

Antibiotics in the Community During the COVID-19 Pandemic: A Qualitative Study to Understand Users' Perspectives of Antibiotic Seeking and Consumption Behaviors in Bangladesh

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Introduction: The COVID-19 pandemic is thought to have led to increased “inappropriate” or “unjustified” seeking and consumption of antibiotics by individuals in the community. However, little reference has been made to antibiotic seeking and using behaviors from the perspectives of users in Bangladesh during this health crisis.

Purpose: This study seeks to document how antibiotic medicines are sought and used during a complex health crisis, and, within different contexts, what are the nuanced reasons why patients may utilize these medicines sub-optimally.

Methods: We used an exploratory, qualitative design. Forty semi-structured telephone interviews were conducted with people diagnosed with COVID-19 (n=20), who had symptoms suggestive of COVID-19 (n=20), and who had received care at home in two cities between May and June 2021 in Bangladesh. In this study, an inductive thematic analysis was performed.

Results: The analysis highlighted the interlinked relationships of antibiotic seeking and consumption behaviors with the diversity of information disseminated during a health crisis. Antibiotic-seeking behaviors are related to previous experience of use, perceived severity of illness, perceived vulnerability, risk of infection, management of an “unknown” illness and anxiety, distrust of expert advice, and intrinsic agency on antimicrobial resistance (AMR). Suboptimal adherence, such as modifying treatment regimes and using medication prescribed for others, were found to be part of care strategies used when proven therapeutics were unavailable to treat COVID-19. Early cessation of therapy was found to be a rational practice to avoid side effects and unknown risks.

Conclusion: Based on the results, we highly recommend the take up of a pandemic specific antimicrobial stewardship (AMS) program in the community. To deliver better outcomes of AMS, incorporating users' perspectives could be a critical strategy. Therefore, a co-produced AMS intervention that is appropriate for a specific cultural context is an essential requirement to reduce the overuse of antibiotics during the COVID-19 pandemic and beyond.

Keywords: COVID-19, antimicrobial resistance, consumption behavior, antimicrobial stewardships, community engagement, Bangladesh

Introduction

The current pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or COVID-19 poses an immense threat to global public health. Since 15th October 2021, COVID-19 has infected almost 240 million people

resulting in over 4.8 million deaths globally.¹ Patients can develop severe complications associated with bacterial pathogens,² which might be responsible for even higher mortality rates.^{3,4} Antimicrobial therapy is important for managing confirmed COVID-19 cases with associated bacterial or fungal infections.⁵ However, the increased use of antibiotics and antifungals is somewhat counterproductive in the global effort to reduce antimicrobial resistance.⁶ A systematic review reported that increased use of antimicrobials while treating COVID-19 patients in Asia, Europe, and other regions⁷ is augmenting the threat of antimicrobial resistance (AMR) globally.⁸ Lower- and Middle-income Countries (LMICs) (like Bangladesh) are prone to the twin burdens of increased risk from COVID-19 and AMR due to poorly resourced health programs, health care services and health governance, and ineffective regulatory and legislative mechanisms to control antibiotic use.^{9–12} As countries have started administering vaccines and therapeutics, which are tackling the problems of the COVID-19 pandemic, the global threat of AMR remains unchecked.⁷ In LMICs, infection and fatality rates are higher, and mass vaccination has been challenged.¹³ The situation is even worse in lower resource settings, like Bangladesh, where mass vaccination is a major concern due to the unequal distribution of the vaccine¹⁴ and vaccine hesitancy.¹⁵ AMR specialists have warned that misuse or overuse of antibiotics during the COVID-19 pandemic can vary, including seeking antibiotics without clinical confirmation of co-infection,^{8,16} suboptimal adherence,^{17,18} and self-medication^{19,20}.

At the user level, “unjustified” or “irrational” behaviors are thought to result in failing to start a course of therapy, omission of doses, early cessation of therapy, errors in dose quantity, “inappropriate” intervals between doses, modifications to the regimes, and the use of shared prescriptions and medicines.^{21–24} Self-medicating with antibiotics is framed as another “problematic” behavior.^{25,26} However, these framings are not sufficient to explain the underlying causes of people’s behavior and their attitudes toward antibiotic seeking and consumption.²⁷ Within the social sciences, these framings are described as one-dimensional and there is a need to explore patients’ beliefs and wider life-worlds.²⁸ Scholars such as Conrad,²⁹ Geest, Whyte and Hardon,³⁰ Hardon and Sanabria,³¹ and Cohen³² have argued that these “doctor centric” or “biological” framings fail to understand the use of medicine and recommend the study of non-compliance from the patients’ perspective. From a social perspective, the use of medicines is relational and interlinked with the diverse inscriptions and is part of an ongoing, constantly evolving interaction between the patients and medicines themselves.³³ Subsequently, the meanings of infections and how people adopt their own practices based on a complex set of beliefs about the body, health threats, and medical treatment are also critical factors to examine.^{34–36} Studying the emic or users’ perspective of risk and illness, and professional identity and power plays a significant role in determining the nuanced reasons for suboptimal consumption and “inappropriate” behaviors and attitudes.^{35,37}

Studying the context, culture, and behaviors is critical to engaging the community in an antimicrobial stewardship program (AMS), thereby controlling the global spread of disease and the emergence of AMR.³⁸ As the consumers of antibiotics, individual community members can contribute to the control of AMR by limiting antibiotic use to where there is a clear benefit.^{38–40} While promoting appropriate and safe use of antibiotics, increased community engagement through community dialogue is considered to be a promising approach for tackling AMR.⁴¹ Before designing an effective AMS in the community, exploring people’s diverse behaviors, thoughts, and the cultural context is highly recommended, particularly while investigating antibiotic seeking, suboptimal use, and medication adherence.^{41–43} However, there is little insight into why and in what context people seek antibiotic medicines, and how they use these medicines in Bangladesh during this pandemic. Previous studies in the pre-pandemic era explained the non-compliance and self-medication with antibiotics using demographic factors,⁴⁴ which often fail to understand from a cultural context the relationships and interlinkages between antibiotic seeking decisions and consumption behaviors, and the diversity of information available.³³ Considering antibiotic use as a “socially embedded phenomenon”,³² this paper sheds light on how patients’ antibiotic medicine seeking and use decisions are made within a complex loop of relationships, situations, roles, and identities that are based on the social and cultural contexts in addition to their therapeutic function. Taking into account the social and cultural meanings of antibiotics that impact on the quality of provision and use,⁴⁵ the paper also focuses on patients’ agency concerning the non-medical effects of antibiotics. The findings will inform public health policy and communications about the pandemic and its intersections with AMS in the community in Bangladesh through community engagement.

Methods and Materials

Study Design

As a qualitative approach is the preferred paradigm in the study of socio-cultural aspects of seeking medicine or adhering to their instructions for use,⁴⁶ the study employed an exploratory, qualitative design. Due to social distancing and other restrictions put in place to control the spread of the virus, the interviews were conducted over the telephone. Where applicable, the study followed COREQ guidelines of reporting qualitative studies.⁴⁷

Study Settings

The study was carried out in two major cities, Dhaka and Chattogram, both epicenters in terms of the infection and fatality rates in Bangladesh at the time of data collection (May to June 2020).⁴⁸ Bangladesh reported its first COVID-19 case on 8 March 2020. The country was facing severe challenges in managing confirmed cases in hospital settings due to a poorly resourced health structure and human resource issues, especially during the period in which infection and mortality rates were climbing.⁴⁹ Apart from the health system response, the government enacted a guideline for treating patients with mild symptoms and asymptomatic cases in the home setting.⁵⁰ Despite various guidelines and treatment protocols, surveys showed the increased use of antibiotics during the pandemic in the community.^{51,52} A qualitative study reported a number of socio-cultural and structural drivers of antibiotic use during this time.⁵³ Earlier studies reported easy access to antibiotic medicines through over the counter (OTC) sales that did not require a prescription to be shown.²⁶ Along with professional doctors, unqualified providers in the informal sector also prescribe antibiotics.⁵⁴ The aggressive and unethical marketing practices of pharmaceutical companies are also linked with the over-prescription of antibiotics,⁵⁵ consequently, most antimicrobials are prescribed based on a best-guess.⁵⁶ Considering the twin burdens of COVID-19 and antibiotic use, these two urban sites were selected to understand people's antibiotic seeking and consumption behaviors from a socio-cultural perspective in the context of COVID-19.

Sampling and Recruitment Procedure

Purposive sampling was used to recruit participants through social media (Facebook) posts and network sampling to achieve saturation. Potential participants were invited for interview if they met the following criteria: i) having clinically tested positive for COVID-19; ii) having had symptoms suggestive of COVID-19 (such as fever, dry cough, sore throat, and loss of taste or smell); iii) having received home care; and iv) having consumed antibiotics. These criteria were based on the World Health Organization (WHO) interim guidelines, which state that antibiotics can be used where there is confirmed co-infection among patients with COVID-19, but that their use is discouraged for those with mild symptoms who receive home care.⁵⁷

At the design stage, we envisioned that seeking and consumption behaviors would vary according to clinically confirmed cases and symptoms, age, social location, and the level of education. Capturing such variation is important since it is likely that different generations have varying attitudes and experiences of antibiotics. After completing 28 interviews and i) listening to the audio recordings, ii) careful reading of the transcripts, iii) inductive coding, and iv) identification of the broad areas of initial themes, we decided that there was insufficient data from individuals having COVID-19 with symptoms. We then recruited another 12 participants based only on their gender, level of education, and age. At this point, we found no emerging themes or categories in their seeking and using behaviors. Finally, 40 semi-structured telephone interviews were conducted with people who had COVID-19 (n=20) and suggestive symptoms (n=20).

The researchers (MAK, MMH, SS and AI) had an initial discussion with potential participants (who showed an interest in taking part in the study) to provide an overview of the study and to obtain their informed consent, and give them the interview schedule. In doing so, the team and the participants had a series of discussions over the phone. These interactions allowed the research team to build rapport and gain trust with the research participants. Two research assistants (RAs), MNU (male) and SA (female), then interviewed them over the phone. Several calls were needed with some participants to complete the interviews and follow-up discussions.

Interview Guide

A semi-structured interview guideline was developed based on an extensive literature review. This guide included preliminary questions regarding participants' health status, history of chronic disease and COVID-19 infection, health-seeking behavior, antibiotic-seeking attitudes, and consumption behavior (please see [supplementary file](#)). The primary version of the interview guide was reviewed by a group of experts in the subject area. Before conducting the interviews, the guide was piloted with four participants in order to check its validity and linguistic suitability, to determine probing and additional questions, and the comprehensibility of the RAs. The pilot interviews were not included in the current analysis.

Ethical Approval and Data Collection

The study was conducted in accordance with human subject research in the Declaration of Helsinki 1964 and its later amendments. Ethical approval was obtained from Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh (CVASU) Research Ethics Committee [approval number CVASU/Dir (R&E)/EC/2020/169(3)]. As the study was conducted during strict restrictions to contain the spread of COVID-19, the interviews were conducted by telephone. Hence, we obtained verbal consent from the participants with the approval of the ethics committee. The participants consented to the publication of the work after the anonymization of their names and use of pseudonyms. Consent was recorded in a digitized audio recorder before starting the interviews. The audio-recorded interviews were conducted between May to June 2020, each lasting between 40 and 90 minutes.

Data Analysis

The analysis method was based on an inductive, grounded theory approach from a constructivist perspective as described in *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis* by Kathy Charmaz.⁵⁸ The data analysis process was followed by i) listening to the audio recordings, ii) careful reading of the transcripts, iii) inductive coding, iv) identifying the themes, v) reviewing the themes, and vi) writing up the findings. The interview recordings were initially transcribed verbatim in Bengali before being translated into English by MNU, SA and FAJ. MAK, SS, SA and MNU checked all transcripts against the audio recordings and translated versions of the transcripts for accuracy and completeness. In doing so, they first listened to the audio recordings to match the written text, then read the English versions to check them against the Bengali transcripts.

Two authors (MAK and SS) coded the same four interview transcripts to generate, by consensus, a preliminary set of open codes derived from the texts. These codes were then used by MMH, MNU and SA to double code a further four interviews. During this phase, a constant comparison was made within and between interview transcripts and between the codes that were developed by MAK and SS for deep-dive analysis. These primary codes were then used to guide the rest of the transcripts, with additional inductive codes added whenever new insights emerged. These codes were then organized into themes and sub-themes. In order to determine the initial codes that made the most analytic sense to categorize all the data incisively and completely, we then performed a focused or selective coding exercise. An axial coding technique was used to bring data back together again to build coherence between categories and sub-categories. Transcripts were first anonymized and a pseudonym inserted for each interview transcript before finally importing them into MAXQDA Standard (2020, VERBI Software, Berlin, Germany) for coding and analysis.

Results

Background Information About the Participants

[Table 1](#) represents the research participants' details. An equal number of interviews were conducted with women and men (n=20 each). The majority of them did not have chronic conditions, and most of the participants belonged to the 24–40 years of age category (n=31). The majority of the participants had completed a university degree. Most of them were involved with different services at both public and private agencies. Before the pandemic, many participants had taken antibiotics in the last year for a range of reasons.

Table I Details of the Participants

Characteristics of the Participants		Number (%)
Type of participant	People with COVID-19	20 (50)
	People with suggestive symptoms	20 (50)
Gender	Male	20 (50)
	Female	20 (50)
Age	24–30	15 (37.5)
	31–40	16 (40)
	41–50	9 (22.5)
Education	MA/MSc/MSS	19 (47.5)
	BA/BSc/BSS	14 (35)
	12th grade	3 (7.5)
	10th grade	4 (10)
Occupation	Service	17 (42.5)
	Home maker	11 (27.5)
	Student	5 (12.5)
	Business	5 (12.5)
	Others	2 (5)
History of chronic disease	No chronic disease	32 (80)
	Asthma	4 (10)
	Diabetes	3 (7.5)
	Cancer	1 (2.5)
Number of times antibiotics taken in the last year	Not taken	19 (47.5)
	Yes	18 (45)
	Could not recall	3 (7.5)

Thematic Findings

All the participants consumed antibiotics for COVID-19 and suggestive symptoms. At the recruitment interviews, potential participants were asked to name the brands of these antibiotics. Analysis of the brand names (were anonymized from the transcripts) revealed that the participants consumed a number of antibiotic groups including azithromycin, doxycycline, amoxicillin-clavulanic acid, erythromycin, ceftriaxone, and ciprofloxacin. Before presenting the thematic results on antibiotic seeking and consumption behaviors, insights into the meanings of antibiotics are described below to help contextualize the explanations of seeking and consumption behaviors.

Along with the pharmaceutical properties of these medicines, the analysis found diverse perceptions and understandings that are related to the socio-cultural properties of these medicines. A number of research participants, including those who had COVID-19 and those who had COVID-19-like symptoms, explained that antibiotics are powerful medicines that accelerate fast recovery and counter almost all diseases. In terms of using antibiotics, it was found that these medicines could kill all viruses and bacterial pathogens. Some participants also indicated that these medicines could

prevent bacterial and viral infections, and work as immunity boosters. Some also stated that these medicines are used to reduce fever, sore throat, stomach ache and serious injury, and to treat diarrhea, coughs, and skin and urinary infections. Many of them had used antibiotics in previous episodes of similar illness.

A summary of the thematic findings on participants' antibiotic seeking and consumption behaviors is provided in Table 2. These themes emerged from the responses provided by the participants and accord with the temporal and risk management aspects of antibiotic seeking and use.

Antibiotics Seeking Behaviors

The analysis revealed five themes related to seeking antibiotics: 1) when a prompt decision is made to seek antibiotics; 2) when home remedies and “normal” medicines fail to cure the symptoms (wait and see); 3) when the symptoms become severe; 4) when close contacts (such as family members) test positive for COVID-19; and 5) hesitation, dilemma and self-negotiation during antibiotic seeking decision making. The responses were the results of complex reasoning processes, an acute awareness of the circumstances in which they found themselves, and knowledge of COVID-19 and its symptomatic treatments.

Seeking Antibiotics as Soon as Testing Positive or Seeing Symptoms

The participants who had tested positive for COVID-19 reported that they needed to seek antibiotics as soon as the infection was confirmed. They preferred to consume antibiotics so that their condition remained under “control”. For example, Sourav (47 years, tested positive) explained:

... .. As many things were unknown, I did not want to take risk. I thought my symptoms could be reduced if I start antibiotics. [Later] ... I knew it because I took it previously when I was suffered from a high fever and body ache. So, I started antibiotics from the very first day when I got the test report.

Previous experiences of speedy recovery from the (COVID-19-like) symptoms encouraged this participant to seek antibiotics. Other participants also gave similar narratives. They did not want to take the risk of further complications due to having the virus. Anowara (42 years, tested positive) explained:

I was very anxious about my condition. I started the antibiotic on that day [the day report was delivered]. I have a previous history of asthma and had to take antibiotics at other times. And I know asthma patients are more vulnerable to the virus. I did not want to take time to start antibiotics.

They focused on reducing the potential damage as a result of getting the virus. While most of the participants immediately sought antibiotics to treat the infection, their seeking approach was perceived as an “appropriate” step based on previous consumption practices and their perceived vulnerabilities due to their medical history.

However, those who tested positive and sought antibiotics immediately offered other reasons that were closely related to COVID-19 induced anxiety and the unpredictable development of their illness. Kamran (38, tested positive) explained:

I was very nervous, and my blood pressure was increased to see my test report. I did not understand what to do. I know antibiotics help to cure these symptoms, and then I started XXX (brand name of azithromycin) from the very first day.

At the time of the interviews, the severity of COVID-19 in terms of increased infection and fatality rates may have been responsible for the anxiety felt by many of the participants. Seeking antibiotics immediately was related to risk and anxiety management.

Seeking Antibiotics When Home Remedies and “Normal Medicine” Proved to be Ineffective

Participants tried several home remedies including warm water vapor, masala tea, green tea, black seed, honey, lemon with warm water, turmeric (*Curcuma longa*), tulsi (*Ocimum tenuiflorum*) syrup, and black tea. Traditionally, these home remedies are popular for treating symptoms suggestive of COVID-19. Individuals with symptoms and mild cases of COVID-19 sought antibiotics when home remedies failed to cure these symptoms. Raihan (34, with symptoms) explained:

Table 2 Summary of Thematic Findings

Themes	Sub-Theme	Explanations	Number of Participants	Nature of Participants
Antibiotic seeking behavior	As soon as tested positive or having symptoms.	Those who had tested positive with COVID-19 and had severe symptoms sought antibiotics to keep the health condition under “control” from further damage and manage anxiety.	16	Individuals with COVID-19=11 Individuals with symptoms=5 Gender: Man=9; Woman=7 Age group: <40= 6; >40=10 Chronic illness=8; Education: Up to BA/BSc=10; MA/ MSc=6
	Seeking antibiotics when home remedies and “normal” medicines fail to cure the symptoms.	Due to the perceived side-effects of antibiotics, home remedies and normal medicines were used, and the body observed in the first place. Sought antibiotics when ailment was deteriorating.	13	Individuals with COVID-19=3 Individuals with symptoms=10 Gender: Man=5; Woman=8 Age group: <40= 4; >40=9 Education: Up to BA/BSc=7; MA/ MSc=6
	When the symptoms get severe.	Sought antibiotics in the case of critical signs and symptoms of COVID-19 such as shortness of breathing, chest pain, and lower oxygen level, indicating secondary co-infection.	7	Individuals with COVID-19=6 Individuals with symptoms=1 Gender: Man=7 Age group: <40= 1; >40=6 Education: Up to BA/BSc=4; MA/ MSc=3
	Close contacts tested positive with COVID-19.	Risk of spreading the virus influenced close contacts, such as other family members, to seek antibiotics.	4	Individuals with symptoms=4 Gender: Man= 1; Woman=3 Age group: <40= 4; Education: Up to BA/BSc=4
	Hesitation, dilemma, and self-negotiation.	The concern about AMR and confusion around the effectiveness and appropriateness of antibiotic use in treating a viral disease led to a dilemma.	4	Individuals with COVID-19 =4 Gender: Man=1, Woman=3 Age group: <40= 4; Education: MA/ MSc=4

(Continued)

Table 2 (Continued).

Themes	Sub-Theme	Explanations	Number of Participants	Nature of Participants
Antibiotics consumption behavior	Following prescribed doses.	Trusted the physician's prescription and regimes.	13	Individuals with COVID-19=11 Individuals with symptoms=2 Gender: Man=7; Woman=6 Age group: <40= 2; >40=11 Chronic illness=8 Education: Up to BA/BSc=9; MA/MSc=4
	Following regimes for antibiotic use of others.	Recovered patient's prescription is tested and it is believed that following that prescription and regimes would help to cure the disease and symptoms.	12	Individuals with COVID-19=2 Individuals with symptoms=10 Gender: Man=10; Woman=2 Age group: <40= 9; >40=3 Education: Up to BA/BSc=8; MA/MSc=4
	Stopped taking when felt better or on experiencing side-effects.	Stopped taking due to side effects that would cause further damage or when symptoms disappeared.	10	Individuals with COVID-19=4 Individuals with symptoms=6 Gender: Man=7; Woman=3 Age group: <40= 8; >40=2 Chronic illness=2 Education: Up to BA/BSc=6; MA/MSc=4
	Multiple suggestions, multiple regimens, and multiple antibiotics.	Sought treatments from multiple physicians when the conditions did not improve.	5	Individuals with COVID-19 =3 Individuals with symptoms=2 Gender: Man=2; Woman=3 Age group: <40= 5; >40=0 Education: Up to BA/BSc=3; MA/MSc=2

Usually, I suffer from cold and throat-ache like all the year-round. At that time, I used to take tulsi leaves, ginger, and honey. I started taking these for my symptoms. But this time [indicating COVID-19 like symptoms], these remedies did not work. I tried for five days, but I was not cured. Then I decided to start antibiotics.

Several participants preferred traditional cures to avoid the side effects of biomedicine. Interestingly, the people who consumed antibiotics in the later stages of infection also reported the failure of traditional home remedies and consequently took antibiotics. For example, Nasima (28, with symptoms) shared her concern over the side effects of antibiotics:

I hate taking tablets. They are artificially made with chemicals, which have side effects. When I felt throat itching and cold, I started taking warm water, black tea with ginger, and masala. But these were not working. I started antibiotics as I know antibiotics help to cure throat ache and cold.

Many other participants who reported perceived side effects of biomedicines and therefore, tried home remedies instead, explained that taking antibiotics was related to a sense of security, risk avoidance, and self-health management, which justified their use.

A number of other participants reported consuming antibiotics when “normal” medicines failed to cure the symptoms. The “normal” medicines were defined as those which were readily available, were self-administered with doses unspecified by specialists, and which could be used as first aid measures. Participants took antibiotics when they realized that these medicines did not cure the symptoms. For example, Rana (29, with symptoms) said:

I took XXX [brand name of paracetamol] and XXX [brand name of Montelukast Sodium] thrice a day for three days. Then I realized there are no improvement of my symptoms. Then I started taking antibiotics for five days after consulting with a doctor.

Such attitudes serve to justify the “appropriateness” of antimicrobial therapy when normal medicines fail to cure the symptoms. A common perception among participants was that physicians usually suggest these normal medicines first, before prescribing an antibiotic when they fail to cure the symptoms.

Seeking Antibiotics Based on the Perceived Severity of the Symptoms

A cluster of narratives on participants’ antibiotic seeking behavior was related to the perceived severity of COVID-19 symptoms. In particular, they sought antibiotics when they observed the critical signs of COVID-19 such as shortness of breathing, chest pain, and lower oxygen levels. These signs are indicative of a secondary infection. Yunus (49, with COVID-19) demonstrates this concern:

I heard about secondary infection. I was unsure whether I had that [secondary infection] on my lungs. I was suffering from chest pain. I consulted with a doctor who prescribed antibiotics. Then I started antibiotics doses.

Because the participants received care in the home setting, they were unsure about whether they had secondary infections. However, shortness of breath was another important symptom prompting some participants to seek antibiotics. Rehena (45, with COVID-19) explained:

The symptoms were like stuck on my body, no change, nothing. I was monitoring my breathing counts every time. On the fifth day, I could not be able to take a long breath. Then I decided that I should not wait anymore and bought antibiotic doses for seven days.

The degree of suffering felt due to the perceived severity of illness influenced participants’ antibiotic seeking attitudes. Several other participants had sought antibiotics where they had severe sore throat, and the loss of smell and taste.

Seeking Antibiotics When Close Contacts Tested Positive for COVID-19

A few of the participants who had symptoms suggestive of COVID-19, reported taking antibiotics because close contacts (such as family member) had tested positive. The explanations indicated that antibiotics would have kept them safe from any perceived harm. Zahid (28, with symptoms) noted:

I took care of my father from the very beginning after showing the symptoms. Initially I was unsure if he had the virus. Then we went for the test and got confirmation. He was tested positive for COVID-19. In the meantime, I stayed with him for taking care. I also had mild symptoms like fever and cold. I thought I should also take antibiotics to remain healthy.

The risk of spreading the virus influenced the attitudes of close contacts of those testing positive for COVID-19, such as family members, as antibiotics were perceived to be powerful enough to prevent them from having the virus and its associated harm.

Hesitation, Dilemma, and Self-Negotiation

A number of participants showed hesitancy and dilemma over whether antibiotics would be appropriate to seek in the case of a viral disease. Intrinsic agency was found among individuals who were hesitant about the nature of diseases and the type of medication to treat them. For example, Morshed (29) explains:

I was unsure if antibiotics [would] work against a viral disease. When my doctor suggested me, I got confused and did not take it. I googled to know how antibiotics might work. From the WHO [World Health Organization] report, I learned that the virus might attack the respiratory tract that could cause pneumonia, and antibiotics should be taken then.

This narrative shows how an individual's awareness of the action efficacy of antibiotics creates mistrust even when a professional suggests they take antibiotics. Their personal uncertainty about seeking antibiotics, their apprehension about the consequences of these decisions, and the sense of responsibility to their own body maintained this dilemma. Although the number of such participants was small, their explanations revolved around notions of "intolerance", "antibiotics may not work against any disease", and the "resistant body". For example, Rashida (30), a woman with COVID-19, explains:

The doctor suggested me to take XXX [brand name of antibiotics]. I was unsure whether I should take it or not; because I know about AMR by my work [She is a public health researcher]. I did not take it then because I thought taking antibiotics is unnecessary and it can cause resistance. I consulted with two other doctors to check if I need antibiotics. They also suggested it, but I did not take. Then I was feeling chest pain and breathing complication. Then I made contact with another doctor who provides care to COVID-19 patients. That doctor explained to me the need for antibiotics to treat secondary co-infection. I started antibiotics then.

This extract from Rashida presents the orthodox thinking about the misuse of antibiotics that increases resistance to them. For the same reason, she thought the doctor might have suggested antibiotics "unnecessarily". Interestingly, she cross-checked with other physicians before deciding to start the course. Whilst she had a good understanding of resistant bacteria, this was not the case for most participants. Those who had partial or accurate knowledge (on the action efficacy of antibiotics for viral disease) gained this from varied sources, including the media, family and friends, and medical practitioners.

Antibiotic Consumption Behavior

All participants reported consuming antibiotics by inclusion criteria and were generally confident in their efficacy to treat COVID-19 and its symptoms. Analysis revealed four sub-themes that are presented below.

Following Prescribed Doses

Individuals of advanced age who had COVID-19 were more likely to seek a prescription for antibiotics from a professional physician and were careful to adhere to the doctor's instructions on antibiotic regimes. For example, Foyez (49, with COVID) explained more about following the doctor's prescription:

Who else determines the doses and nature, except doctors? I do not know which antibiotics would be effective. Even I cannot tell you the generation of antibiotics available in the market. So, following the doctor's recommendation is safe.

This explanation presents the "good patient" characteristics of antibiotic adherence. Following doctors' suggestions was found "essential" to ensuring the effectiveness of antibiotics for a new disease like COVID-19. Zakir (46, with COVID-19) explained:

People were telling us to have antibiotics. They were not doctors. We, the Bengalis, prefer to buy medicine and consume it. This is not right, mainly when there is a new disease. People even do not know if antibiotics would work against a viral disease. So, I followed what my doctor suggested.

Added to this explanation, other narratives indicated a belief in expert knowledge and medical authority. However, this may not be followed appropriately by everyone in the general public. The following section presents some other perspectives.

Following the Antibiotic Regimes of Others

The study identified twelve participants (five tested positive and the other seven had suggestive symptoms) who followed the antibiotic regimes of other people. Some participants followed the prescription of a recovered patient; this was perceived to be effective because it had been “proven” to cure the symptoms. Karim (36, with COVID-19) explained this trust in a recovered patient’s prescription:

I tried several normal medicines but my condition did not improve. I consulted with him [a recovered patient], and he shared his prescription. As he recovered, I thought the same antibiotics and dosage would be helpful to recover myself. [later] I was confident about doses and type as he recovered following the prescription.

Sharing the prescriptions of recovered patients was found to be common among family members where there was a COVID-19 patient who was prescribed antibiotics by a physician. Zahid (28, with symptoms) explained:

My father was tested positive. We consulted with a doctor and got the suggestion of antibiotics for 7 days. As I had symptoms, I also consumed antibiotics, the one that suggested for my father.

Why did you follow your father’s prescription? For me, this is similar to follow a doctor’s suggestion. The doctor would suggest me if I would have told him about my condition.

Several other participants with symptoms of COVID-19 used other peoples’ prescriptions but modified the regimes as they had a mild case of the disease. In these cases, participants intentionally tried to reduce the number of antibiotics consumed. Nazrul (32, with symptoms) explained:

One of my acquaintances consulted with a doctor and took antibiotics. I took all the medicines that the doctors prescribed him. His doctor gave him 7 days course, but I took it for 5 days because my symptoms were not similar to him.

Prescription sharing through social media groups and digital platforms was found to be common within social networks. Participants sought suggestions from recovered patients, family members, and kin groups who had received prescriptions from doctors.

Stop Taking Antibiotics When Feeling Better or Experiencing Side-Effects

This study found ten participants who stopped using antibiotics when they felt better and their symptoms were cured. There are a range of explanations reported by the participants for stopping use or failing to complete the doses. For example, Rehena (33, with symptoms) explained:

When I found that my throat-ache was disappeared and my other symptoms gone, I decided to stop taking antibiotics. I thought consuming more doses would be worthless.

To stop taking antibiotics was a “rational” decision for Rehena as she recovered from the symptoms. Antibiotics were believed to have some side effects such as weakness, nausea, sleepiness, vomiting, and loss of hair, weight, and appetite. A few other participants stopped taking antibiotics when they observed these side effects. For example, Rokibul (28, with COVID-19) explained the reason for early cessation of antibiotics:

Doctors suggested me to have 5 days, but after taking three tablets, I felt unwell, having weakness and nausea. In the meantime, I could not eat well due to the virus. My condition became severe. So, I stopped taking.

Early cessation was found to be a considered decision in order to prevent any side effects. Moreover, other participants were concerned about any “unknown” side effects if they were to take antibiotics to treat COVID-19.

Multiple Suggestions, Multiple Regimens, and Multiple Antibiotics

As there was some confusion among clinicians around treatment (at the time of the study), participants sought second opinions from multiple physicians when their conditions did not improve. Consequently, they changed the regime and type of antibiotics. Rahima (38, with COVID-19) explained:

My condition did not improve, then I consulted with a doctor, who suggested XXX [brand name] for 7 days. After 4 days, my symptoms remained similar. Then I decided to consult with another doctor. He prescribed me XXX [another brand name] and suggested me to take for 5 to 7 days.

Participants followed multiple regimes and used a range of brands, when considering their action efficacy to cure symptoms. Two participants followed multiple regimes and used different brands of antibiotics to find effective doses and brands that could help them to manage COVID-19-induced anxiety and to remain healthy.

Discussion

While recommendations have been made for taking part in the COVID-19 pandemic specific AMS program,^{7,10} there is little data to help design a culturally appropriate and inclusive AMS to reduce the overuse of antibiotics in the community. This qualitative study provides empirical evidence on users’ perspectives on antibiotic seeking and consumption behaviors that can help design an inclusive AMS through community engagement. Diversified behaviors were captured taking into account participants’ social location, age, educational attainment, and previous history of disease (Table 2). The diversity of antibiotic seeking behaviors showed: how the participants monitored their bodies for signs of infection, their previous experience of antibiotic consumption, and their attitudes towards a relatively new disease. Among our study population, antibiotics were perceived to be a powerful medicine that kills viruses and bacterial pathogens, being effective against all diseases and boosting immunity. The socio-cultural properties of antimicrobials might influence antibiotic seeking and consumption behaviors (Figure 1). These findings aligned with a recent study in which antibiotics are regarded as the “big boss”, “final solution” and “preventive medicine”.⁵³

The decision to seek antibiotics early depended both on participants’ previous experience of managing similar illnesses and their level of COVID-19-induced anxiety (about spreading infection, the severity of the disease and death). In line with relevant international literature,^{59,60} participants with chronic infections were more likely to seek antibiotics immediately upon testing positive for COVID-19 as they considered themselves to be vulnerable. Consistent with an Australian study,⁶⁰ several participants tended to “wait and see” before making the final decision to seek antibiotics. These attitudes provide insight into how participants viewed their health. Concerns were also raised about whether consuming biomedicine would make their condition worse due to the side effects. As a result, some relied on home remedies. However, in both cases, participants sought antibiotics in the later stages of the illness since these were considered to be the final solution. The relative explanations of such attitudes and behaviors confirmed the social embeddedness of antibiotic practices within society,^{28,32,61} particularly during a health crisis.³⁶

Indeed, several participants were confused about whether they could have avoided using antibiotics in spite of their physicians’ recommendations. This dilemma was due to either growing concern over AMR or the action efficacy of antibiotics to a viral infection. The intrinsic agency on the potential risk of this growing resistance and the perceived ineffectiveness of antibiotics against a viral disease highlighted concerns with how antibiotics might affect their bodies as described in the literature.^{62,63} Most importantly, participants’ relative narratives show mistrust of physicians’ suggestions in the context of a health crisis, which does not conform to the typical representation of “good patient” attitudes towards professional doctors.⁶⁴ Self-negotiation and engagement with risks might have been influenced by the perceived severity of the illness and therefore, their trust in professional advice.⁶⁵ This may have been due to the sudden health crisis being caused by a relatively “new disease” with no proven therapeutics by which to tackle it.

While exploring antibiotic consumption behavior, self-medication practice was found to be common (with some exceptions) among individuals who had been diagnosed with COVID-19. Elderly individuals with COVID-19 were more

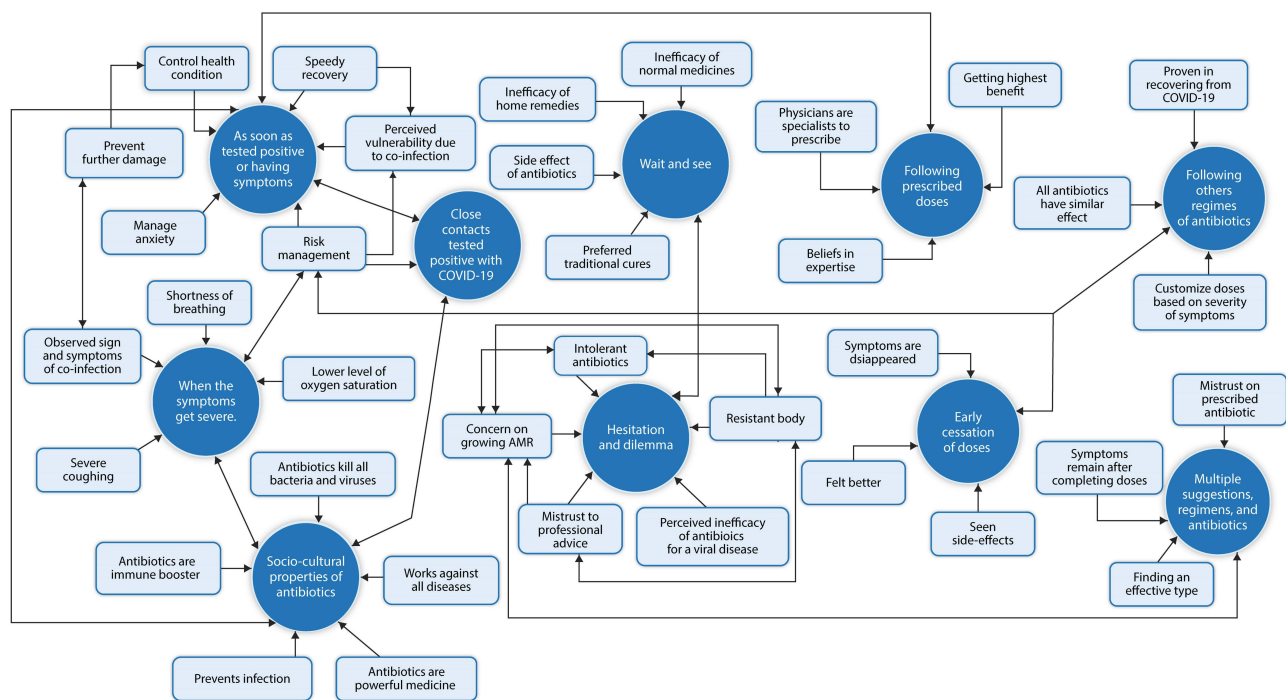


Figure 1 Significant matrix of socio-cultural aspects of antibiotics seeking and consumption behaviors: retrieved from inductive, grounded theory analysis.

likely to consult a physician and follow the prescribed treatment regimes. Trust in the expertise and skills of professionals to give appropriate instructions make age a more powerful mediator of behavior.⁶⁰ While following physicians' suggestions and recommendations is positively associated with controlling AMR at the community level,⁶⁶ in the case of COVID-19, antibiotics are viewed as necessary when the presence of a secondary co-infection is confirmed.⁷ In the current study, participants' self-medication behavior was purposeful and linked to their previous consumption experience. Self-medicating with antibiotics was thought to result in inappropriate dosing and duration of treatment, contributing to resistant strains of bacteria.^{7,67} However, self-medication was seen to be a strategy for self-care in this study. The international literature has described self-medication as an integral part of society's response to ill health.^{60,68} In this health crisis context, self-medicating with antibiotics might have been driven by socio-cultural factors, such as beliefs in the efficacy of antibiotics (the concept of "big medicine"), anxiety management (due to increased infection and mortality rates, and social stigma) and poor response from the health system in diagnosing and treating COVID-19.⁵³ Moreover, Bangladesh has also faced severe challenges in terms of managing confirmed cases in hospital settings due to infrastructural and staffing issues.⁴⁹ Evidence also suggested that premature hype surrounding possible therapies for COVID-19 was responsible for antibiotic overuse.⁸ These factors are partially responsible for the widespread use of antibiotics among home-based patients.⁵¹ To make AMS programs more effective, an understanding of these nuanced reasons for self-medication from the perspective of patients is needed.^{45,68}

Modifications to the regimen were also reported by participants. This study found three types of modification, ie, shortening the regimen, stopping use when feeling better, and observing the side-effects. The narratives in this study indicated that these behaviors were relational rather than irrational, a view which is also evident in the social science literature.³² While other studies noted how taking antibiotics was abandoned in order to perform routine activities, to get back to "normal life", and as symptoms disappeared and the severity of the disease lessened,^{44,62,69,70} participants in the current study did not want to risk side effects caused by consuming antibiotics. Such practices were presented as a care strategy, described by Willis and Chandler²⁷ to prevent discomfort since they were experiencing an unknown disease. In previous studies, early cessation of therapy was associated with lay perceptions of recovery from illness, inappropriate knowledge about antibiotics, knowledge and skills on adherence, and concern about AMR.^{21,71–73} In contrast, some participants in the current study felt that completing a treatment course was "unnecessary" as they had recovered from the

ailment. Consistent with other studies,^{74–77} sharing and following antibiotic prescriptions and medicine regimes were behaviors of some participants in this study. Using the prescriptions of those who had recovered from COVID-19 was widespread, while some participants preferred to follow the antibiotic regimes used by a family member. This is rational for them since it was perceived that the doctors would have prescribed them with similar types of antibiotics and same course. They were able to understand the action efficacy of antibiotics, and to learn curative and safety experience from recovered individuals. These results contrast with another study that found sharing prescriptions saved time and money.⁷⁴

This study is not without limitations and the findings should be interpreted in the light of these. Participants do not represent all COVID-19 patients and individuals with symptoms from Bangladesh, therefore, their views may not be generalizable. Although a level of saturation was achieved, this could potentially limit the transferability of the findings. Due to lockdown and travel restrictions, the study used social media posts and personal networks to recruit participants. Therefore, those who sought and consumed antibiotics but were unaware of this study were excluded. These individuals would have added value to the study by sharing their perspectives. However, it is worth exploring antibiotic seeking attitudes and consumption behavior from a user perspective in a complex context following the COREQ guidelines.

Conclusion

The inductive analysis used in this study highlighted the relational and interlinked relationships between the general public's understanding of antibiotics, and their antibiotic seeking and consumption behaviors with the diverse inscriptions during a health crisis. The categories and sub-categories used in the analysis showed that previous experience of use, perceived vulnerability, distrust of expert advice, and the intrinsic agency of AMR influenced antibiotic seeking behaviors. The analysis also revealed that suboptimal adherence such as modifications to the treatment regimes and adopting treatments prescribed for others were part of a care strategy, while early cessation of treatment was a rational practice to avoid side effects and unknown risks. The explanations reported above demonstrate the need for an emic perspective on everyday practicalities that influence antibiotic practice. The study highly recommends increasing community engagement in AMS interventions to target antibiotic use during the COVID-19 health crisis and beyond. Integrating patients' agency in community engagement activities is potentially critical for an inclusive and participatory AMS. Therefore, AMS messages need to accommodate personal risk management of COVID-19 by a diverse public, particularly in relation to when to seek antimicrobials and to encourage adherence to these once prescribed. As evident elsewhere, a co-designed AMS intervention can result in better outcomes for addressing the socio-cultural and contextual aspects of consumer behavior related to antibiotic seeking and adherence. At the policy level, this study strongly recommends updating relevant guidelines such as the COVID-19 management guideline for home-based patients. Clear instructions and messages should be provided about when to seek antibiotics and how to use these medicines to treat COVID-19, once prescribed.

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Disclosure

The authors report no conflicts of interest in this work.

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