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Research Article

A Comprehensive Survey on the usages of Antibacterial Drug and its Side Effects and Resistance aiding in Understanding Current Scenarios in Local population of Kolkata, West Bengal, India

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Abstract

Antibiotics are chemical compounds with bactericidal properties, synthesized from microbiological sources. Ancient Egyptians used plant extracts and honey as antimicrobial agents for wound healing, with limited therapeutic impact at low concentrations. History of antibiotics are very old. Now days people use antibiotics to a large extent. The review study was conducted using a series of questions in an online application and was disseminated throughout North 24 Parganas, West Bengal, India, through electronic social media platforms like Facebook, Gmail, and WhatsApp, among others, during the period of. Digital questionnaires were used to collect data on antibiotic intake and participant reactions to antibiotic usage, encouraging participation. This review explores the impact, knowledge, side effects, resistance, and usage of antibiotics in local populations, aiding in understanding current scenarios and future plans for antibiotic research.

Keyword: Antibiotics; Chemotherapeutics; Online Application; Digital Questionnaires; Resistances

Introduction

Anti-biotics are chemical substances that are generally synthesized from a microbial source and those substances have bactericidal properties or can prevent bacterial growth [1]. The therapeutic effect of antibiotics is produced in a very low concentration [2]. In ancient times several types of extract like plant extract and other types of extract and moulds were used by people to treat infected wounds and this evidence is found in ancient Egyptian history. Alexander Flaming is the person who discovers the antibiotics through his disorganized condition of work. He observed that the bread fungi which was *Penicillium notatum had caused an infection to the bacterial culture plate which contains Staphylococcus. Later times Flaming had done several works on it including isolation of the particular fungi and cultured the fungi. He also proved that a very low concentration of the fungi can limit the growth of bacteria. Now we all know that compound as a penicillin* [3].

It is a clear statement that most successful chemotherapeutic agent [4]. *The first penicillin, penicillin G was first isolated by* Ernst Chain and Howard Florey in the year of 1942. Availability of this antibiotic in the outside world from the associated military in the year 1945 [5]. Before antibiotics, in Old America, quinine which is extracted from cinchona was used to treat malaria by the parasite-cidial effect. Also, it was found that honey was used as an antibacterial compound. The high sugar content and acidity of honey restrict the growth of bacteria and current research also proved it as a strong antibacterial agent [6]. The concept of anti-infective and in vast words chemotherapy was developed by Paul Ehrlich [7]. He was the developer of a synthetic pro-drug where arsenic was used as the active pharmaceutical ingredient and named as neo-salvarsan and salvarsan (salvation arsenic) to treat syphilis caused by *Treponema pallidum* [8,9]. This discovery was termed as magic bullet for its target specificity [10]. The revolution of treatment of bacterial infection began with the discovery of antibiotics. Different types of infection as infection of the sinus and ear, infection in the oral cavity, infection over the skin, throat infection meningitis urinary infection, renal infection, pneumonia caused by bacteria, and whooping cough can be treated by bacteria. Mentioned infections can only be treated if the bacteria are the causative microorganism [11,12]. Antibiotics application does not affect viral infection [13]. In today's modern world antibiotics are segregated into different classes. The classes of antibiotics are penicillins, cephalosporins, fluoroquinolones, aminoglycosides,monobactams, carbapenems, macrolides, and some other types of antibiotics are also present as [14]. A noticeable thing is that the use of antibiotics has increased by 46% between the period of 2000 to 2018 and for the countries with middle as well as low income the increase is 76%. Middle East region and North Africa the rate of consumption is highest. Fluoroquinolone and cephalosporin consumption has notably increased in South Asia by nearly 1.8 and 37 folds respectively [15].

Antibiotics undoubtedly are the revolutionary therapeutic agents but it also exerts negative impacts on consumer. Huge number of side effects including anemia (especially hemolytic), nephritis, vaginal candidiasis are the common ones and dermatological problems are highly observed [16,17]. In this era the most concerned issue with antibiotics is the development of resistance [18]. In the present study, a large number of populations was identified and the usage of antibiotics and the side effect associated with it were examined.

Materials and Method

The study was implemented by a set of questions, in an online application and distributed through electronic social media, like WhatsApp, Facebook, Gmail, etc. throughout North 24 Parganas, West Bengal, India, in the time range of 2021 to 2022. The questions were in digital form to encourage participants to respond. The questions were divided into two sections in the online format first was for collecting important information regarding the consumption of antibiotics and the second was to check the participants' reaction about how they react with the use of antibiotics under observation. The answer to those questions was close-ended as the participants had the option to express their thinking on a scale of one to seven. One represents that participant totally agreed with the condition and seven represents that participant totally disagreed with the condition. The questions of the first and second section are represented in 'table 1'.

SL NO	Questions
1	Age
2	Sex
3	Any chronic disease
4	How many times have you consumed anti-biotics during past 12 months
5	If you had taken, then what waste reason?
6	In how many days the disease has cured?
7	Did you complete the course?
8	If no, then for how long did you take the medication?
9	Name of the antibiotic(s) that you took or taken (if any)
10	Did you take the antibiotics against physician's prescription?
11	If no, can we assume that you have a little knowledge about medicine?
12	After taking medication did you feel any Side Effect?
13	If yes or maybe, what was the side effect?
14	Did you share the problem related to side effect with physician?
15	Was medication (antibiotics) stopped or any new medication started to treat the side effect?
16	Did any other adult in your household take antibiotics during the past twelve months? Please tick one option
17	Was any side effect observed in the adult?
18	If yes, then what was the side effect?

19	How was side effect treated?
20	Do you suffer from cough and cold seasonally?
21	If yes, do you take any antibiotic for that?
22	Leftover antibiotics can be saved for personal future use or to give to someone else.
23	Leftover antibiotics should be taken back to the pharmacy.
24	I think that it is good that one needs a prescription to acquire antibiotics from pharmacies in Sweden.
25	I think that it is good that one needs a prescription to acquire antibiotics from pharmacies in Sweden.
26	I think that it is good to be able to buy antibiotics online, without having to see a doctor.
27	I think that it is good to be able to acquire antibiotics from relatives or acquaintances, without having to be examined by a doctor.
28	It is good that one can buy antibiotics without a prescription in pharmacies in certain countries.

Table 1: Questions presented in the first section of the survey form.

Results and Discussion

Enumeration of age groups that participated in the survey: Mostly young age people were interested to participate in survey. Maximum responses were given by people of aged between 18 to 23.

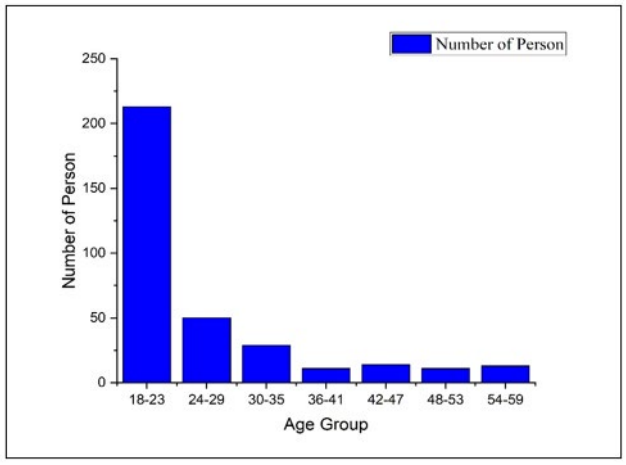

Figure 1: Graphical presentation of age groups.

Enumeration of participants' response to the question about gender: According to the survey we got that male participants were 69.65% and female participants were 30.35%. It reveals that male participants were more enthusiastic to share the information.

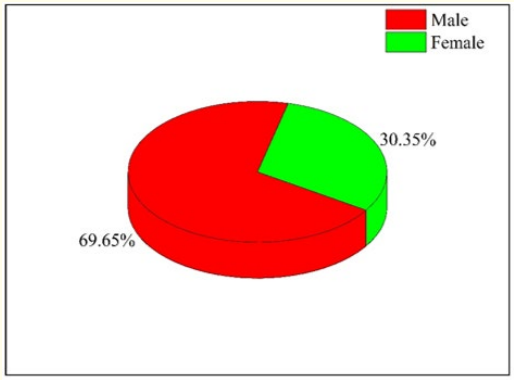

Figure 2: Graphical presentation of gender.

Enumeration of participants' response to the question about chronic disease: As the information obtained from the survey, we got the result that the people who consumed antibiotics most of them about 75.69% were free from any chronic diseases and only 24.31% were suffering from chronic diseases.

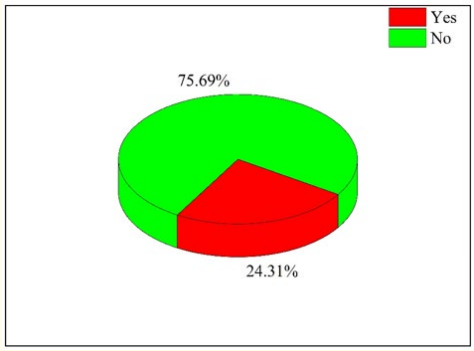

Figure 3: Graphical presentation of presences of any chronic disease in participants.

Enumeration of participants' response to the question about the frequency of consumption of antibiotics: We got the result that 47.11% of participants have consumed antibiotics during the last 12 months for once. 25.72% of participants have consumed antibiotics for 2-5 times. 20.81% population claimed that they never consumed any antibiotics during the last 12 months.

Surprisingly6.36% of the population has consumed antibiotics, more than 5 times. It is an alarming condition.

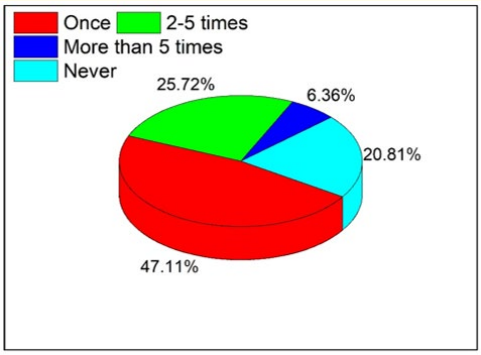

Figure 4: Graphical presentation of presences of frequency of consumption of antibiotics by participants.

Enumeration of participants' responses to the question about the reason for consumption of antibiotics: The common cold was the main reason behind the consumption of antibiotics. 58.3% of participants have consumed antibiotics due to the common cold. COVID-19 was another cause of antibiotic consumption. The percentage against COVID-19 was 8.49%. 4.06% of participants consumed antibiotics due to teeth infection, 4.8% for throat infection, 2.21% for tonsillitis, 5.59% for diarrhea, 1.85% for wound healing, 3.69% for topical infection, and 10.7% for other conditions that cannot be categorized.

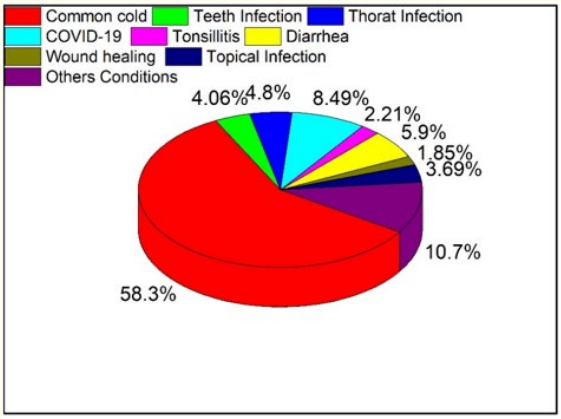

Figure 5: Graphical presentation of causes of consumption of antibiotics by participants.

Enumeration of participants' responses to the question about the period to cure the condition after taking antibiotics: To this particular question most of the participants replied that they took antibiotics only for less than five days days. Only five percent participants replied that they took antibiotics for more than five days.

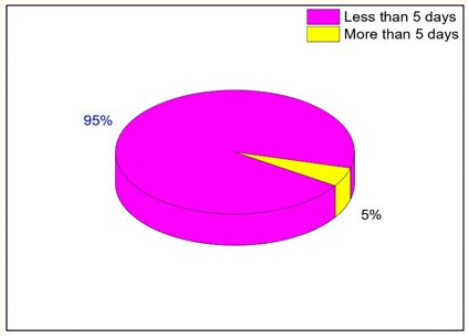

Figure 6: Graphical Presentation of participants' responses to the question on time period of taking antibiotics in condition where they did not complete the course.

Enumeration of participants' responses to the question whether the course is complete or not: 66.78% have participants responded that they have completed the course whereas 33.22% of participants responded that they did not complete the course.

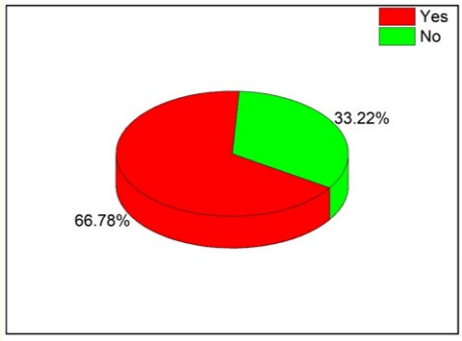

Figure 7: Graphical presentation of completion of antibiotic course by participants.

Enumeration of participants' responses to the question for what period they took the antibiotics if they did not complete the course: The participants who had responded that they did not complete the course of antibiotics among them 80 % (eighty) of the people

had responded that they consumed antibiotics for less than 5 days and rest of the responded they took antibiotics for more than 5 days but not in a manner of multiplier of 5 days.

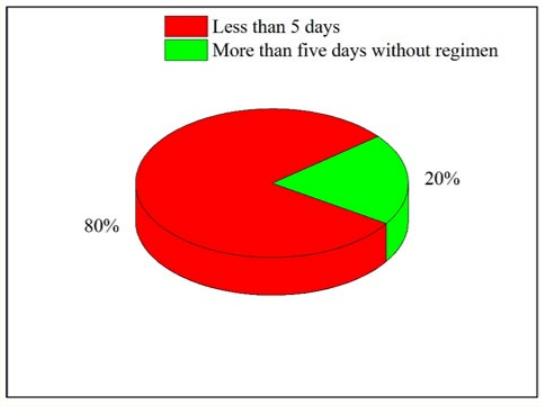

Figure 8: Graphical representation of participants' responses to the question responses to the question for about the time period they took the antibiotics if they did not complete the course.

Enumeration of participants' responses to the question of what was the antibiotic they consumed: Participants who responded that they consumed antibiotics during last twelve months, most of them responded that they consumed azithromycin. Second highly consumed antibiotics was a fixed dose combination of amoxycillin and clavulanic acid. Least consumed antibiotic was erythromycin.

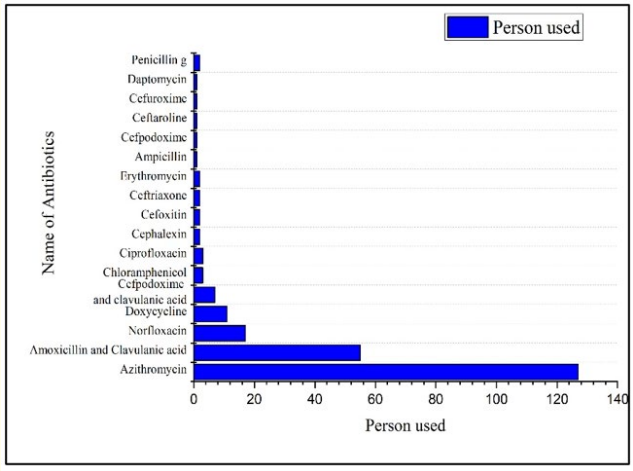

Figure 9: Graphical representation of the participants about the name of antibiotics they had consumed.

Enumeration of participants' responses to the question about whether they took antibiotics against prescription or not: In the case of antibiotics a prescription is mandatory so we asked. 47.93% of participants responded that they took antibiotics against their physician's prescription and the rest of them did not take antibiotics against prescription.

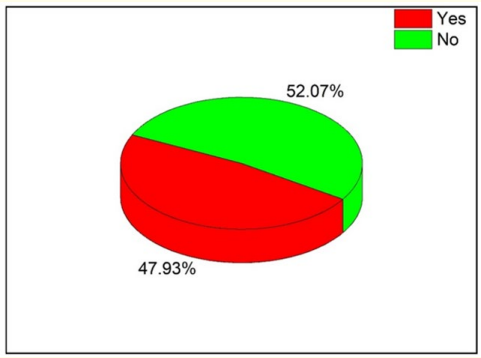

Figure 10: Graphical presentation of consumption of antibiotics by participants against physicians' prescription.

Enumeration of participants' responses to the question about their knowledge of medicine: For the participants who took antibiotics without any prescription we put a question on their knowledge of medicine. 73.26% of participants have claimed that they have a little bit of knowledge of medicine. 26.74% of participants responded that they don't have any knowledge of medicine.

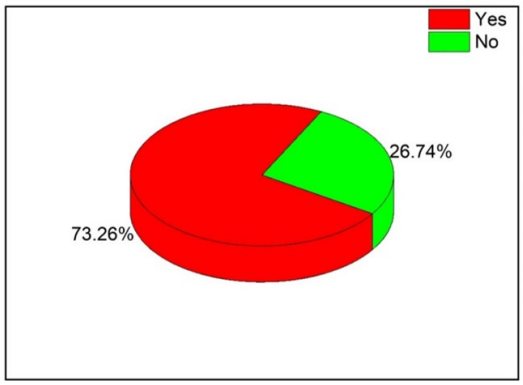

Figure 11: Graphical presentation of participants response whether they have any knowledge about medicine.

Enumeration of participants' responses to the question about the side effect of antibiotics: Occurrences of side effect is a common issue with antibiotics. In this survey, only 13.45% of participants who consumed antibiotics responded about the side effects they observed. 62.41% of participants responded that they did not feel any side effects and 24.14% of participants were unable to confirm about side effects.

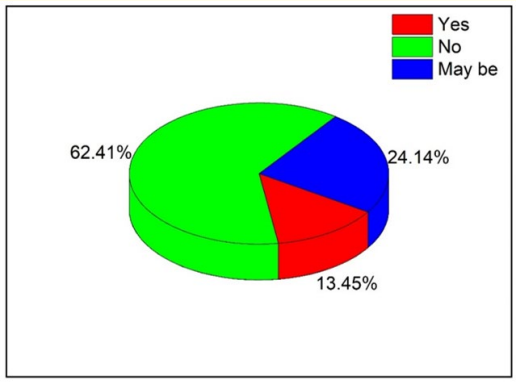

Figure 12: Graphical presentation of participants responses whether they felt any side effect.

Enumeration of participants' responses to the question of what was the side effect they felt

Enumeration of participants' responses to the question about sharing their side effect-related problem with their physician: Of participants who felt side effects, among them only 26.9% of participants shared their problem with the physician, and the rest 73.1% did not share their problem with the physician.

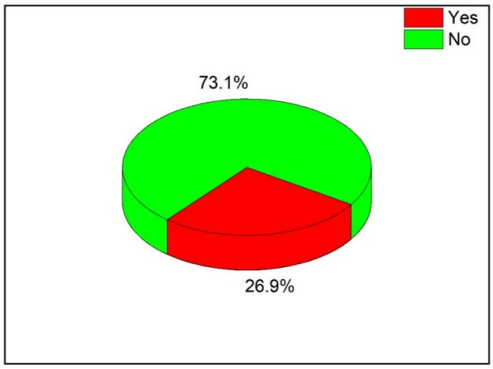

Figure 13: Graphical presentation of participants' responses if they shared their problem with the physician.

Enumeration of participants' responses to the question about how the treatment of the side effect was done: For participants with side effects 26.9% participants responded that the side effect was treated by stopping the antibiotics or by starting a new medication and rest 85.26% participants responded that the antibiotics were continued no treatment regimen was followed.

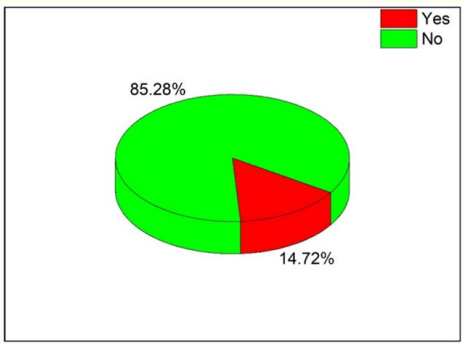

Figure 14: Graphical presentation of participants' responses whether the side effect was treated or not.

Enumeration of participants' responses to the question about whether the adult person in their house took any antibiotics: 12.14% of participants responded that elderly people in the household never consumed antibiotics in the last twelve months. 28.03% of participants responded that they have no idea about the consumption of antibiotics by elderly people. 28.32% of participants responded that in the last twelve months, elderly people of household consumed antibiotics once, 23.12% of participants responded that in the last twelve months, elderly people of household consumed antibiotics two to five times, 4.62% participants responded that in last twelve months, elderly peoples of household consumed antibiotics for more than 5 times and only 4.62% participants claimed that they don't have any adult person in the household.

Enumeration of participants' responses to the question about if there was any side effect in adults: 33.59% of participants responded from the group who has elderly people in their

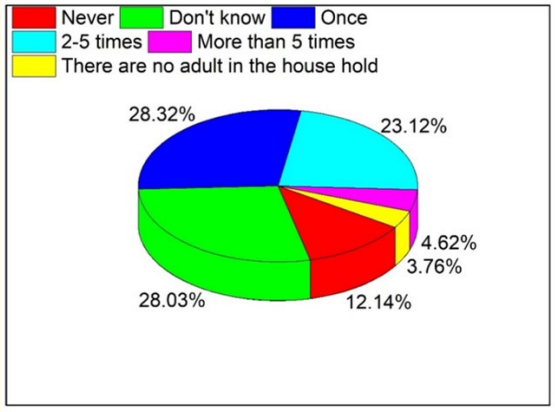

Figure 15: Graphical presentation of participants' responses against the question about the frequency of consumption of antibiotics by adults.

household that they observed side effects in adult and the rest 66.41% claimed that there was no side effect in elderly people.

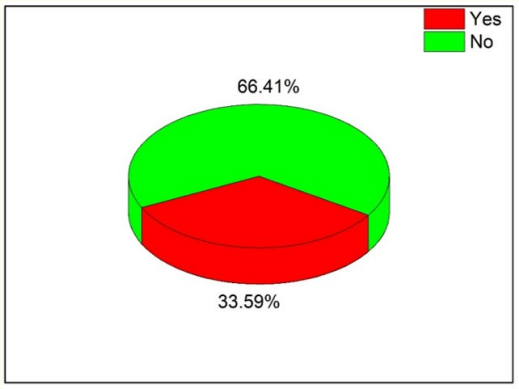

Figure 16: Graphical presentation of participants' responses whether adult felt any side effect or not.

Enumeration of participants' responses to the question about observed side effects in adults

Enumeration of participants' responses to the question about the treatment procedure of side effects which was observed in adults: 23.2% of participants responded that the side effect was treated by stopping the antibiotics and 76.8% of participants responded that a new medication was administered for treatment of the side effect.

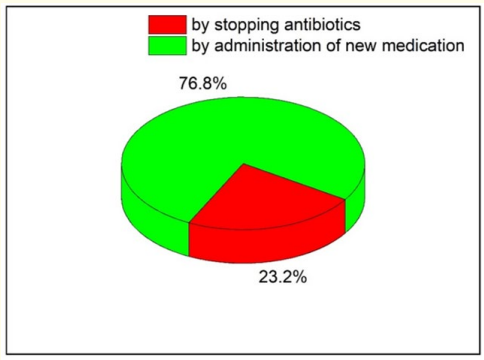

Figure 17: Graphical presentation of participants' responses about the treatment method of side-effect in adult.

Enumeration of participants' responses to the question if the person often suffers from cough and cold: To understand the actual scenario of the common cold we include the question. 66.24% of participants responded that they suffer from cough and cold very often. 23.25% of participants responded that do not suffer. The rest 10.51% of participants were unable to justify whether they suffered or not.

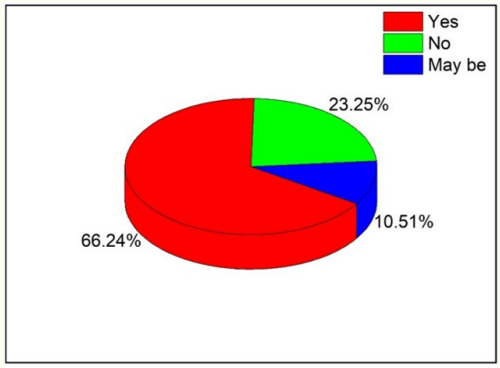

Figure 18: Graphical presentation of participants' responses whether they suffer from seasonal cold or not.

Enumeration of participants' responses to the question about the consumption of antibiotics to treat the condition if they often suffer from a seasonal cold: Of those who responded yes about suffering from cough and cold very often 56.64% of participants responded that they consumed antibiotics to treat the condition and rest 43.36% claimed that they do not take antibiotics to treat the condition.

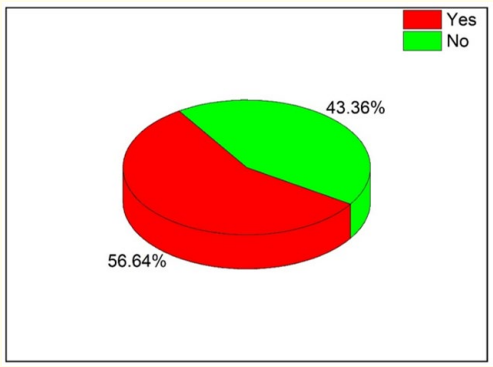

Figure 19: Graphical presentation of participants' responses to the question whether they took antibiotics to treat common cold.

Enumeration of participants' responses to the question if the common cold condition cures maturely or not: 81.48% of participants responded that the condition cures naturally.

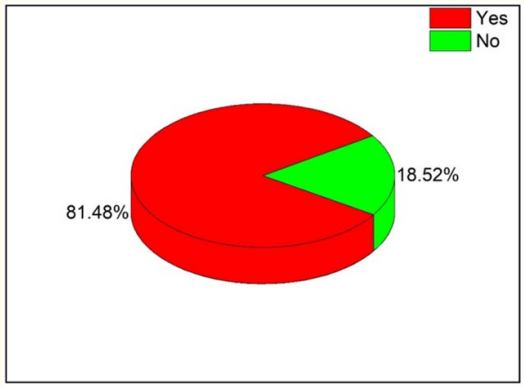

Figure 20: Graphical presentation of participants' responses to the question whether the common cold cures naturally or not.

Enumeration of participants' responses to the question whether the left-over antibiotics should be preserved for personal use in future in a scale of one to seven, where one means totally agreed and seven means totally disagree: Majority of the participants, around 127 participants totally agreed with the statement. 61 participants totally disagreed with the statement.

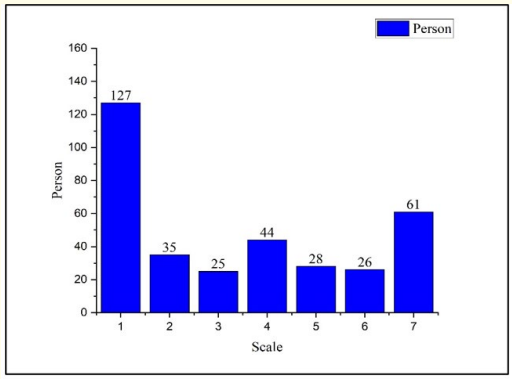

Figure 21: Graphical presentation of participants' responses to the question whether the left-over antibiotics should be preserved for personal use in future.

Enumeration of participants' responses to the question whether the participants agreed or not to return the excess antibiotics to pharmacy: Only 28 participants totally agreed with the statement 145 participants totally disagreed with the statement.

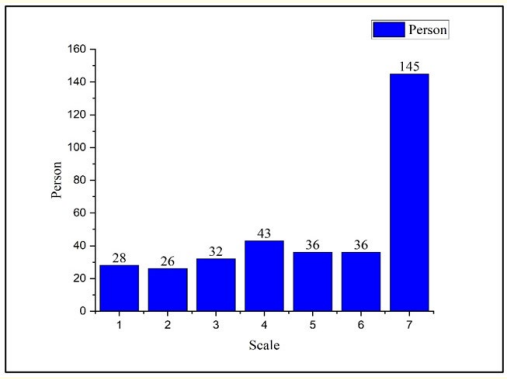

Figure 22: Graphical presentation of participants' responses to the question whether the participants agreed or not to return the excess antibiotics to pharmacy.

Enumeration of participants' responses to the question whether the participants agreed or not to the system in Sweden to acquire antibiotics that a requirement of physician prescription.

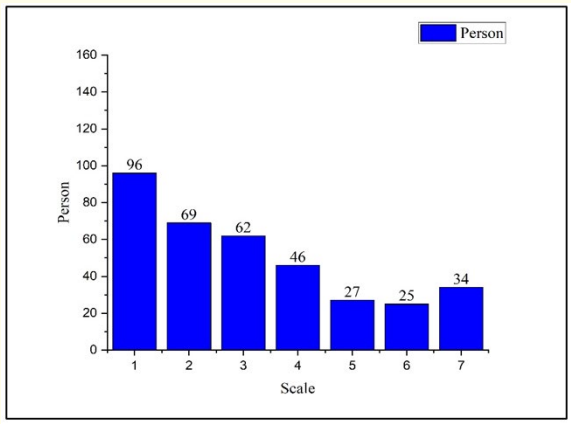

Figure 23: Graphical presentation of participants' responses to the question whether the participants agreed or not to the system in Sweden to acquire antibiotics that a requirement of physician prescription.

Enumeration of participants' responses to the question whether the participants agreed or not to acquire antibiotics without prescription of a doctor in online mode.

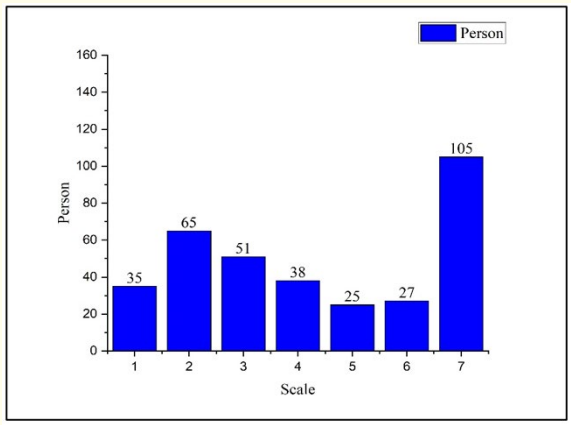

Figure 24: Graphical presentation of participants' responses to the question whether the agreed or not to acquire antibiotics without prescription of a doctor in online mode.

Enumeration of participants' responses to the question whether the participants agreed or not to acquire antibiotics without a proper examination of a doctor by their relatives.

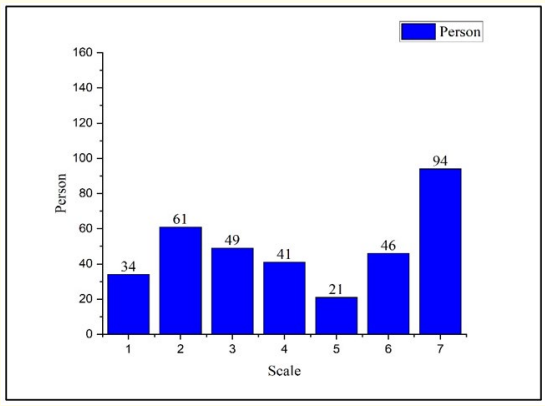

Figure 25: Graphical presentation of participants' responses to the question whether the agreed or not to acquire antibiotics without a proper examination of a doctor by their relatives.

Enumeration of participants' responses to the question whether the participants agreed or not that one can get antibiotics without prescription in certain countries.

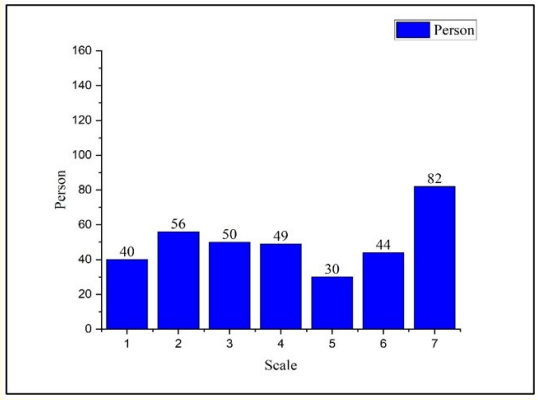

Figure 26: Graphical presentation of participants' responses to the question whether the agreed or not that one can get antibiotics without prescription in certain countries.

Conclusion

Antibiotics have revolutionized medicine, saving countless lives since their discovery in the early 20th century. However, the origin of antibiotics is now overshadowed by the alarming rise in antibiotic resistance. This global crisis stems from the relentless adaptability of microorganisms, driven by misuse and overuse of antibiotics.

Normal population of Kolkata, West Bengal, India were found to overprescribe antibiotics, which could be a major contributor to the worldwide problem of antimicrobial resistance. We need to consider the results of this study in light of some study limitations. Since the survey was responses may have been subject to response bias. Although a few trends were evident, the sample size was small and thus inferences were difficult. Despite all these limitations, this study has several strengths, including being the first in the region to our knowledge to report on this topic of importance and clinical relevance. There is an urgent need to raise public and professional awareness regarding the risks of injudicious use of antibiotics in healthcare.

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Conflict of Interest

The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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