Original article:

Availability and price changes of potential medicines and equipment for the prevention and treatment of COVID-19 among pharmacy and drug stores in Bangladesh; findings and implications

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Abstract:

Objective: There are concerns with increased prices and drug shortages for pertinent medicines and personal protective equipment (PPE) to prevent and treat COVID-19 enhanced by misinformation. Community pharmacists and drug stores play a significant role in disease management in Bangladesh due to high co-payments. Consequently, a need to review prices and availability in the pandemic. ***Materials and Methods:*** Multiple approach involving a review and questionnaire among pharmacies and stores early March to end May 2020. ***Results and Discussion:*** 170 pharmacies and drug stores took part, giving a response rate of 63.9%. Encouragingly, no change in utilization of antimalarial medicines in 51.2% of stores despite global endorsements. However, increased utilisation of antibiotics (70.6%), analgesics (97.6%), vitamins (90.6%) and PPE (over 95%). Encouragingly, increases in purchasing of PPE. No increase in prices among 50% of the stores for antimalarials, with a similar situation for antibiotics (65.3%), analgesics (54.7%), and vitamins (51.8%). However, price increases typically for PPE (over 90% of stores). Shortages also seen for medicines and PPE, again greater for PPE. ***Conclusions:*** The pandemic has impacted on the supply and prices of medicines and PPE in Bangladesh. Key stakeholder groups can play a role addressing misinformation, with enhanced local production helping address future shortages and prices.

Keywords: Bangladesh, Community pharmacists, LMICs, price rises, self-purchasing, shortages

Bangladesh Journal of Medical Science, Special Issue on Covid19, 2020. Page : S 36-S 50
DOI:https://doi.org/10.3329/bjms.v19i0.48106

1. Introduction/ Background

1.1 General and Bangladesh

The coronavirus disease 2019 (COVID-19) pandemic was first identified in Wuhan, China, during December 2019, and by 19 June 2020, there were 8.385 million cases and over 450,000 deaths worldwide giving a case fatality ratio (CFR) among confirmed cases of 5.37%[1-3]. This included over 541,000 confirmed cases in the WHO South East Asian Region, including Bangladesh, with over 16,300 deaths giving a CFR 3.02%[1]. The first reported cases for COVID-19 in Bangladesh were in early March 2020[4-6], and by 15 June 2020, there were over 90,600 cases with just over 1,200 deaths giving a CFR of 1.33%[7,8]. However, there are concerns with appreciable under-reporting of cases due to limited testing capabilities[9-13]. For instance, by 24 March 2020 in Bangladesh, the Institute of Epidemiology, Disease Control and Research (IEDCR) laboratory had only tested 675 samples with 565 new tests

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undertaken since 13 March 2020[5].

There are also concerns that due to a lack of resources and personnel, along with high levels of both infectious and non-infectious disease, that COVID-19 could overwhelm Bangladesh[11,14-21]. This includes high prevalence rates of coronary vascular disease (CVD) and diabetes[19,20], including both macro- and microvascular complications[16,18,20,22,23], as well as hypertension[17,18,24,25]. Concerns include a lack of intensive care unit (ICU) beds among public hospitals in Bangladesh to treat patients with severe COVID-19[4,12,15,26]. Medicine costs are already a concern in Bangladesh as they account for an appreciable proportion of direct medical costs (83.5%) for treating patients with type 2 diabetes (T2DM) in the community, which is typically out-of-pocket[27]. This is a concern as Kasonde *et al.* (2019) recently ascertained that several purchased medicines to manage non-communicable diseases (NCDs) in Bangladesh were expensive by international standards, with the least affordable being bisoprolol (for hypertension), metformin and atorvastatin, adding to concerns with affordability to treat family members with T2DM[28].

We are aware of ongoing plans in Bangladesh to reduce the prevalence and burden of NCDs; however, there are concerns with their implementation[29-32]. There are also currently high rates of smoking in Bangladesh, up to 35% of the adult population, highest among the South East Asian countries[11,33-35], adding to the cost and burden of NCDs[35,36], which also needs to be addressed.

With respect to infectious diseases, there are concerns with high rates of antimicrobial resistance (AMR) in Bangladesh exacerbated by high rates of inappropriate prescribing and dispensing of antibiotics, including macrolides such as azithromycin[37-42], which have resulted in a National Action Plan to try and address this[43]. Encouragingly for patients, prices of essential antibiotics in private pharmacies in Bangladesh, including model stores, were not much higher than international prices in a recent study by Rahman *et*

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al. (2019), with only limited price increases between 2003 and 2019[44]. The increase in cases with dengue[21], and the continued challenges with tuberculosis in Bangladesh, with patients typically seeking help from non-qualified practitioners before seeking help from qualified professionals, also needs addressing[45-48]. Encouragingly, whilst there are still cases of malaria in Bangladesh, co-ordinated activities have reduced these by more than 50% in 2016 versus 2010[49]. Targeting and managing hotspots will help further reduce and eliminate malaria, which is the goal of the Government[49,50]. Pharmacies can also take part in immunization programs in Bangladesh, especially where there are bottlenecks[51].

1.2 Bangladesh Healthcare Systems Including Community Pharmacy and Drug Stores

Payment for health care provision in Bangladesh is typically out-of-pocket, with Bangladesh having one of the highest rates of catastrophic healthcare expenditures worldwide[52]. As a result, a significant number of households are forced to sell assets or borrow money to fund treatments when family members become ill[52]. COVID-19 will only add to these concerns.

Consequently, retail drug stores, both licensed and unlicensed in equal numbers, are important in Bangladesh as they are often the principal source of healthcare for patients given their financial circumstances[14,41,53]. A key concern though has been a lack of formal counseling within stores unless pro-actively sought by patients[53,54], with currently more than 80% of the population in Bangladesh preferentially seeking care from drug stores as well as untrained or poorly trained village doctors[53].

However, there have been recent steps to address concerns with the publication of standards for drug outlets[55]. Under this system, in a Model Pharmacy (Level I), the service should be provided, managed, or supervised by an A grade pharmacist, with B or C grade pharmaceutical personnel assisting with dispensing under supervision. In a Model Medicine Shop (Level II), the service should be performed at a minimum by a C graded professional[55]. However, unregulated drug shops are still seen as essential as excessive regulations adding to costs could potentially remove access to medicines for many of the population[41].

1.3 Risk Factors and Approaches to Prevent and Treat COVID-19 - General

COVID-19 is transmitted from person to person principally through respiratory droplets[56,57], with increased morbidity and mortality associated with several underlying health conditions including cardiovascular disease (CVD), hypertension, diabetes, chronic obstructive pulmonary disease (COPD), shortness of breath and smoking[58-65]. Ethnicity may also be important, with patients in the United Kingdom of Bangladesh origin having appreciably increased mortality from COVID-19[66-69]. There were concerns initially that renin-angiotensin inhibitors would enhance susceptibility to COVID-19, as well as increase its severity, leading to recommendations to stop these treatments, which is a concern in Bangladesh given current high prevalence rates of CVD, diabetes, and hypertension[17,19,20,70]. However encouragingly, recent studies have shown no such association[71,72].

Currently, there appears to be no cure for COVID-19; however, several medicines have been proposed and are undergoing trials[73,74]. There have been several published studies on chloroquine and hydroxychloroquine with or without azithromycin following initial studies in China[75-78]. However, there were concerns with the lack of comparisons in early studies and side-effects, including cardiac side-effects, with more recent studies documenting issues with their effectiveness as more data becomes available[75,78-85]. The study of Mehra *et al.* (2020) showed increased mortality; however, now retracted and subject to external auditing[86,87]. As a result of more recent studies, including the UK Recovery trial, the WHO has halted the hydroxychloroquine arm in the ongoing Solidarity Trial[1,84]. There have also been similar activities among European countries as well as with the National Institute of Health in the US[88,89]. Remdesivir has shown encouraging results following earlier concerns[90,91], and triple antiviral therapy is also showing promise although patients numbers are small[92]. More recently, dexamethasone has improved outcomes in ventilated patients and those receiving oxygen[93]. However, further studies are needed before specific treatments can be robustly recommended, given the redaction of recent studies and concerns with study designs[79,94,95].

This lack of recommended treatments has resulted in companies and individuals exploiting the opportunity often with misinformation[96-98]. Misinformation and the endorsement of hydroxychloroquine by Governments and others[99-104] has increased prices alongside hospitalizations and deaths from poisoning[100,105-108]. This is a concern in countries such as Bangladesh with potentially catastrophic consequences for families, especially if funds for other diseases are diverted towards purchasing

increasingly expensive unproven treatments.

1.4 Activities by the Government and Others in Bangladesh to Reduce the Spread and Mortality due to COVID 19

The Government, WHO, and others have instigated a variety of financial and other measures to help prevent the spread of COVID 19 and reduce financial and socioeconomic consequences (Table 1). During this period, the WHO also issued guidance on misinformation by providing updates on 'myth busters'[109].

Table 1: Activities Instigated to Help Prevent the Spread of COVID-19 in Bangladesh and Associated Financial Consequences.

Sector	Activities
Health/ prevention including shortages	• First week of March 2020 – The Government started to postpone/ cancel all mass gatherings[11] • March 15, 2020 The Government banned all flights coming from Europe except the United Kingdom; however, flights from Europe still landed[11,110], with further bans on International travel introduced later[11] • March 16, 2020 The Government imposed a 14-day obligatory quarantine on all travelers entering Bangladesh[11,111], and on March 19, the Government deployed the army to help supervise two quarantine facilities in Dhaka[11,112] • March 16, 2020 The Government closed all educational institutes[5] • March 19, 2020 The Government instructed local administrations to ban political and religious rallies as well as social and cultural gatherings[5] • March 23, 2020 The Government announced the closure of all public and private offices[5] • March 25, 2020 The Government declared the enforcement of lockdown measures for 10 days effective from March 26, which has been further extended[4,11,113]. However, there were concerns with the lack of coordination between different authorities reducing its impact, and in reality, social distancing is impractical in many over-crowded cities, especially among the slum areas[11]. In some areas, 10 to 16 families share one bathroom or toilet and no regular supply of water[11,114] • June 12, 2020 The Government introduced the concept of risk zones for the prevention of COVID-19 into Red, Yellow, and Green zones based on prevailing risks. On 14 June 2020, 11 red zones were declared in Chittagong City, and from 16 June 2020, all shops, including pharmacies, in the area must remain closed during this period. Other red zones included Kattuli, Khulshi, Chittagong Port, Halishahar and Patenga[7,115] • Ongoing concerns with enough Personal Protective Equipment[11]; although gifts have helped to reduce concerns[102]
Financial/ socioeconomic consequences	• March 18-2020 - The Government adopts the National Preparedness and Response Plan (NPRP) for COVID-19 in Bangladesh with a total cost of US$29.550 billion[5] • April 3-2020 - The World Bank fast tracks US$100million to support Government efforts to tackle COVID-19 in Bangladesh[116] • June 2020 - The International Monetary Fund approved a US$732 million disbursement package to Bangladesh to help further address the financial impact of the COVID-19 pandemic including concerns with an appreciable reduction in income form garment manufacturing[4,12,117]

An ongoing concern are the unintended consequences of COVID-19 with clinics, and hospitals shut down due to fears of infection[13]. These include stigmatization of healthcare workers who have treated COVID-19 patients[13,118], as well as an increase in mental health disorders enhanced by concerns with employment and available resources to purchase food with existing high poverty levels in Bangladesh[13,119,120].

1.5 Role of Pharmacists and Others in Drug Stores in the Prevention and Management of COVID 19 Including Unintended Consequences

Pharmacists and similar healthcare professionals in Bangladesh can prevent and manage patients with COVID-19 as well as help address unintended consequences[121,122]. This includes addressing issues of availability, access, and adherence to medicines in patients with chronic NCDs during the pandemic[123-129]. Potential activities also include giving guidance on prevention and possible treatments of COVID-19 based on evidence rather than misinformation as well as reinforcing Government messages to prevent the spread of COVID-19, including purchasing personal protection equipment (PPE)[122,130-133]. Suggested activities also include appropriate referral of patients with more severe symptoms[132]. This is important as it can be difficult in practice to differentiate respiratory tract infections from COVID-19 in patients presenting with coughs and fever[134].

Pharmacists and others could also offer online or phone counseling services for patients, promote the rational use of medicines, and potentially offer vaccination services[130,135]. However, this may require improved professionalism among pharmacists and store owners[136-138]. Pharmacists and others also need to balance demand and supply of medicines, which is essential in countries with high patient co-payments and existing concerns with the availability of medicines in healthcare facilities[126,139].

1.6 Study Objectives

Consequently, we believe there is a need in Bangladesh with its high rate of both infectious and communicable diseases, considerable concerns with over-crowding and sanitation, as well as catastrophic consequences for families when members become ill, to assess the impact of COVID-19 on the availability and prices of suggested medicines and other technologies to prevent and treat COVID-19 among pharmacies and drug stores. We have noted that previous research in Bangladesh showed limited increases in the prices of antibiotics over time, although there were concerns with the prices of some medicines to treat patients with NCDs[28,44]. However, we believe there are likely to be shortages of suggested medicines to treat COVID-19 in Bangladesh with considerable importing of raw materials potentially affecting medicine prices[140]. Consequently, we wished to assess the current situation to provide future guidance.

We will not be assessing the influence of the various Government initiatives on the prevalence and mortality of COVID-19 in Bangladesh due to concerns with current low testing rates as well as evolving strategies such as risk zones (Table 1)[8,141]. However, we will be monitoring this in the future alongside unintended consequences given rising prevalence rates of COVID-19 in Bangladesh as lockdown measures ease, Bangladesh being one of the world's most densely populated countries[11,142] and with existing high rates of both infectious and non-infectious diseases.

2. Methodology

We undertook a multiple approach involving a narrative review of the current situation with COVID-19. This included a review of current prevalence rates and treatment approaches as well as the role of community pharmacists alongside issues of misinformation. This was combined with a comprehensive questionnaire survey among community pharmacies and drug stores in Bangladesh to assess the current situation regarding prices, availability, and usage patterns of carefully selected medicines potentially used in the management of COVID-19 as well as PPE.

Convenient sampling was used, with snowballing used to collect most requested data through emails and other mechanisms with known contacts; otherwise, direct contact with pharmacy shop personnel for the remainder (cold calling). There was no sample size calculation as there was no previous data to base calculations upon. However, the intention was to undertake the research among an appreciable number of pharmacies and drug stores across Bangladesh as this was the first comprehensive study in this area worldwide, and we wanted to ensure good coverage. Key questions to assess the patterns of demand, availability, and price changes of the selected medicines and equipment, as well as pharmacists potential future role to reduce misinformation, are contained in Box 1. The questions were open-ended without specific categories as there was no pre-existing data to guide this, and they were provided as an Excel spreadsheet. Where possible, exact details were sought from the community pharmacists and store owners. Where this proved difficult, more general information was sought.

Box 1: Key Questions to Community Pharmacists and Drug Store Owners in Bangladesh Regarding Prevention and Treatment for COVID-19

- Geographic location (Region)
- What change in medicine purchasing patterns have you noticed from the beginning of March until the end of May 2020 for antimalarials (hydroxychloroquine), antibiotics (e.g., azithromycin and co-amoxiclav), analgesics, and multivitamins/ immune boosters, based principally on invoices or other information sources were available. In addition, in some pharmacies, details regarding cold remedies and allergy medicines
- What changes in the prices of targeted medicines have you noticed from the beginning of March until end May 2020, e.g., for antimalarials, antibiotics, analgesics, and multivitamins (based on invoices or other information sources) as well as cold remedies/ allergy medicines (some pharmacies)
- Similarly, for PPE, e.g., face masks, hand sanitizers/ antiseptics, as well as thermometers (beginning of March until end May 2020 - based on invoices or other information sources including impressions)
- What shortages/availability concerns have you noticed from the beginning of March until end May for pertinent medicines, vitamins, face masks, hand sanitizers and thermometers (based on stock levels or other information sources/ impressions)
- Any suggestions for addressing inappropriate self-medication for the future, including addressing misinformation from patients?

The Pharmacists/ drug store personnel were briefed on the objectives of the study with the option to participate or not, with confidentiality maintained throughout. Our hypothesis, based on findings in other countries, was that there would be shortages of antimalarial medicines and an appreciable increase in their prices, with a similar situation for antibiotics, vitamins, and hygiene equipment. In most situations, all pharmacies/ drug stores (170 stores) were included whilst in others (110 pharmacies/ drug stores), additional data was collected on antiseptics and medicines for common allergies/ colds.

We combined the data collected with the experience

of the co-authors regarding issues of health policy, health, pharmaceutical care, and self-purchasing in LMICs, to provide future direction, building on comments from the interviewees. We have successfully used this approach before to provide future direction[143-148]. The findings on the purchasing patterns, issues of shortages, and price changes will be compiled into tabular format. No formal statistical analysis was performed as it was envisaged that the level of detail would vary considerably by store.

We did not systematically review publications for their quality using well-known scales such as the Newcastle-Ottawa scale as some quoted papers are in pre-publication format, and there are a considerable number of internets sources[149]. However, these were reviewed for appropriateness prior to inclusion. We also did not seek ethical approval, as this study did not involve patients. However, we sought approval from pharmacy managers and drug store owners before participation with interviewees given the opportunity to refuse. This is in line with previous studies undertaken by the co-authors in related areas, including policies to enhance the rational use of medicines and address issues of medicine shortages involving contact with academics, health authority personnel, and their advisers[143,145,147,148,150,151].

3. Results

Overall, 170 pharmacies and drug stores took part in the survey (Table 2), giving a response rate of 63.9%.

Table 2: Details of Responses Among Pharmacy/ Drugs Stores Approached

Consolidated Interview Groups		How Many Pharmacies/ Stores Approached (N)	How Many Accepted to Take Part (N)	How Many Refused (N)
Group 1		58	26	32
Group 2	Personal communication	57	57	0
	Cold Calling	95	53	42
	Total	152	110	42
Group 3		34	19	15
Group 4		22	15	7
Total		266 (100%)	170 (63.9%)	96 (36.1%)

NB: Each group refers to different co-authors responsible for data collection throughout Bangladesh

The stores were located throughout Bangladesh (Table 3 and Figure 1).

Table 3: Pharmacy/ Drug Store Location in Bangladesh

Location	No of Drugstore Visited
Rural Area Jessore District	25
Dhaka City South	48
Dhaka City North	21
Rural Area of Sylhet District	5
Rangpur City	5
Rural Area of Kushtia	20
Rural Area of Noagan	4
Comilla City	11
Chittagong City	4
Rural Area of Comilla	12
Outskirts Dhaka	5
Bandarban District Town	4
Bogra City	6
Total	170

NB: There are 64 districts in Bangladesh.

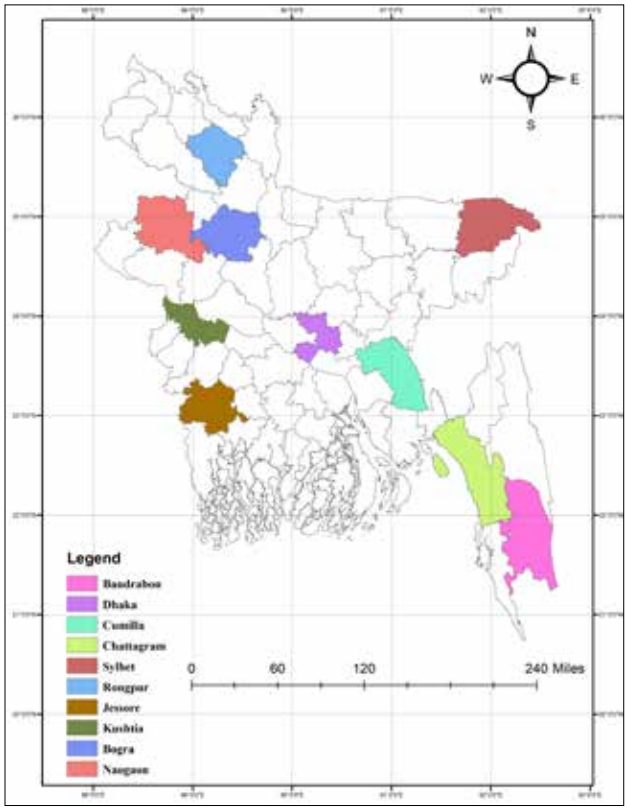

Figure 1: Location of Pharmacies and Drug Stores Taking Part in the Study.

We will first report on changes in utilization patterns before reporting on price changes and shortages with the various medicines and PPE (Box 1).

3.1 Utilisation Patterns

Table 4 depicts changes in utilization patterns among pharmacies and drug stores between the beginning of March (first patients with COVID-19 identified)

until the end of May 2020. Encouragingly, there was no change in utilization patterns in just over half of the stores visited for antimalarial medicines (51.2%) despite global endorsements. However, there was increased utilization of antibiotics (70.6%), analgesics (97.6%), medicines for common colds (94.5%), and vitamins (90.6%), with some substantial increases seen (over 40% from baseline). Encouragingly, there was increased purchasing of PPE in over 95% of stores (Table 4).

Table 4: Utilisation Changes for Medicines and PPE Between Beginning March 2020 and End May 2020

	Antimalarials	Antibiotics	Analgesics	Common cold/ allergy	Vitamins/ immune boosters	Face masks/ thermometers	Hand sanitisers/ antiseptics
Data not available/ no demand	4					1	
Decrease	5	5				1	
No change	78	45	4	6	16	6	5
Increase (not specified)	72	104	140	99	140	139	100
Slight increase (not specified)	1		2				
High increase (not specified)		7	14	2	3	10	1
5% - 20% increase	1			1			
21 - 40% increase		1					
41 - 60% increase		1	1		2		
2 fold increase		6	7	1	8	7	
2 - 3 fold increase	9	1	2				2
3 fold increase				1	1	6	
3 to 4 fold increase							
4 fold or greater increase							2
Total	**170**	**170**	**170**	**110**	**170**	**170**	**110**
No change/ no data/ decrease	51.2	29.4	2.4	5.5	9.4	4.7	4.5

NB: As mentioned – open-ended questions which depended on the willingness of the owners with no pre-set definitions

3.2 Price Changes

Table 5 depicts changes in prices during the study period. As surmised, increases were seen in the prices of antimalarial tablets, some of which were substantial (over 50% from baseline). Encouragingly, there was no increase in prices/ no data available for antimalarial tablets among 50% of the stores visited during the study period, with a similar situation seen for antibiotics (65.3%), analgesics (54.7%), medicines for common cold/ allergies (68.2%) and vitamins (51.8%). However, there were typically increases in the prices of PPE (over 90% of stores), again with some substantial increases.

Table 5: Price Changes for Medicines, PPE and Hand Sanitisers between Beginning March 2020 and End May 2020

	Antimalarials	Antibiotics	Analgesics	Common cold/ allergy	Vitamins/ immune boosters	Face masks/ thermometers	Hand sanitisers/ antiseptics
Data not available	4					1	
No increase	81	111	93	75	88	7	8
Increase (not specified)	55	43	56	26	73	110	75
Slight increase (not specified)	1	1	2				
High increase (not specified)		7	12		2	4	
5% - 10% increase			1	1		2	1
11% - 20% increase	6	2		5		6	3
21 - 30% increase	4			3	1	2	2
31 - 40% increase	1					1	5
41 - 50% increase	7				1		5
51 - 60% increase	2						7
2 fold increase		5	5		5	19	3
2 - 3 fold increase	9	1	1			7	
3 fold increase						7	1
3 to 4 fold increase						1	
4 fold or greater increase						3	
Total	**170**	**170**	**170**	**110**	**170**	**170**	**110**
% No change/ no data	50.0	65.3	54.7	68.2	51.8	4.7	7.3

NB: As mentioned – open-ended questions which depended on the willingness of the owners with no pre-set definitions

3.3 Shortages of Medicines and PPE

Perhaps not surprisingly, shortages of medicines and PPE was seen among the visited stores (Table 6). However, shortages appeared appreciably greater for PPE compared with targeted medicines, including antimalarials (54.1% of stores), antibiotics (17.6%), and analgesics (24.1%).

Table 6: Price Changes for Medicines, PPE and Hand Sanitisers between Beginning March 2020 and End May 2020

	Antimalarials	Antibiotics	Analgesics	Common cold/ allergy	Vitamins/ immune boosters	Face masks/ thermometers	Hand sanitisers/ antiseptics
Adequate/ available/ normal/ no shortages	78	140	129	66	105	34	9
Limited shortages	1						
Shortages	63	18	36	44	57	114	95
Limited availability		5					
Shortages up to one month		1	2		8	10	
Shortages 10 - 29% of the time	2	4				3	4
Shortages 30 - 39% of the time	2		2				1
Shortages 40 - 70% of the time	4						1
Shortages up to three months						1	
Not available	20	2	1			8	
Total	**170**	**170**	**170**	**110**	**170**	**170**	**110**
% Shortages	54.1	17.6	24.1	40.0	38.2	80.0	91.8

NB: As mentioned – open-ended questions which depended on the willingness of the owners with no pre-set definitions

3.4 Potential Ways Forward to Address Misinformation and Enhance Appropriate Use of Technologies

Strategies to address misinformation and concerns are included in Table 7.

Table 7: Key activities among stakeholder groups to improve prevention and management of patients with COVID-19

Stakeholder Group	Suggested Activities
Government	• Encourage an evidence-based environment for key pronouncements, especially when proposing activities to prevent and treat COVID-19. This is especially important among lower-income families where monies spent on prevention and treatment will mean less monies for other medicines and food especially among patients with existing chronic NCDs and is in line with advice from the Council for International Organisations of Medical Sciences[152] • Ensure active dissemination of activities to prevent the spread of COVID-19 including necessary sanitation and other measures mindful of the likely situation especially in densely populated towns • Continue to undertake planned programs to reduce AMR as well as improve the management of patients with chronic NCDs to reduce the unintended consequences of COVID-19. Similarly, for planned programs to reduce/ prevent malaria and tuberculosis • Potentially seek to enhance local production of pharmaceuticals including active pharmaceutical ingredients (APIs) to reduce reliance on imports during pandemics • Encourage greater diversity with the production of PPE building on the extensive garment-producing activities in Bangladesh
Physicians	• Ensure prescribed treatments are evidence-based – especially among patients with limited resources • Continue to encourage appropriate management of chronic NCDs given rising concerns
Pharmacists/ drug store owners	• Try to ensure that medicines or suitable alternatives, helpful for patients with COVID-19 are routinely available • Continue to encourage self-care/ hygiene measures including appropriate wearing of masks and hand sanitization • In appropriate situations, continue to argue against the need for antibiotics where this is a concern, argue for good adherence to purchased medicines, and encourage appropriate referrals to other healthcare professionals were pertinent and possible • Potentially seek novel approaches to help with adherence to medicines especially for patients with chronic diseases including messaging services given concerns with clinic availability • Potentially become involved in vaccination programs as studies suggest that when pharmacists provide immunizations, they substantially increase the number of vaccinated people[135]

NB: NCDs = non-communicable diseases; PPE = personal protective equipment

4. Discussion

We believe this is the first comprehensive study worldwide to assess the impact of COVID-19 on the utilization, availability, and price changes of medicines and PPE used to prevent and treat COVID-19 in LMICs such as Bangladesh with high patient co-payments and potentially catastrophic consequences for families when members become ill.

As expected, there was an increase in the utilization of suggested medicines and PPE worsened by lockdown and transportation restrictions as part of control strategies (Table 4). However, this was not as great for antimalarial treatments and antibiotics compared with analgesics and vitamins. As again expected, there were also price increases for pertinent medicines (Table 5), given some of the shortages seen (Table 6). This contrasts with the previous situation for antibiotics where Rahman *et al.* (2019) found only limited price increases between 2003 and 2019[44]. This is perhaps not unexpected given supply problems with importation during the pandemic and some of the increases in utilization seen soon after the start of the pandemic. Greater local production could help address this, especially with respect to PPE, which is similar to activities in other countries (Table 7)[153].

Table 6 discusses potential activities that can be undertaken among all key stakeholder groups in Bangladesh and wider to address issues and concerns. This also includes addressing unintended consequences of COVID-19, which we will be following up in the future.

Limitations with this study include the fact that we were unable to obtain exact details on changes in utilization and pricing patterns from all stores due to issues of confidentiality and lack of data to hand. We also did not cover all districts and regions in Bangladesh. However, we are confident our findings can be helpful for future planning, given the number of community pharmacies and drug stores involved.

5. Conclusion

We have seen increases in utilization, prices, and shortages of pertinent medicines and equipment used to prevent and treat COVID-19. However, encouragingly shortages and price increases were not as great as originally expected. There are still issues of misinformation, especially regarding potential treatments Store owners, as well as other key stakeholder groups, can help address this in the future.

Conflicts of Interest and Funding

The authors declare they have no conflicts of interest, and the study was self-funded.

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