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Prevalence, Pattern and Impact of Self Medication of Anti-Infective Agents during COVID-19 Outbreak in Dhaka City

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Objectives: To observe the prevalence, pattern, sources, and impact of self-medication practice among the respondents with high socio-economic standings and education.

Setting: Citizens living in Dhaka city, Bangladesh, during the COVID-19 outbreak from April 2020 to May 2020. Method: Cross-sectional online survey conducted on 626 citizens without having a background of medical knowledge or related to any healthcare services (doctors, nurses, pharmacists, medical students) by structured questionnaires during the COVID-19 outbreak.

Outcome measures: Frequency of self-medication, commonly used antimicrobial agents, symptoms causing self-medication, sources of inspiration, relation with COVID-19 test results, economic burden involved in self-medication during the outbreak.

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Prevalence, Pattern and Impact of Self Medication of Anti-Infective Agents during COVID-19 Outbreak in Dhaka City

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Outcome measures: Frequency of self-medication, commonly used antimicrobial agents, symptoms causing self-medication, sources of inspiration, relation with COVID-19 test results, economic burden involved in self-medication during the outbreak.

Results: The prevalence of self-medication amid the pandemic of the COVID-19 was 88.33%, and only 179 (28.59%) took medication with doctors' advice and the remaining 447 (71.40%) respondents took the drugs as "self-medication" by other sources. The most frequently used anti-infective drugs during the outbreak were ivermectin (77.15%), azithromycin (54.15%), doxycycline (40.25%). The common symptoms were fever, throat pain, dry-cough, and a total 105 (16.77%) respondents took medications without having any symptoms. Almost 355 (85.33%) had taken medication without doing any test for COVID-19. The causes of self-medication as news of spread, effects, and remedies in media channels, internet, mental stress of lockdown and isolation, insecurity, and panic about the scarcity of drug and healthcare support.

Conclusion: High risks of developing antibiotic resistance, adverse drug reactions, and financial loss were predictable with the absence of strict regulatory enforcement to protect people and proper utilization resources during the COVID-19 outbreak in Dhaka city.

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Impact on Practice

- Self-medication of anti-infective agents during the COVID-19 outbreak is high due to inadequate access to the doctors, easy availability of any drugs without prescription, and remedy of common symptoms.
- Most of the educated citizens having high socio-economic status in Dhaka become stressed due to scarcity of supply as informed by news media, internet, and friends that provoked self-medication of anti-infective agents.
- Unapproved medications for the COVID-19 like azithromycin, doxycycline, hydroxychloroquine and ivermectin were used in self-medication that added unnecessary financial burden.
- Lack of monitoring, surveillance, and regulations in drug dispensing can be a major cause of resistance, organ damage, adverse drug reactions, and interrupted supply chain for high demand during the COVID-19 outbreak in Dhaka city.

I. Introduction

According to the World Health Organization (WHO), self-medication is explained as "the selection and use of medicines by individuals (or a member of the individual's family) to treat self-recognized or self-diagnosed conditions or symptoms. Reasons commonly adducted for indulgence in self-medication include delayed access to healthcare centers, socio-cultural belief, relatively high cost of hospital treatment, previous experience of treatment of same symptoms, easy availability of drugs, poor regulatory practice, the urgency of feeling relieved, advice from friends and media. The of self-medication is prevalent in most parts of Bangladesh, regardless of socio-economic status and level of education. While this is indisputable, the incidence of self- medication is may be higher in the low or middle-income countries without consulting with qualified health professionals[1]. Although the WHO stressed that rational self-medication practice helps in

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the prevention and treatment of some minor pathological conditions at affordable cost[2], otherwise it may cause wastage of resources, resistance to pathogens, and serious health hazards with adverse drug reactions and prolonged morbidity[3]. In a developing country like Bangladesh, the practice of self-medication may provide an alternative for people as low-cost to avoid the high cost of clinical services, and many drugs dispensed over the counter (OTC) without prescription[4]. But it is gone beyond the OTC drugs and sometimes prescription-only drugs like antimicrobials, sedatives, hypnotics and strong NSAIDs also reported to be dispensed without prescription in few cases.

Moreover, the ratio between doctor and patient in Bangladesh is currently as low that places the country at second position from the bottom, among the South Asian countries, according to the WHO[5]. Besides, some individuals practice out of ignorance, poverty, and generalized hypes.

Dhaka, being the capital and the major economic-hub of the country; it lags in the ratio between healthcare workers compared to other neighboring countries, thus hampering proper and timely healthcare. So, practice of self-medication is almost inevitable as the country has only six doctors, nurses, and midwives for every 10,000 populations, according to the report of health bulletin published yearly by the Health Ministry[6]. Some studies on the general tendency and pattern of self-medication practice of prescription-only drugs among students, and people with or without medical knowledge showed an alarming scenario in Dhaka city[7].

The outbreak of coronavirus disease-2019 is putting a massive strain on vulnerable healthcare systems in low and middle-income countries like Bangladesh. Inequitable access to healthcare is further widened by the socio-economic gap and sense of insecurity during this pandemic since the beginning of 2020[8]. Besides, the population of higher socio-economic standing is more potential to have access to better health information, medications and affordability that may lead to self-medication practice in mass. Similarly, people with higher education are reported to have much distress, probably due to high self-awareness and access to mass information network[9].

The combat against COVID-19 is continuing in Bangladesh, with the highest incidence rate in Dhaka city. The available data by WHO revealed that the highest AR was observed to continue in the Dhaka (2321.7/1,000,000) and was highest (9422.1/1,000,000) from April to June 2020[10]. As there is no approved cure for the COVID-19 or a vaccine against SARS-CoV-2, the aim of treatment is focused to manage and reduce symptoms until clinical recovery. Most people (around 80%) are an asymptomatic or mild infections that can be treated at home.

As stated in the National Guideline on Case Management of COVID-19 in Bangladesh, there is no precise, effective treatment for COVID-19; the mainstay of management is early diagnosis and supportive care of symptoms and optimum support for organ function in severe illness. No drug is yet recommended as chemoprophylaxis as there is no quality evidence of efficacy and safety in COVID 19. Though Patients should be managed in hospital settings; however, proper home care may also be advised with mild illness unless rapid deterioration or inability to avail hospital if necessary[11]. But lack of rapid response, scarcity of hospital beds, absence of private practice, inadequate capacity of testing (RT-PCR), the spread of un-authenticated treatment protocols are putting the citizens in the dilemma of choosing medical advice. Lot of prescription-only drugs like antimicrobials (azithromycin, doxycycline), anti-parasitic (ivermectin), anti-malarial (hydroxychloroquine) are reported to become a shortage in the dispensary and peripheral supply chain throughout the city. Moreover, the risk of a wide range of side effects (Table-I) are also of great concern for undocumented self-medication.

Table-I: List of possible side effects of anti-infective agents used in self-medication during COVID-19

	Mild / common	Severe / rare
Azithromycin	Diarrhea, nausea, abdominal pain, vomiting, headache	Prolong QT interval, Arrhythmia, Hepatic dysfunction, Myasthania
Doxycycline	loss of appetite, nausea, vomiting, diarrhea, rash, sensitivity to the sun, hives, discoloring of teeth, bloody diarrhea, stomach cramping and pain, fever, dehydration, weight loss	headache, blurry vision, double vision, vision loss, Irritation of esophagus, Anemia, Pancreatitis. pain in upper abdomen, fever, skin reactions, blisters, peeling skin, small purple spots
Hydroxychloroquine	nausea, vomiting, stomach pain or cramps, loss of appetite, weight loss, diarrhea, dizziness, spinning sensation, headache, ringing in ears, mood changes, nervousness, irritability, skin rash, itching, or hair loss.	Bone marrow depression, anemia, aplastic anemia, agranulocytosis, leukopenia, and thrombocytopenia. Hemolysis reported in individuals with glucose-6- phosphate dehydrogenase deficiency, Cardiomyopathy, cardiac failure, prolongs the QT interval, Ventricular arrhythmias, torsade de pointes

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Ivermectin	tiredness, loss of energy, stomach pain, loss of appetite, nausea, vomiting, diarrhea, dizziness, sleepiness or drowsiness, itchiness, trouble breathing, swelling of throat or tongue, skin rash	Bronchospasm, hepatotoxicity, seizure

Because of commonly occurring symptoms of soreness or pain in throat, dry cough, fever, body ache, breathlessness, people started to take medicines without being diagnosed or tested for COVID-19. Besides the risk of misuse or overuse of these drugs may lead to immediate or delayed complications including adverse drug reactions (hypersensitivity, anaphylaxis), drug interactions, malfunction or destruction of vital organs such as the liver, kidney; the practice of self-medication gives a deceitful sense of security, and masking the correct diagnosis. Many countries are using different drugs, but they are not using those as the guidelines and should only be used under the supervision of physicians on a case-by-case basis, not as a general recommendation[12].

Given this high prevalence of self-medication of prescription-only drugs in Bangladesh and its associated adverse socio-economic impact on individuals, and the healthcare service system, supply chain at large. This study is therefore done to evaluate the awareness, pattern and attitude towards self-medication of anti-infective agents among the high socio-economic and educated citizens in Dhaka during the outbreak of the COVID-19 without testing, diagnosis and prescription.

Ethics Approval: None of the authors has any conflict including employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/ registrations for this study.

II. Methodology

Using and relying on the authors' network with people living in Dhaka city, the capital of Bangladesh; this online survey adopted a descriptive non-experimental research design to investigate the awareness and practice of self-medication conducted from April to June 2020, the period during the nationwide lockdown and to surge of number of positive COVID-19 cases. Because it was not feasible to do a community-based sampling survey during this outbreak period, we decided to collect data online by convenience sampling. A structured questionnaire was circulated to complete via clicking the link, connected to Google form. The questionnaire contained a brief introduction on the background, objective, procedure, voluntary nature of participation, declaration of anonymity and confidentiality, and notes for filling in the online questionnaire.

The online questionnaire was developed and validated through the face and content validity techniques, by giving the draft questionnaire to a few of the citizens with inclusion criteria at Dhaka city, to assess whether the response looks meaningful, well designed and a good measure of the construct to an innocent bystander. The response was used to refine and modify the questionnaire further.

The content validity was done by giving the resultant questionnaire to three independent scholars from the fields of Public Health, Pharmacology, and Social Statistics to assess its appropriateness, clarity, coverage, and relevance to the study.

The reliability of the validated questionnaire was ascertained by test-retest method. The questionnaire was administered twice at two weeks' interval on ten respondents from Dhaka city who practiced self-medication during the COVID-19 outbreak. The responses were compared and the reliability coefficient determined (r=0.83). The incorporated draft questionnaire was recast for ambiguity and repetitive questions were struck off.

The cross sectional populations were included with the inclusion criteria as, the adult citizens living in Dhaka city, aged 25 years or more, with the education level of graduation or above, non-medical professionals, having email address, and agreed to participate voluntarily. Respondents having involvement or knowledge on medical background (medical graduates, medical practitioners, nurses, medical researchers, pharmacists) were excluded from finding out the public perceptions, and their responses to take medications without prescription during the COVID-19 outbreak. The frequencies of the response were recorded in the datasheet, and observed according to demographic characteristics, sources of information, clinical symptoms, the status of COVID-19 test results, and cost involvement. The market prices of commonly used medicines as self-medication during the outbreak were calculated to reveal the economic burden caused by COVID-19 driven self-medication practice.

III. Results

Total of 639 participants completed the online survey questionnaire and submitted it with e-mail verification. After excluding 13 respondents, of whom 10 were doctors by profession and three were below the minimum age limit (25 years), the final sample consisted of 626 were valid participants. Among the final sample, 316 (50.47%) respondents were from the age group of 45-54 years, 346 (55.27%) were women, 312 (49.84%) held a bachelor's degree, and 230 (36.74%) engaged in non-civil services. Other demographic characteristics are shown in Table-II.

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Table-II: Frequency distribution of respondents by their socio-demographic features

Variables	Frequency	Percentage (%)
Gender:		
Male	282	45.04%
Female	346	55.27%
Age:		
25-34	96	15.33%
35-44	156	24.92%
45-54	316	50.47%
55 +	58	9.26%
Education level:		
Undergraduate	110	17.57%
Bachelor degree	312	49.84%
Master degree	178	28.43%
Doctoral and advanced	26	4.15%
Work status:		
Students	84	13.41%
Civil service	13	2.06%
Non-civil service	230	36.74%
Self-employed / business	184	29.39%
Retired	38	6.07%
Unemployed	77	12.30

Table-III: Frequency distribution of respondents by use of anti-infective agents

		Number of Respondents	Azithromycin		Doxycycline		Hydroxychloroquin		Ivermectin	
			N	Cost involved (USD)	N	Cost involved (USD)	N	Cost involved (USD)	N	Cost involved (USD)
RT-PCR test	Positive	132	111	*490*	93	*227*	84	*420*	109	*160*
	Negative	78	20	*102*	31	*76*	0	*0*	55	*81*
	Not done	416	208	*1046*	128	*313*	44	*215*	319	*460*
Total		626	339	*1638*	252	*616*	128	*635*	483	*710*

- Cost involved = Unit price x Daily dosage x Number of days
- Total cost converted from local BDT to USD

Out of 626 respondents, only 73 (11.66%) did not take any medication during the survey period as 12 (1.91%) were negative by rRT-PCR test for COVID-19 and 61 (9.74%) did not test. The remaining 132 respondents (21.08%) was found positive test results for COVID-19.

The most frequently used prescription-only drug among the respondents were ivermectin (77.15%), azithromycin (54.15%), montelukast (43.13%), calcium supplements (41.37%), doxycycline (40.25%), and hydroxychloroquine (20.44%) respectively. The frequency of taking the prescription-only drugs among the respondents who were not even diagnosed by the rRT-PCR positive results, was reported higher with ivermectin (76.68%) and azithromycin (50.0%) as shown in Table-III.

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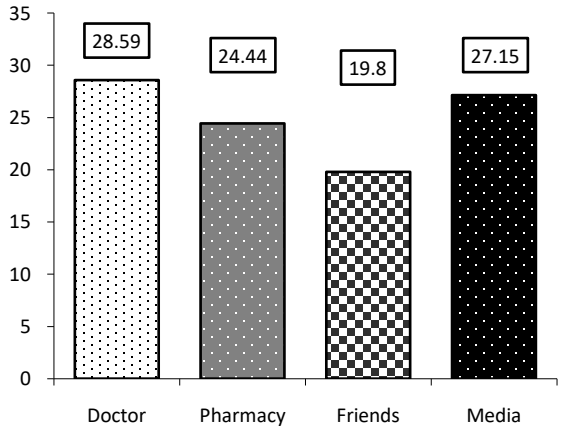


Figure-1: Distribution of respondents taken medication according to source of advices

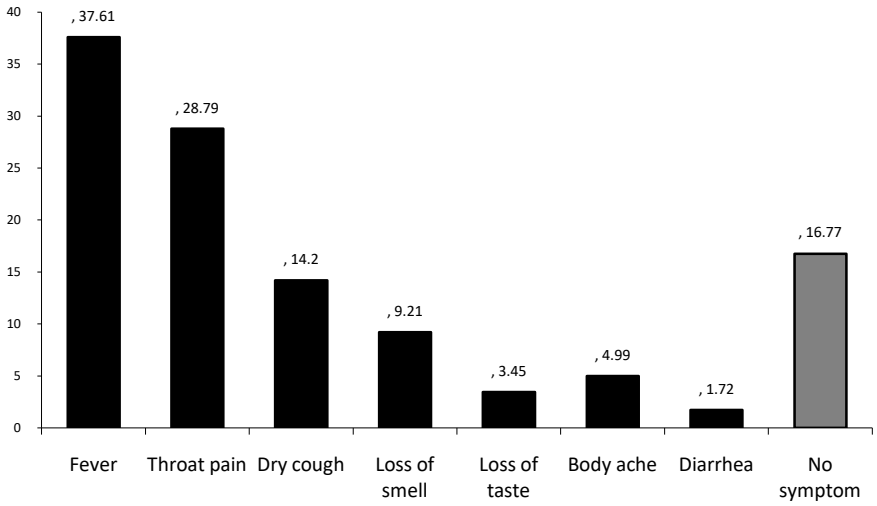


Figure-2: Distribution of respondents taken medication according to symptoms

Among the respondents, only 179 (28.59%) took medication with doctors' advic and remaining 447 (71.40%) respondents took the drugs, as "self-medication" by the other sources like friends/family, pharmacy/dispensary and media/internet as shown in Fig-1.

A total of 105 (16.77%) respondents took medications without having any symptoms, and the remaining 521 respondents, common symptoms for which the respondents took medications were fever (37.61%), throat pain (28.79%), dry-cough (14.20%), loss of smell (9.21%), loss of taste (3.45%), body ache (4.99%), and rarely diarrhea (1.72%) respectively as shown in Fig-2.

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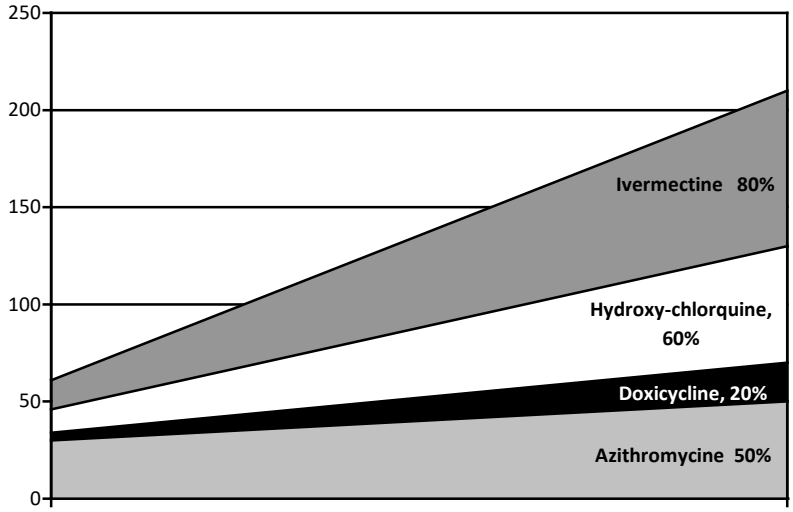


Figure-3: Raised price of the anti-infective agents during COVID-19 outbreak

The market price of the anti-infective agents was higher than the retail price as shown in Fig-3. Azithromycin raised almost 37%, hydroxychlorquine 18%, doxycycline 12% and ivermectin 7%, respectively.

IV. Discussion

To the best of our knowledge, this is the first online survey in Dhaka city evaluating the pattern and frequency of self-medication practice of prescription-only drugs in the COVID-19 outbreak (April to June 2020) in Bangladesh. As the survey population was well-educated adults from different working status, the respondents' participation was expected to represent the sincerest and accurate scenario of the defined survey population.

An almost equal proportion of males and females participated in the study and most of them (50.47%) belonged to the age group of 45-54 years. The highest number of respondents (49.84%) were graduates (Bachelor's degree), and the lowest with doctoral degrees (4.15%). Only 2.06% respondents were from civil service and the rest were from non-civil service (36.74%), self-employed, or business (29.39%) living in Dhaka city at the time of the COVID-19 pandemic.

Among 626 survey population in Dhaka city who had taken medication for COVID-19, only 132 (21.08%) were documented as positive and 78 (12.45%) as negative by RT-PCR test. The rest of 416 (66.45%) had never done the test, but almost 355 (85.33%) had taken medication without doing any test for the COVID-19. This finding could be due to having additional distress due to high self-awareness of their health, as reported by Roberts T. et al. among people with higher educational status[9]. Having self-medication without detecting COVID-19 among a large number of respondents could also be due to feeling of insecurity influenced by the availability of local medical resources, efficiency of the public health system, and prevention and control measures taken in pandemic situation[17].

The rate of self-medication of antimicrobial agents like azithromycin (54.15%), doxycycline (40.25%) was found much higher during the outbreak of COVID-19 comparing to 21% and 25% for azithromycin and doxycycline before the pandemic as reported by Chowdhury N et al[13]. Azithromycin was the fifth-highest percentage of people with self-medication throughout the previous years, whereas it became the most common antibiotic during the present pandemic. On the other hand, ivermectin being the anti-parasitic agent, was self-medicated by 77.15% of the respondents. This might be due to the nationwide broadcast of an experience by a team of Bangladeshi physicians, and Bangladesh Medical College Hospital (BMCH) claimed as "outstanding results" in 60 patients with COVID-19 patients all of whom recovered in a combination with ivermectin and doxycycline[12]. This attempt was made on the outcome of an in-vitro study reported as a single treatment by ivermectin is capable of ~5000-fold reduction of viral load at 48 hours in cell culture[14]. Self-medication of this drug was found highest (483/626) among the respondents irrespective of test results by RT-PCR. Though the drugs like chloroquine, hydroxychloroquine and azithromycin, was recommended in the treatment protocol of the Covid-19 patients in Bangladesh, according to the "National Guidelines on Clinical Management of Coronavirus Disease-2019" published in the health directorate's website[11]; hydroxychloroquine was used much less (20.44%) than any other antimicrobials without prescription. This could be due to mass publicity and sharing of news in national and international news and social media as the drug can cause hazardous abnormalities in cardiac rhythm in the COVID-19 patients, and should be limited only in clinical trials or hospitals with adequate facilities to monitor any cardiac

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complications, warned by FDA in a safety communication briefing globally[12]. The overall the prevalence and dominance of self- medication of antimicrobials in low and middle-income countries were reported around 39% in previous studies before the COVID-19 pandemic[15,16] but was outrageously higher (88.33%) in Dhaka city during the pandemic.

Considering the sources or advice for medication, only 179 (28.59%) respondents followed or consulted with doctors and rest by media or internet (27.15%), pharmacy or dispensary (24.44%), and friends or family (19.8%). This finding was very much similar to the previous studies that reported the high prevalence of self-medication (including antimicrobials) since people could obtain any drugs from the pharmacies without prescription even in the distant areas of the country[18]. Moreover, during a pandemic, people struggle to cope with constant news of the spread and effects of COVID-19 on news-media, social-media, internet without having adequate forms of social support and access to doctors as a result of lockdowns and self-isolation[8,19]. Most of the respondents (37.61%) took antibiotics as self-medication for fever during Covid-19 outbreak, followed by throat pain (28.79%), dry cough (14.20%), whereas almost 16.77% respondents had no symptoms whatsoever. Having inappropriate antimicrobials, and supplementary medications (zinc, calcium, Vitamin-D) without prescription is associated with the risk of drug interactions, masking symptoms of underlying diseases, and most importantly, the development of antimicrobial resistance[20,21].

Prices of essential COVID-19 medicines have increased 4% globally since February 2020, as reported by Gustav Ando in Life Science Research and Analysis. Although there is no specific treatment for Covid-19, the drug administration in Bangladesh started working in advance to increase the production of some supportive medicines[22]. Despite the availability of essential drugs, the increase demand in major cities for self-medication of azithromycin raised almost 37%, hydroxychlorquine 18%, doxycycline 12%, and ivermectin 7% respectively. The total amount of buying those medicines in response to COVID-19 situation had an unnecessary financial burden on the people in Dhaka. Overall economic hardship in low and middle-income countries have to cope with the added expenditure that could be avoided by strict regulatory surveillance on self-medication and dispensing without prescription.

Although there is no approved specific medication to prevent or treat COVID-19, this online survey among the educated adults with high socio-economic standings revealed that a high prevalence of self-medication of prescription-only drugs was persistent during the outbreak in Dhaka city. Unsolicited news of spread, effects and remedies in media channels, internet, mental stress of lockdown, and isolation, insecurity, and panic about the scarcity of drug and healthcare support might has triggered up the practice self-medication. Psychological distress levels were also influenced by availability of local medical resources, prevention and control measures[23]. There is sufficient evidence of increasing resistance to antibiotics in Bangladesh resulting from irrational and misuse of antibiotics, where sales of antibiotics are not restricted at any level[24]. Unopposed access to buy antibiotics and its injudicious use might provoke a long-term burden of drug-resistant strains with problems of under and over-dosage, treatment failure and severe adverse effects on vital organs. It also results in delays in care seeking, which results in paradoxical economic loss due to delayed diagnosis, and irrational treatment[25]. Bangladesh is already in the burden of a lower ratio of healthcare workers and a supply support system, with a high rate of community-transmission of COVID-19 and requires effective and efficient enforcement of regulation against free display and sales of drugs without prescription and individuals duly authorized.

V. Conclusion

The pattern of medication, including self-medication, is an important health indicator, which reflects the degree of supply utilization, and regulatory enforcement of healthcare services within a community. Immediate acceleration of health education campaigns, strict legislations on dispensing drugs and increasing the quality, and access to healthcare are the important interventions that might change the people's health-seeking behavior[26]. The pandemic situation of COVID-19 is likely to sustain for years and it will have a huge socio-economic and psycho-social impact on people's lifestyle and behavior, as predicted by the WHO, and epidemiologists from different regions. Therefore, a vast nationwide survey and surveillance should be done on self-medication of the mass population to protect them from the potential risks, overuse shortage and irrational financial burden during the COVID-19 outbreak.

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