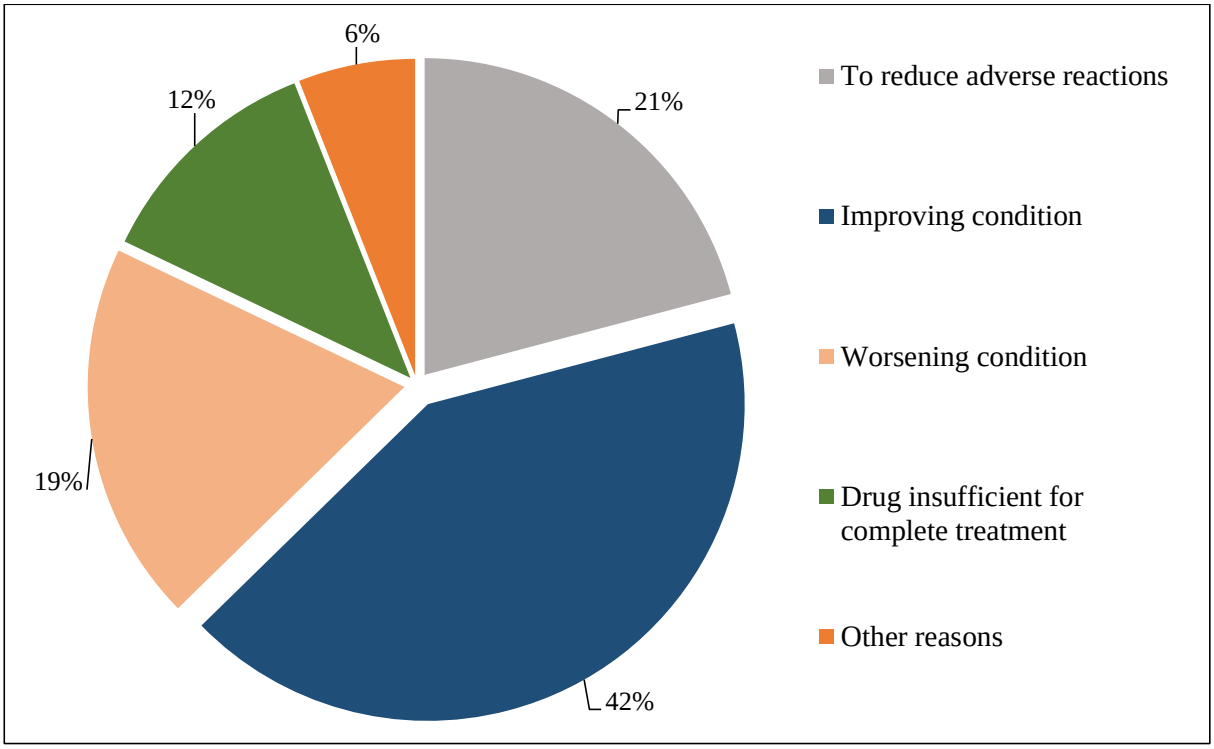


Figure 13: What were your reasons for changing the antibiotic dosage?

m. As it is clear from the represented data, azithromycin (31, 16.14%) and amoxicillin (30, 15.62%) are very commonly used antibiotics for self-medication when compared to other presented antibiotics. The amoxicillin-clavulanate combination (8, 4.16%) and penicillin (4, 2.08%) are the next preferred antibiotics for self-medication in these communities.

Table 7: Which antibiotic have you commonly used for SMA?

Antibiotics	Number of participants	Percentage
Amoxicillin-Clavulanate	8	4.16%
Amoxicillin	30	15.62%
Azithromycin	31	16.14%
Clarithromycin	1	0.52%
Erythromycin	1	0.52%
Cefpodoxime	3	1.56%
Penicillin	4	2.08%
Co-trimoxazole	2	1.04%
Ceftriaxone	2	1.04%
Cefotaxime	1	0.52%
Tetracycline	3	1.56%
Doxycycline	1	0.52%
Cefazolin	1	0.52%
Ciprofloxacin	1	0.52%
Ofloxacin	2	1.04%
Cefixime+Ofloxacin	1	0.52%

n. Evidently, majority (59, 30.72%) of them stopped taking the antibiotic soon after symptoms reduced while the next majority (56, 29.16%) of them completed the antibiotic course. 1 (0.52%) participant supposedly stopped taking the antibiotic after 5 days of initial dose.

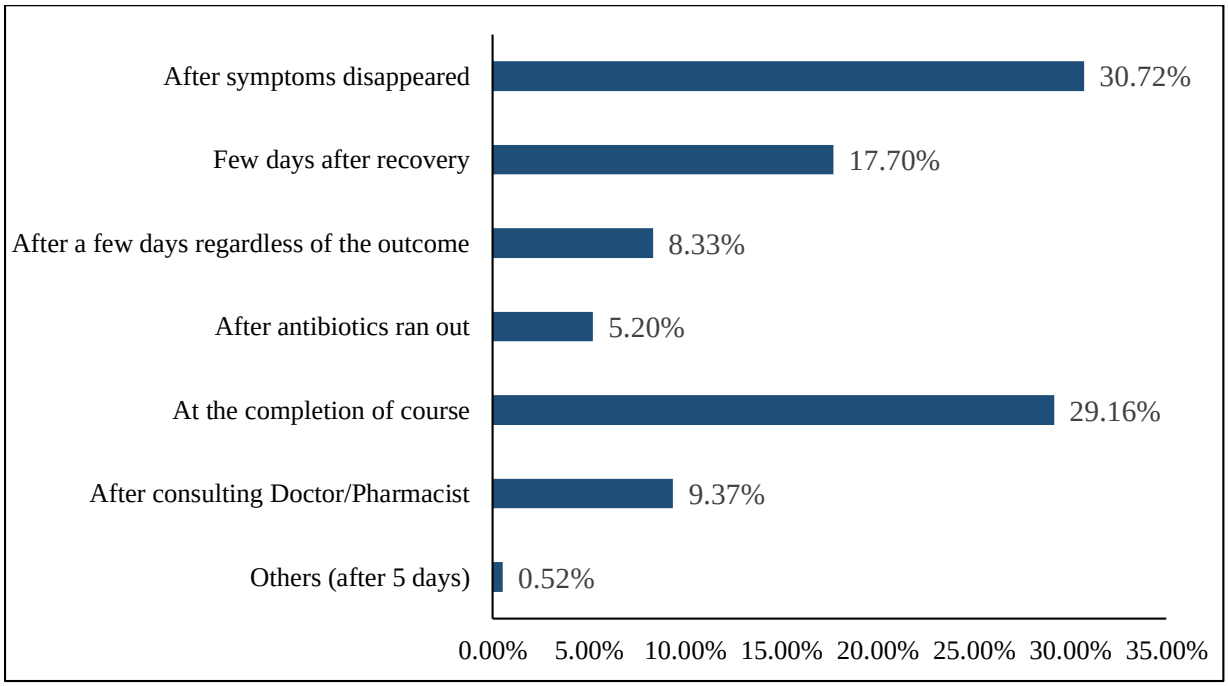


Figure 14: When did you normally stop taking the antibiotic?

o. Of the 192 participants that self-medicated with antibiotics, most of them (130, 67.70%) supposedly did not experience any specific side-effects. Yet, 31 (16.15%) respondents seemed to have experienced certain side-effects. The remaining participants (31, 16.15%) were unable to clearly recall about the same.

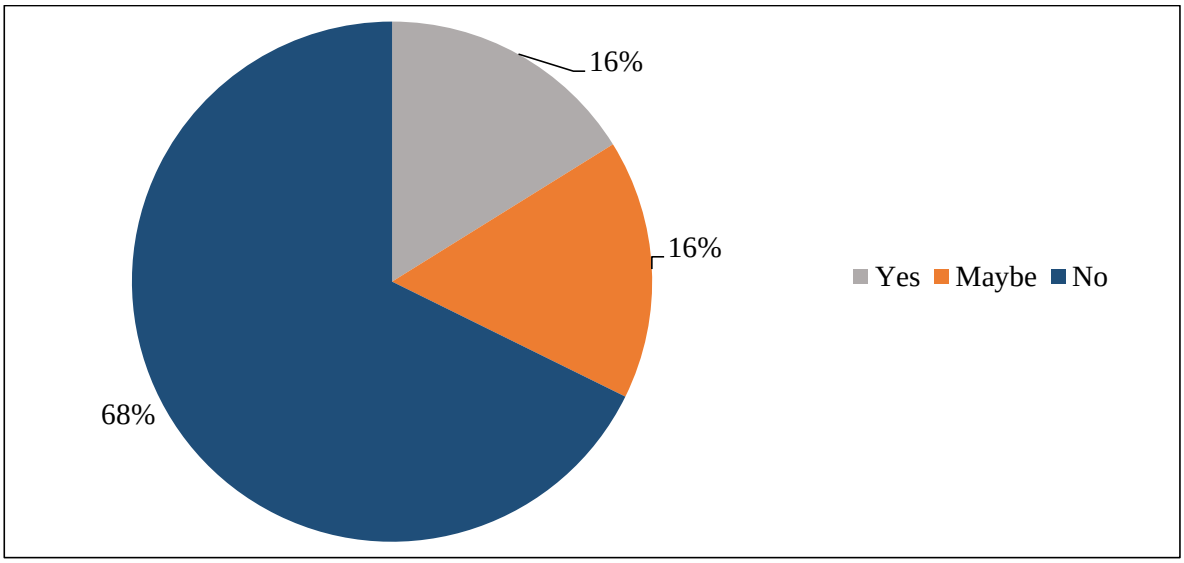


Figure 15: Did you experience any Side-effects while practicing SMA?

p. Majority of the 62 participants experienced loss of appetite (12, 19.35%) and nausea (12, 19.35%). Bloating associated with indigestion (9, 14.51%) was the next common side effect experienced. Constipation was the least experienced side effect (2, 3.22%).

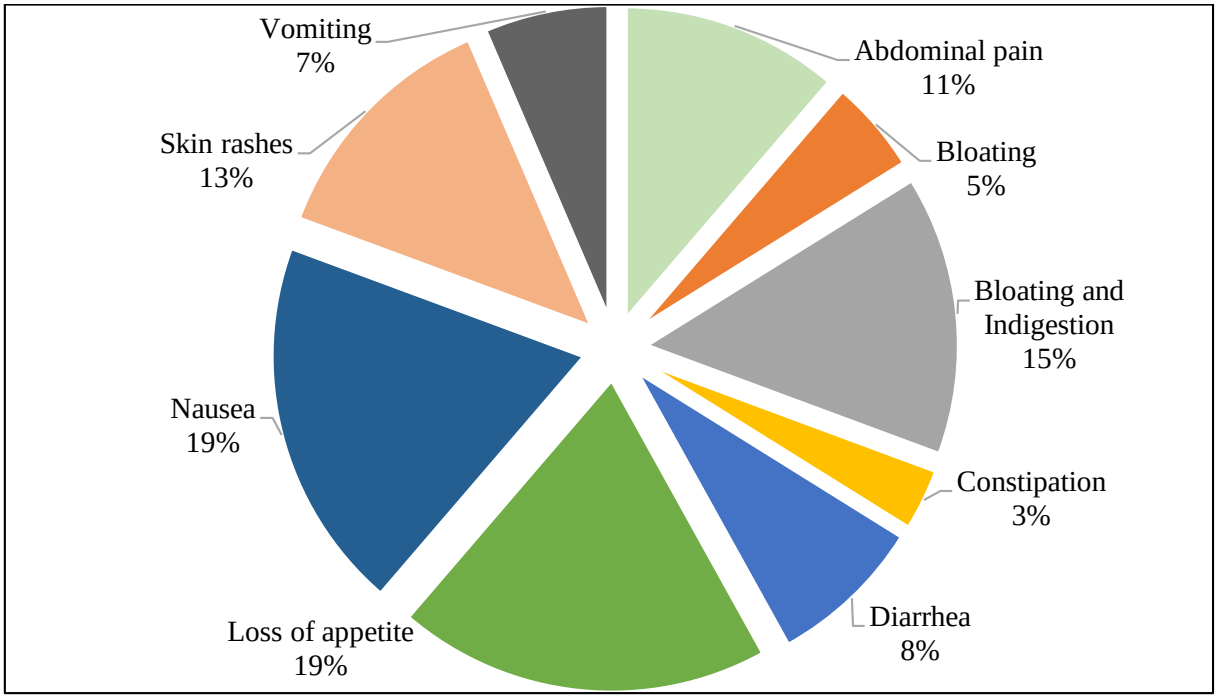


Figure 16: Which side-effects did you experience during SMA?

q. Majority (4, 30.76%) of them experienced side-effects associated with amoxicillin consumption, out of which diarrhea was more common (2, 15.38%). Azithromycin associated side-effects were experienced by the next majority of participants (3, 23.07%).

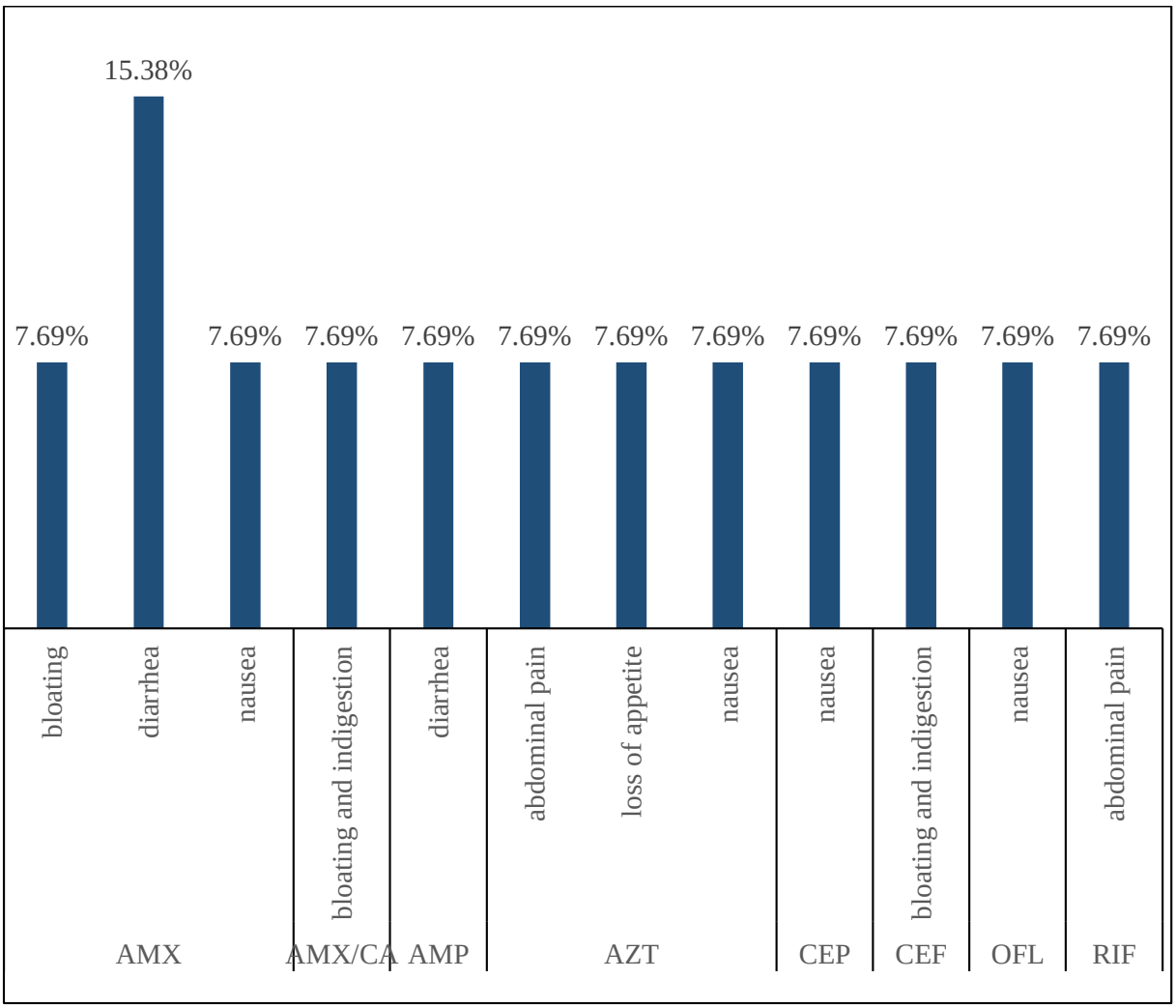


Figure 17: Name of antibiotic that caused the Side-effect

r. 100% (7) practice of SMA was seen in the upper class and absolutely no (0%, 0) practice of SMA was seen in the lower class of the community. SMA was 93.83% (161) and 80.55% (24) in the upper middle and upper lower class of the community respectively.

Table 8: Practice of SMA in different SES

SES	SMA	Percentage of participants
Upper class	7	100%
Upper middle class	161	93.83%
Upper lower class	24	80.55%
Lower class	0	0%

DISCUSSION

The study was a observational study conducted in the communities of Soldevanahalli and AGB Layout, Bengaluru. It included 287 participants based on inclusion and exclusion criteria.

The study population was dominated by upper-middle class participants (73.54%) and females (55%). In this study, self-medication with antibiotics was found to be prevalent. This finding is comparable with the studies carried out by Ateshim Y *et al* in Eritrea[18] and Nepal A *et al* in Nepal[19]. The prevalence of Self-medication of Antibiotics (SMA) identified in this study was lower than that reported in Ethiopia[20] (conducted by Beedemariam Gebretekle *et al*), but higher than Eritrea and Nepal. These varied differences in prevalence of SMA may be due to differences in study designs, population studied, questionnaires and scales used.

Similar to the study conducted by Machowska A *et al*, the drivers of SMA were found to be "lack of public knowledge and awareness" and "easy access to antibiotics without a prescription"[21]. An added finding of this study was that patients resorted to SMA when the "disease was not serious", due to "previous successful experience" and "to get quick relief". It was clear that people have a misapprehension about the effectiveness of antibiotics against treating fever.

The study revealed that azithromycin (34%) and amoxicillin (33%) were the most commonly used antibiotics for self-medication. This trend might be explained by the fact that both drugs are well-known to the community and have broad spectrum of antibacterial activity thereby inducing the community pharmacists to dispense them over other antibiotics. Azithromycin belongs to the drug class of macrolides that is known to cause gastrointestinal issues. Consumption of antibiotics without a healthcare professional's guidance may cause severe damage. Community pharmacies were found to be the main source for people to acquire antibiotics.

It was encouraging that most participants studied by Ateshim Y *et al* in Eritrea[18] know the correct indications of antibiotics (i.e., for bacterial infections only), unlike this study. Majority (54.71%) had an impression that antibiotics were effective against viral and fungal infections, fever, and aches and pains. It is concerning that more than half of the participants had self-medicated with antibiotics to treat common cold. At this point, public awareness is crucial to fight antimicrobial resistance.

An interesting finding of this study which was contrary to the study conducted in New Jersey by Edwards D J *et al* was that SMA in participants from lower SES was not prevalent like in their higher counterparts[22]. This may be due to the fact that people from lower SES in India have free access to physician (government hospitals). Therefore, there is already a limited scope for SMA in their case. However, this does not eradicate the fact that majority of the population are still prone to SMA as they do not have free consultation with any physician.

These findings call for an immediate involvement of government and healthcare authorities. Public sensitization on rational use of antibiotics and strict regulation should be enforced in order to overcome misuse of antibiotics and thereby prevent the threat of ABR.

CONCLUSION

Antibiotics are the agents used to treat bacterial infections only. The understanding that antibiotics are effective against all infections, any type of pain, and fever has led to misuse and overuse of antibiotics. This is driving us towards an inevitable global threat of ABR.

The aim of this study was to assess the misuse of antibiotics in the community and the most commonly misused antibiotic. Despite majority considering SMA as an inappropriate practice, their antibiotic seeking behaviour was found to be widespread. Popping an antibiotic to get quick relief or when the disease is not serious has become a common trend, especially in skilled employees where they are forced to sit constantly for hours and work using computers. This is an issue that must be quickly addressed as it is irrational.

Side effects associated with antibiotics used for self-medication indicate the importance of counselling prior to dispensing. It was also observed that only a few respondents completed the course of antibiotics. Majority of them stopped taking the antibiotic after the symptoms resolved. A bothersome amount of people deliberately changed the dosage of antibiotics during the course due to reasons such as: improving condition, to reduce adverse effects, worsening of condition and the drug being insufficient for complete treatment.

Healthcare professionals must play their role regarding public education and counselling. Corrective measures, if taken right away, may save the human race from impending doom.

ACKNOWLEDGEMENT

We express our sincere gratitude to all the people associated with this study for guiding, helping and supporting us throughout the journey of this project.

Funding

This research work did not receive any kind of funding.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ABR: Antibiotic Resistance; **AWaRe:** Access, Reserve and Watch; **PNSP:** Penicillin-non-susceptible *Streptococcus pneumoniae*; **SES:** Socio-economic Status; **SMA:** Self-medication of Antibiotics.

SUMMARY

The word "antibiotics" has become a common term that is understood, although incorrectly perceived by laymen. Overuse and misuse of antibiotics have widely been practiced over the years, which led to the threat of antibiotic resistance. According to a study conducted by the Indian Council of Medical Research, cephalosporins (60%) and fluoroquinolones (41.5%) were found to have maximum resistance in the Indian population. Antibiotic resistance has made it harder to control and treat certain serious bacterial infections such as tuberculosis, pneumonia, sepsis and so on. The goal of this study was to assess the misuse of antibiotics in the community; the category of antibiotic being misused, patient compliance to antibiotic course, to observe side effects, and to identify any relation between socio-economic status and self-medication of antibiotics. This was an observational study. The subject's demographic details and responses were collected with the help of a standardized questionnaire which were then entered in Microsoft Excel and appropriate statistical analysis was performed. A total of 287 participants were recorded of which 154 were females, the mean age was 30.75 ± 11.13 years, and majority belonged to the upper-middle class. Self-medication of antibiotics was seen in 66.20% of participants. "Disease was not serious", "previous successful experience" and "to get quick relief" were the most common reasons. A macrolide, azithromycin (34%) was the most commonly misused antibiotic. Majority (30.72%) stopped taking antibiotics after the symptoms resolved which indicated poor patient compliance. Loss of appetite (19.35%) and nausea (19.35%) were the most common side effects experienced. An interesting finding was that the self-medication was absolute (100%) in the upper-class whereas nil (0%) in the lower-class of the economy. Preventive measures must be implemented by the respective regulatory authorities and corrective measures must be taken by the healthcare professionals.

REFERENCES

1. Davies J . Are antibiotics naturally antibiotics? J Ind Microbiol and Biotechnol. 2006 Jul 01;33(7):496-9. doi: 10.1007/s10295-006-0112-5, PMID 16552582.

2. Alnemri AR, Almaghrabi RH, Alopnazi N, Alfrayh AR. Misuse of antibiotic: A systematic review of Saudi published studies. Curr Pediatr Res. 2016. Issue 2. Vol. 20.

3. Hindustan times. Antibiotic intake in India rises by 30% in a decade. Available from: https://www.hindustantimes.com/india-news/antibiotic-intake-in-india-rises-by-30-in-a-decade-says-report-101612377295525.html.

4. Centre for Disease Dynamics, Economics & Policy. Increase in global consumption of antibiotics reflects stewardship challenges [cited April 06 2021]. Available from: https://medicalxpress.com/news/2020-07-global-consumption-antibiotics-stewardship.html.

5. Willacy H . Antibiotics [internet]; 2020 May 27. Patient Info. [cited Apr 07 2021]. Available from: https://patient.info/infections/antibiotics-leaflet.

6. Kapoor G, Saigal S, Elongavan A. Action and resistance mechanisms of antibiotics: A guide for clinicians. J Anaesthesiol Clin Pharmacol. 2017;33(3):300-5. doi: 10.4103/joacp. JOACP_349_15, PMID 29109626.

7. Antibiotics - side effects [internet]. uk: National health service. [cited Apr 08 2021]. Available from: https://www.nhs.uk/conditions/antibiotics/side-effects/.

8. Antibiotic resistance [internet]. Who [cited Apr 08 2021]. Available from: https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance.

9. Lobanovska M, Pilla G. Penicillin's discovery and antibiotic resistance: lessons for the future? Yale J Biol Med . 2017;90(1):135-45. PMID 28356901.

10. Bronzwaer SLAM, Cars O, Buchholz U, Mölstad S, Goettsch W, Veldhuijzen IK, *et al*. A European study on antimicrobial use and antimicrobial resistance. Emerg Infect Dis;8(3):278-82. doi: 10.3201/eid0803.010192.

11. CDC. Antibiotic use questions and answers [internet]. Centers for Disease Control and Prevention; 2019 [cited Apr 09 2021]. Available from: https://www.cdc.gov/antibiotic-use/q-a.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fantibiotic-use%2Fcommunity %2Fabout%2Fshould-know.html

12. Mugada V, MahatoV, Andhavaram D, Vajhala SM. Evaluation of prescribing patterns of antibiotics using selected indicators for antimicrobial use in hospitals and the Access, Watch, Reserve (AWaRe) classification by the World Health Organization. Turk J Pharm Sci. 2021;18(3):282-8. doi: 10.4274/tjps.galenos.2020.11456, PMID 34157817.

13. Tankeshwar A . WHO AWaRe classification of antibiotics [internet]. Microbe Online [cited Apr 12 2021]. Available from: https://microbeonline.com/who-aware-classification-anti biotics/.

14. Jha DN. Most Healthy Indians resistant to common antibiotics: study [internet]. Economic Times. CMS [cited Apr 13 2021]; 2019.

15. Perappadan BS. Display information on 7 common antibiotics. Central Drugs Standard Control Organization [internet]; 2019. The Hindu [cited Apr 13 2021]. Available from: https://www.thehindu.com/sci-tech/health/display-information-on-7-common-antibiotics-central-drugs-standard-control-organisation/article26823575.ece.

16. CDC. What exactly is antibiotic resistance? [internet]. Centers for Disease Control and Prevention; 2022 [cited Jul 8 2022]. Available from: https://www.cdc.gov/drugresistance/about.html#:~:text=Antibiotic%20resistance%20has%20the%20potential,most%20urgent%20public%20health%20problems

17. Llor C, Bjerrum L. Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. Ther Adv Drug Saf. 2014;5(6):229–41. doi: 10.1177/2042098614554919, PMID 25436105.

18. Ateshim Y, Bereket B, Major F, Emun Y, Woldai B, Pasha I, *et al*. Prevalence of self-medication with antibiotics and associated factors in the community of Asmara, Eritrea: a descriptive cross sectional survey. BMC Public Health. 2019;19(1):726. doi: 10.1186/s12889-019-7020-x, PMID 31182071.

19. Nepal A, Hendrie D, Robinson S, Selvey LA. Knowledge, attitudes and practices relating to antibiotic use among community members of the Rupandehi District in Nepal. BMC Public Health. 2019;19(1):1558. doi: 10.1186/s12889-019-7924-5, PMID 31771595.

20. Gebretekle GB, Haile Mariam D, Abebe W, Amogne W, Tenna A, Fenta TG, et al. Opportunities and barriers to implementing antibiotic stewardship in low and middle-income countries: lessons from a mixed-methods study in a tertiary care hospital in Ethiopia. PLOS ONE. 2018;13(12):e0208447. doi: 10.1371/journal.pone.0208447, PMID 30571688.

21. Machowska A, Stålsby Lundborg C. Drivers of irrational use of antibiotics in Europe. Int J Environ Res Public Health. 2018;16(1):27. doi: 10.3390/ijerph16010027, PMID 30583571.

22. Edwards DJ, Richman PB, Bradley K, Eskin B, Mandell M. Clinical investigations. Acad Emerg Med. 2002;9(1):22–6. doi: 0.1197/aemj.9.1.22