

# Antibiotics Use in the Community

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The general population has been excessively using antibiotics during the COVID-19 pandemic. Therefore, the use of antibiotics for any reported illnesses in the preceding four weeks and knowledge of antibiotics among the general population in the community were assessed for possible interventions. A mobile phone survey among a general population across eight administrative divisions of Bangladesh was conducted during January–March 2021.

antibiotic resistance

COVID-19

pandemic

antibiotic awareness

antibiotic use

## 1. Introduction

Modern healthcare is predominantly reliant on antibiotic treatment [1], but there has been a phenomenal and imprudent use of antibiotics leading to the advent of resistant strains of bacteria [2][3]. To address the antimicrobial resistance (AMR) as a whole, with more emphasis on antibiotic resistance, the World Health Organization (WHO) initiated a range of AMR-related activities, including the development of the Global Action Plan on Antimicrobial Resistance (GAP-AMR) by the 68th World Health Assembly in May 2015 [4]. Published literatures exhibit a high proportion of inappropriate use of antimicrobials, and, as a result, optimizing the use of antimicrobial agents is one of the five key strategic objectives outlined in the GAP-AMR [4].

In late 2019, a novel coronavirus (SARS-CoV-2) was identified as the cause of an outbreak of disease named COVID-19 (coronavirus disease 2019), causing pneumonia in severe cases [5] further complicating as an acute respiratory distress syndrome (ARDS), a hyperinflammatory state and ultimately a multiorgan dysfunction with fatal consequences [6][7]. It was subsequently characterized as a pandemic on 11 March 2020 by the WHO [8]. Despite being a viral disease, it mimicked clinical symptoms of bacterial pneumonia; hence, different antimicrobials, especially antibiotics, were used as empirical therapy [9][10][11][12][13]. Furthermore, during the initial stages of the pandemic, there was a lack of proper antivirals with proven efficacy, and this, compounded by the anxiety and uncertainty of available treatment, led to the empirical but rather widespread and excessive use of antibiotics [13]. A study in Italy showed that, during lockdown for COVID-19, there was a relevant reduction in antibiotic consumption among children, due to closed daycare centers and schools, except for a relative increase in azithromycin use in adults [14]. However, there was no strong justification for routine use of azithromycin for reducing time to recovery or risk of hospitalization from the suspected COVID-19 in the community [15].

During the COVID-19 pandemic, the general population has likely been sensitized about using antibiotics for treating COVID-19. According to web-based surveillance on the COVID-19 pandemic and antibiotics used in

Malaysia, 37% of the participants were aware that using antibiotics could not speed up recovery from all infections [16]. Still, 49% of the respondents reported that antibiotics were effective against bacterial infection only [16]. Dispensing of antibiotics was increased profoundly in Egypt during the early period of the COVID-19 pandemic without proper clinical evaluation, and azithromycin, ceftriaxone, and linezolid were the major antibiotics used [17]. Approximately, 93% of the presumptive COVID-19 patients received antibiotics with official prescriptions and without prescriptions, of which 18% comprised of pharmacist and patient's recommendations [17]. Before the COVID-19 pandemic, studies in Bangladesh reported that 48% of adult respondents heard about antibiotics, 70% of children of those parents who were aware of antibiotics had received it previously, and 28% of study participants took antibiotics before presenting at the hospital for acute febrile illness [18][19]. During the first wave of the COVID-19 pandemic in Bangladesh, a study among suspected COVID-19 patients found that the use of antibiotics was 92% during their overall suspected phase. Among them, 89% were prescribed antibiotics on hospital admission, while 47% of COVID-19 suspected patients received antibiotics 24 h before hospital admission [20]. A prime contributor to antibiotics overuse in Bangladesh is perhaps the availability of over-the-counter dispensed antibiotics through unregulated drug stores (pharmacies) [19][21]. Therefore, assessing the use of antibiotics and the relevant knowledge on antibiotics among the general population irrespective of hospitalization, especially during the COVID-19 pandemic, is imperative in order to formulate policy interventions regarding the rational use of antibiotics.

Higher-income countries have used telephone surveys to collect real-time data on population-level estimates of health and demographics [22][23][24]. Bangladesh had a mobile phone teledensity of 103% in 2021 [25], with over 175 million subscribers registered in May 2021 [26]. We utilized this opportunity and conducted a mobile-phone-based survey to obtain real-time data during the COVID-19 pandemic. In this study, we aimed to assess antibiotic use for any reported illnesses in the preceding four weeks and knowledge regarding antibiotics among the general population in Bangladesh.

## 2. Discussion of A Mobile Phone Survey about Antibiotics Use during the COVID-19 Pandemic in Bangladesh

Our study found 32.7% (95% CI: 27.2–38.6) of the general population who reported illness in the preceding four weeks of the interview using antibiotics in the community. This proportion of antibiotic use for illnesses was higher than a pre-pandemic study in a community setting in Bangladesh during 2018, reporting (21%) antibiotics use within the last month [18]. The COVID-19 pandemic may have influenced this rise in the proportion of antibiotic use in Bangladesh. However, the proportion of antibiotics used among COVID-19 patients was much low (12.5%) in our findings. However, determining the proportion of antibiotic use among COVID-19 cases was not the study's objective. Yet, this study finding is much lower than 47% among the suspected COVID-19 cases reported in a previous hospital-based study from Bangladesh [20]. The proportion of antibiotics used for COVID-19 respondents in our study is also much lower than the study conducted in Egypt during the COVID-19 pandemic [17]. This may be likely to the fact that a very low number of COVID-19 cases were detected through this survey.

This study also measured the relevant knowledge regarding antibiotics irrespective of any respondents suffering from COVID-19 illness. The basic knowledge regarding antibiotics was very high among our survey respondents. Our study found a very high proportion (86.3%, 95% CI: 84.7–87.8) of respondents reported to know names of antibiotics compared with the previously reported proportion of 48% in Bangladesh before the COVID-19 pandemic [18]. Furthermore, azithromycin, a macrolide antibiotic, was found as the most frequently (12%) recalled/reported antibiotic. This is perhaps because azithromycin was the most commonly prescribed antibiotics by physician's advice and self-medication during the COVID-19 pandemic situation in Bangladesh [27] and other countries in Europe and Asia [28]. An online survey conducted at the end of March 2020 on 6227 physicians in 30 countries revealed that, after some common analgesics, azithromycin was the second-highest prescribed drug for COVID-19 [29]. Earlier reports on antibiotics awareness in Bangladesh stated the most frequent (11%) antibiotic reported to be a fluoroquinolone named ciprofloxacin [30]. Although our study participants mentioned several unspecified harmful effects of antibiotics if taken without a physician's prescription, very few (4%) could expressly state about antibiotic resistance. This rate is much lower than previous reports from Bangladesh, where 60% of the respondents stated antibiotic resistance [30]. Overall, our findings illustrate that the general population was more knowledgeable about antibiotics during the COVID-19 pandemic compared with the pre-pandemic period.

Drug shops (pharmacies) contributed to the lion's share (33.3%) of antibiotic dispensing without a prescription, and village doctors also contributed a handsome proportion (13.1%) in prescribing antibiotics in our study. Recent past studies in Bangladesh reported proportions as high as 43% [31] and 16% from drug shops (pharmacies), and 18% from village doctors [30]. Bangladesh's common practice is to fetch over-the-counter medicines and even antibiotics regardless of consulting any qualified healthcare providers and the socio-economic status and education of the buyer [32][33]. Our findings and this intrinsic nature of the population regarding procuring antibiotics raise a flag to immediately adopt and strengthen "prescription-only from formal providers" for antibiotic purchase [20].

The antibiotic azithromycin was the most frequently prescribed/used, followed by cefixime—a third-generation cephalosporin. For treating suspected or confirmed mild-to-moderate COVID-19 cases without clinical suspicion of bacterial infections, antibiotics were discouraged from using for empirical treatment by WHO [34]. However, due to overburdened laboratories for testing microbiological samples and lack of recommended antiviral therapy for COVID-19 infection, there was an increased empirical use of antimicrobials, including broad-spectrum antibiotics, by the clinicians [13][35]. In Spain, a biphasic use of antibiotics was observed during the COVID-19 pandemic during 2020, along with amoxicillin/clavulanic acid and broad-spectrum antibiotics in public referral hospitals [35]. Physicians reported the widespread use of broad-spectrum antibiotics in 23 countries [9]. Moreover, the most common antibiotic classes prescribed were macrolides, fluoroquinolones,  $\beta$ -lactam/ $\beta$ -lactamase inhibitors, and cephalosporins in North America, Europe, China, and Asia [28]. The use of macrolide and cephalosporins were similar to the results from a recent study conducted across Bangladesh during the first wave of the COVID-19 pandemic, where macrolide was the most frequently (27%) used antibiotic followed by cephalosporin (16%) among suspected COVID-19 patients before hospital admission [20]. However, both azithromycin and cefixime belong to the Watch group antibiotic, which is not recommended according to the WHO AWaRe classification/tool [36]. This non-compliance in antibiotic use also flags a concern for antimicrobial resistance.

Although we were able to cover respondents from across eight administrative divisions of Bangladesh, while interpreting our study findings, several limitations must be kept in consideration. The majority of our study respondents were males aged 18–40 years; therefore, our sampled respondents may not represent Bangladesh's demographic profile. Furthermore, antibiotics were more likely to be used in extremes of age while we had no respondents <5 years, and only 4.2% were above 50 years. It was a survey based on mobile phone, and hence there may be recall bias in the responses leading to data loss and distortion. Furthermore, knowledge questions on antibiotics were limited to basic ones such as names, dosage, and harmful effects. Lastly, there were minimal opportunities to cross-validate responses, and only 5% of the complete interviews were randomly cross checked by repeat interviews. Overall, our results may be an underestimate of our actual prevalence of antibiotic use and knowledge.

In conclusion, our study findings underscored the increased proportion of antibiotic use for recent illnesses and raised knowledge about antibiotics at the community level during the COVID-19 pandemic in Bangladesh. Overuse of antibiotics, widespread availability, and generalized access to all types of antibiotics as over-the-counter drugs in the community surface raise concerns for antibiotic resistance in the near future. A robust monitoring system supported by policy and law is highly recommended to delimit over-the-counter antibiotic sales. Together with building community awareness on AMR, precisely due to the irrational use of antibiotics, it is imperative to promote, standardize, and strengthen antimicrobial stewardship within the health system of Bangladesh.

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