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

Mainul Haque¹, Salequl Islam², Samiul Iqbal³, Umme Laila Urmi⁴, Zubair Mahmood Kamal⁵, Aminur Rahman⁶, Mustafa Kamal⁷, Monami Haque⁸, Iffat Jahan⁹, Zakirul Islam¹⁰, Mohammad Monir Hossain¹¹, Munzur-E-Murshid¹², Israel Sefah¹³, Amanj Kurdi¹⁴, Brian Godman¹⁵

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

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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 2020⁴⁻⁶, 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 capabilities⁹⁻¹³. 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

- 1. Mainul Haque, Unit of Pharmacology, Faculty of Medicine and Defence Health, Universiti Pertahanan Nasional Malaysia (National Defence University of Malaysia), Kem Sungai Besi, 57000 Kuala Lumpur, Malaysia, Email: runurono@gmail.com, ORCID ID: https://orcid.org/0000-0002-6124-799
- 2. Salequl Islam, Department of Microbiology, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh. Email: salequl@juniv.edu, Orcid ID: http://orcid.org/0000-0001-6131-4132
- 3. Samiul Iqbal, Department of Orthodontics, Faculty of Dentistry, BSMMU, Dhaka-1000, Bangladesh. Email: samiulrdc@gmail.com, ORCID ID: http://orcid.org/0000-0003-1625-5924
- 4. Umme Laila Urmi, Department of Microbiology, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh. Email: ummelailaurmi@gmail.com, Orcid ID: http://orcid.org/0000-0003-1327-1638

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<u>Correspondence to:</u> Brian Godman, Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow G4 0RE, United Kingdom. Email: <u>Brian.godman@strath.ac.uk</u>. Telephone: +44141 548 3825. Fax: +44141 552 2562

undertaken since 13 March 2020⁵.

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-ofpocket²⁷. 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 T2DM²⁸.

We are aware of ongoing plans in Bangladesh to reduce the prevalence and burden of NCDs; however, there are concerns with their implementation²⁹⁻³². 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 azithromycin³⁷⁻⁴², which have resulted in a National Action Plan to try and address this⁴³. 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*

- 5. Zubair Mahmood Kamal, Integrated Sleep Disorders Center (ISDC), McGuire VAMC / VCU Health, 513 Veterans Ave, Richmond, VA 23224, USA. Email: zubair0014@gmail.com. ORCID ID: https://orcid.org/0000-0001-9659-2925
- 6. Aminur Rahman, Finance & Account Division, Grameen Euglena, Grameen Bank Complex, Mirpur 2, Dhaka-1216, Bangladesh. Email: m.aminur22@gmail.com. ORCID ID: https://orcid.org/0000-0002-2665-9095
- 7. Mustafa Kamal, Al-Manar Hospital Ltd., Modern Hospital Cumilla Ltd, Dhaka, Bangladesh. Email: Mustafa. kamal.dhk@gmail.com. ORCID ID: https://orcid.org/0000-0003-1234-2019
- 8. Monami Haque, Human Resource Department, Square Toiletries Limited. Rupayan Center, 11th Floor, 72 Mohakhali C/A, Dhaka-1212, Bangladesh. Email: monami@squaregroup.com. ORCID ID: http://orcid.org/0000-0002--7970-6094
- 9. Iffat Jahan, Department of Physiology, Eastern Medical College, Comilla, Bangladesh. Email: iffatcom7@gmail. com. ORCID ID: https://orcid.org/0000-0003-0551-3609
- 10. Zakirul Islam, Department of Pharmacology, Eastern Medical College, Comilla, Bangladesh. Email: zakirulislamcom7@gmail.com. ORCID ID: https://orcid.org/0000-0003-3153-1333
- 11. Mohammad Monir Hossain, Department of Anatomy. Eastern Medical College, Comilla, Bangladesh. Email: monir2010@yahoo.com. ORCID ID: https://orcid.org/0000-0003-2036-5894
- 12. Munzur-E-Murshid, WISH2Action Project, Handicap International, Chamrargola, Kurigram Sadar, Kurigram 5600, Bangladesh. Email: munzurmurshid@gmail.com. Orcid ID: http://orcid.org/0000-0001-5503-7757
- 13. Israel Sefah, Ghana Health Service, Keta Municipal Hospital, Pharmacy Department, Keta-Dzelukope, Ghana, and University of Health and Allied Sciences, School of Pharmacy, Pharmacy Practice Department, Volta Region, Ghana. Email: isefah1980@gmail.com. ORCID ID: http://orcid.org/0000-0001-6963-0519
- 14. Amanj Kurdi, Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow G4 0RE, United Kingdom and Department of Pharmacology, College of Pharmacy, Hawler Medical University, Erbil, Iraq. Email: amanj.baker@strath.ac.uk. ORCID ID: http://orcid.org/0000-0001-5036-1988
- 15. Brian Godman, Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow G4 0RE, United Kingdom; Division of Clinical Pharmacology, Karolinska Institute, Karolinska University Hospital Huddinge, Stockholm, Sweden; School of Pharmacy, Sefako Makgatho Health Sciences University, Ga-Rankuwa, Pretoria, 0208, South Africa and School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia Email: Brian.Godman@ki.se. ORCID ID: http://orcid.org/0000-0001-6539-6972

al. (2019), with only limited price increases between 2003 and 2019⁴⁴. The increase in cases with dengue²¹, 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 addressing⁴⁵⁻⁴⁸. Encouragingly, whilst there are still cases of malaria in Bangladesh, co-ordinated activities have reduced these by more than 50% in 2016 versus 2010⁴⁹. 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 bottlenecks⁵¹.

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 worldwide⁵². As a result, a significant number of households are forced to sell assets or borrow money to fund treatments when family members become ill⁵². 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 doctors⁵³.

However, there have been recent steps to address concerns with the publication of standards for drug outlets⁵⁵. 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 professional⁵⁵. 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 population⁴¹.

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 smoking⁵⁸⁻⁶⁵. Ethnicity may also be important, with patients in the United Kingdom of Bangladesh origin having appreciably increased mortality from COVID-19⁶⁶⁻⁶⁹. There were concerns initially that renin-angiotensin would enhance susceptibility inhibitors 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 China⁷⁵⁻⁷⁸. 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 auditing86,87. 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 small⁹². More recently, dexamethasone has improved outcomes in ventilated patients and those receiving oxygen⁹³. 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 of hydroxychloroquine and the endorsement of hydroxychloroquine by Governments and others of hydroxychloroquine by Governments and others and deaths from poisoning of hydroxidations and deaths from poisoning of hydroxidations and deaths from poisoning holds. 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 | | | | | |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| | 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 later¹¹ | | | | | |
| | 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 gatherings⁵ | | | | | |
| Health/prevention | March 23, 2020 The Government announced the closure of all public and private offices⁵ | | | | | |
| Health/prevention i n c l u d i n g shortages | | | | | | |
| | • 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 Equipment¹¹; although gifts have helped to reduce concerns¹⁰² | | | | | |

| Sector | Activities |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 billion⁵ April 3-2020 - The World Bank fast tracks US\$100million to support Government efforts to tackle COVID-19 in Bangladesh¹¹⁶ 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 infection¹³. 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 symptoms¹³². This is important as it can be difficult in practice to differentiate respiratory tract infections from COVID-19 in patients presenting with coughs and fever¹³⁴.

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 owners¹³⁶⁻¹³⁸. Pharmacists and others also need to balance demand and supply of medicines, which is essential in countries with high patient copayments 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 prices¹⁴⁰. 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 preexisting 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 direction¹⁴³⁻¹⁴⁸. 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 sources¹⁴⁹. 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 |
| | Personal communication | 57 | 57 | 0 |
| Group 2 | Cold Calling | 95 | 53 | 42 |
| | Total | 152 | 110 | 42 |
| Group 3 | | 34 | 19 | 15 |
| Group 4 | | 22 | 15 | 7 |
| Total | | otal 266 (100%) | | 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.

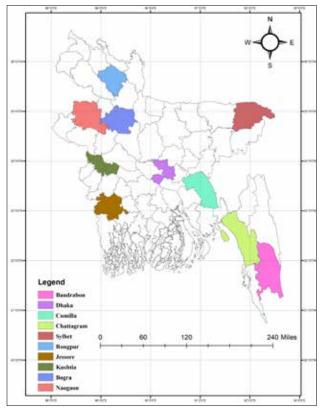


Figure 1: Location of Pharmacies and Drug Stores Taking Part in the Study.

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

| | | | | Common cold/ | Vitamins/immune | Face masks/ | Hand sanitisers/ |
|---------------------------------|---------------|-------------|------------|--------------|-----------------|--------------|------------------|
| | Antimalarials | Antibiotics | Analgesics | allergy | boosters | thermometers | 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

| 1V1ay 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/ |
|---------------------------------|---------------|-------------|------------|-------------------------|-----------------------------|-----------------------------|------------------|
| 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 Sciences¹⁵² 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 |

| Stakeholder Group | Suggested Activities |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 people¹³⁵ |

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 2019⁴⁴. 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.

References:

- WHO. Coronavirus disease (COVID-19) Situation Report - 151. Available at URL: https://www. who.int/docs/default-source/coronaviruse/ situation-reports/20200619-covid-19-sitrep-151. pdf?sfvrsn=8b23b56e 2
- Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. N Engl J Med. 2020;382(13):1199-207.
- Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-42.
- 4. Ramachandran S. The COVID-19 Catastrophe in Bangladesh. 2020. Available at URL: https://thediplomat.com/2020/04/the-covid-19-catastrophe-in-bangladesh/.
- 5. WHO Bangladesh. COVID 19 Situation Report 4. 2020. Available at URL: https://www.who.int/docs/default-source/searo/bangladesh/covid-19-who-bangladesh-situation-reports/who-ban-covid-19-sitrep-04. pdf?sfvrsn=69b6d931 8.
- 6. Paul R. Bangladesh confirms its first three cases of

- coronavirus. 2020. Available at URL: https://www.reuters.com/article/us-health-coronavirus-bangladeshidUSKBN20V0FS.
- WHO SE Asia. COVID-19 Situation in the WHO South-East Asia Region 15 June 2020. Available at URL: https://experience.arcgis.com/experience/56d2642cb37 9485ebf78371e744b8c6a.
- WHO Bangladesh. COVID 19 Situation Report 16. 2020. Available at URL: https://www.who.int/docs/default-source/searo/bangladesh/covid-19-who-bangladesh-situation-reports/who-covid-19-update-16-20200615. pdf?sfvrsn=dc18b4e3 4.
- 9. WHO South East Asia. WHO calls for urgent, aggressive actions to combat COVID-19, as cases soar in South-East Asia Region. 17 March 2020. Available at URL: https://www.who.int/southeastasia/news/detail/17-03-2020-who-calls-for-urgent-aggressive-actions-to-combat-covid-19-as-cases-soar-in-south-east-asia-region.
- Lee YN. Southeast Asia could be the next coronavirus hot spot — these charts show why. 20 April 2020. Available at URL: https://www.cnbc.com/2020/04/20/ southeast-asia-could-be-the-next-coronavirus-hot-spotthese-charts-show-why.html.
- 11. Anwar S, Nasrullah M, Hosen MJ. COVID-19 and

- Bangladesh: Challenges and How to Address Them. *Front Public Health*. **2020**;8:154. doi:10.3389/fpubh.2020.00154
- Savage S, Ahasan N. Coronavirus, exposes the deep divide in Bangladeshi society. 2020. Available at URL: https://www.telegraph.co.uk/global-health/climate-andpeople/coronavirus-exposes-deep-divide-bangladeshisociety/.
- Shammi M, Bodrud-Doza M, Towfiqul Islam ARM, Rahman MM. COVID-19 pandemic, socioeconomic crisis, and human stress in resource-limited settings: A case from Bangladesh. *Heliyon*. 2020;6(5):e04063-e.
- Ahmed SM, Hossain MA, Rajachowdhury AM, Bhuiya AU. The health workforce crisis in Bangladesh: shortage, inappropriate skill-mix, and inequitable distribution. Hum Resour Health. 2011;9:3. doi:10.1186/1478-4491-9-3
- 15. Saleh A. In Bangladesh, COVID-19 threatens to cause a humanitarian crisis. 2020. Available at URL: https://www.weforum.org/agenda/2020/04/in-bangladesh-covid-19-could-cause-a-humanitarian-crisis/.
- Afroz A, Alam K, Hossain MN, et al. Burden of macroand microvascular complications of type 2 diabetes in Bangladesh. *Diabetes Metab Syndr.* 2019;13(2):1615-1622. doi:10.1016/j.dsx.2019.03.001
- 17. Chowdhury MZI, Rahman M, Akter T, et al. Hypertension prevalence and its trend in Bangladesh: evidence from a systematic review and meta-analysis. *Clin Hypertens*. **2020**;26:10. doi:10.1186/s40885-020-00143-1
- 18. Fottrell E, Ahmed N, Shaha SK, et al. Distribution of diabetes, hypertension, and non-communicable disease risk factors among adults in rural Bangladesh: a cross-sectional survey. *BMJ Glob Health*. **2018**;3(6):e000787. doi:10.1136/bmjgh-2018-000787
- 19. Islam AK, Majumder AA. Coronary artery disease in Bangladesh: a review. *Indian Heart J.* **2013**;65(4):424-435. doi:10.1016/j.ihj.2013.06.004
- Shariful Islam SM, Lechner A, Ferrari U, et al. Healthcare use and expenditure for diabetes in Bangladesh. BMJ Glob Health. 2017;2(1):e000033. doi:10.1136/bmjgh-2016-000033
- Mutsuddy P, Tahmina Jhora S, Shamsuzzaman AKM, Kaisar SMG, Khan MNA. Dengue Situation in Bangladesh: An Epidemiological Shift in terms of Morbidity and Mortality. *Can J Infect Dis Med Microbiol*. 2019;2019:3516284. doi:10.1155/2019/3516284
- Bhuyan KC, Fardus J. Factors Responsible for Diabetes Among Adult People of Bangladesh. Am J Biomed Sci & Res. 2019; 2(4): 137-42.
- Alam Miah MB, Yousuf MA. Analysis the significant risk factors on type 2 diabetes perspective of Bangladesh. *Diabetes Metab Syndr.* 2018;12(6):897-902. doi:10.1016/j.dsx.2018.05.012
- 24. Khanam R, Ahmed S, Rahman S, et al. Prevalence and factors associated with hypertension among adults in rural Sylhet district of Bangladesh: a cross-sectional study. *BMJ Open.* **2019**;9(10):e026722. doi:10.1136/bmjopen-2018-026722
- Rahman M, Zaman MM, Islam JY, et al. Prevalence, treatment patterns, and risk factors of hypertension and

- pre-hypertension among Bangladeshi adults. *J Hum Hypertens*. **2018**;32(5):334-348. doi:10.1038/s41371-017-0018-x
- Maswood MH. Only 112 ICU beds for coronavirus patients in Bangladesh. 8 April 2020. Available at URL: https://www.newagebd.net/article/104016/only-112-icubeds-for-coronavirus-patients-in-bangladesh.
- 27. Afroz A, Alam K, Ali L, et al. Type 2 diabetes mellitus in Bangladesh: a prevalence based cost-of-illness study. *BMC Health Serv Res.* **2019**;19(1):601. doi:10.1186/s12913-019-4440-3
- 28. Kasonde L, Tordrup D, Naheed A, Zeng W, Ahmed S, Babar ZU. Evaluating medicine prices, availability, and affordability in Bangladesh using World Health Organisation and Health Action International methodology. BMC Health Serv Res. 2019;19(1):383. doi:10.1186/s12913-019-4221-z
- Biswas T, Pervin S, Tanim MIA, Niessen L, Islam A. Bangladesh policy on prevention and control of noncommunicable diseases: a policy analysis. *BMC Public Health*. 2017;17(1):582. doi:10.1186/s12889-017-4494-2.
- Biswas T, Haider MM, Das Gupta R, Uddin J. Assessing the readiness of health facilities for diabetes and cardiovascular services in Bangladesh: a cross-sectional survey. *BMJ Open.* 2018;8(10):e022817. doi:10.1136/ bmjopen-2018-022817
- 31. Islam SMS, Islam MT, Islam A, Rodgers A, Chow CK, Naheed A. National drug policy reform for noncommunicable diseases in low-resource countries: an example from Bangladesh. *Bull World Health Organ*. **2017**;95(5):382-384. doi:10.2471/BLT.15.161117
- 32. Rawal LB, Kanda K, Biswas T, et al. Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: a qualitative study assessing challenges and opportunities for improving NCD services at the primary healthcare level. *BMJ Open.* **2019**;9(10):e029562. doi:10.1136/bmjopen-2019-029562
- Khandker NN, Biswas T, Khan ANS, Hasib E, Rawal LB. Socio-demographic characteristics and tobacco use among the adults in urban slums of Dhaka, Bangladesh. *Tob Induc Dis.* 2017;15:26. doi:10.1186/s12971-017-0131-1
- Rafique I, Nadeem Saqib MA, Bashir F, Naz S, Naz S. Comparison of Tobacco Consumption among Adults in SAARC Countries (Pakistan, India, and Bangladesh). J Pak Med Assoc. 2018;68(Suppl 2)(5):S2-S6.
- 35. Faruque GM, Wadood SN, Ahmed M, Parven R, Huq I, Chowdhury SR. The economic cost of tobacco use in Bangladesh: A health cost approach. Bangladesh Cancer Society, February 23, 2019. Available at URL: https://www.cancerresearchuk.org/sites/default/files/tat004_factsheet proactt final print.pdf.
- Burki TK. Tobacco consumption in Bangladesh. Lancet Oncol. 2019;20(4):478. doi:10.1016/S1470-2045(19)30144-5
- 37. Ahmed I, Rabbi MB, Sultana S. Antibiotic resistance in Bangladesh: A systematic review. *Int J Infect Dis.* **2019**;80:54-61. doi:10.1016/j.ijid.2018.12.017
- 38. Biswas M, Roy MN, Manik MI, et al. Self-medicated

- antibiotics in Bangladesh: a cross-sectional health survey conducted in the Rajshahi City. *BMC Public Health*. **2014**;14:847. doi:10.1186/1471-2458-14-847
- Uzzal M, Anup K, Abdul S, Anwar U. Prevalence, Practice, and Irrationality of Self-medicated Antibiotics among People in Northern and Southern Region of Bangladesh. Int J Res Pharm Bio Sci. 2017; 4 (10): 17-24.
- 40. Hoque R, Ahmed SM, Naher N, et al. Tackling antimicrobial resistance in Bangladesh: A scoping review of policy and practice in human, animal, and environment sectors. *PLoS One.* **2020**;15(1):e0227947. doi:10.1371/journal.pone.0227947
- Lucas PJ, Uddin MR, Khisa N, et al. Pathways to antibiotics in Bangladesh: A qualitative study investigating how and when households access medicine including antibiotics for humans or animals when they are ill. *PLoS One.* 2019;14(11):e0225270. doi:10.1371/ journal.pone.0225270
- 42. Saha S, Hossain MT. Evaluation of medicines dispensing pattern of private pharmacies in Rajshahi, Bangladesh. *BMC Health Serv Res.* **2017**;17(1):136. doi:10.1186/s12913-017-2072-z
- 43. Ministry of Health & Family Welfare Bangladesh. National Action Plan Antimicrobial Resistance Containment in Bangladesh 2017-2022. 2017. Available at URL: https://www.flemingfund.org/wp-content/uploads/d3379eafad36f597500cb07c21771ae3.pdf.
- 44. Rahman A, Dina SS, Islam M, Chowdhury JA, Kabir S, Choudhury AA, Amran S. The Study of Availability, Affordability, and Price Variation of Essential Antibiotics in Bangladesh. *Biomed Pharmacol J.* **2019**; 12(4): 1811-26. doi: 10.13005/bpj/1812
- 45. Ehsanul Huq KATM, Moriyama M, Zaman K, et al. Health seeking behavior and delayed management of tuberculosis patients in rural Bangladesh. *BMC Infect Dis.* 2018;18(1):515. doi:10.1186/s12879-018-3430-0
- 46. Nathavitharana RR, Daru P, Barrera AE, et al. FAST implementation in Bangladesh: high frequency of unsuspected tuberculosis justifies challenges of scale-up. *Int J Tuberc Lung Dis.* 2017;21(9):1020-1025. doi:10.5588/ijtld.16.0794
- 47. Islam S, Sultana R, Hasan A, Horaira A, Islam A. Prevalence of Tuberculosis: Present Status and Overview of Its Control System in Bangladesh. *Int J Life Sci Scienti Res.* 2017; 3(6):1471-1475 doi: 10.21276/ijlssr.2017.3.6.8
- 48. Sarker M, Homayra F, Rawal LB, et al. Urban-rural and sex differentials in tuberculosis mortality in Bangladesh: results from a population-based survey. *Trop Med Int Health*. **2019**;24(1):109-115. doi:10.1111/tmi.13171
- 49. APLMA. Bangladesh: New plan for malaria elimination (2017–2021). 2017. Available at URL: https://www.aplma.org/blog/42/bangladesh-new-plan-for-malaria-elimination-2017-2021.html.
- 50. Noé A, Zaman SI, Rahman M, Saha AK, Aktaruzzaman MM, Maude RJ. Mapping the stability of malaria hotspots in Bangladesh from 2013 to 2016. *Malar J.* **2018**;17(1):259. doi:10.1186/s12936-018-2405-3
- 51. Shawon MSR, Adhikary G, Ali MW, et al. General

- service and child immunization-specific readiness assessment of healthcare facilities in two selected divisions in Bangladesh. *BMC Health Serv Res.* **2018**;18(1):39. doi:10.1186/s12913-018-2858-7
- Rahman MM, Zhang C, Swe KT, et al. Disease-specific out-of-pocket healthcare expenditure in urban Bangladesh: A Bayesian analysis. *PLoS One.* 2020;15(1):e0227565. doi:10.1371/journal. pone.0227565
- 53. Ahmed SM, Naher N, Hossain T, Rawal LB. Exploring the status of retail private drug shops in Bangladesh and action points for developing an accredited drug shop model: a facility-based cross-sectional study. *J Pharm Policy Pract.* 2017;10:21. doi:10.1186/s40545-017-0108-8
- 54. Darj E, Newaz MS, Zaman MH. Pharmacists' perception of their challenges at work, focusing on antimicrobial resistance: a qualitative study from Bangladesh. *Glob Health Action.* **2019**;12(sup1):1735126. doi:10.1080/16 549716.2020.1735126
- 55. Government of the People's Republic of Bangladesh Ministry Of Health And Family Welfare (Mohfw). Standards for the Establishment and Operation of Model Pharmacies And Model Medicine Shops. 2016. Available at URL: http://www.drugsellerinitiatives.org/publication/altview/standards-for-the-establishment-and-operation-of-model-pharmacies-and-model-medicine-shops-2016/PDF/.
- 56. WHO. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. 2020. Available at URL: https://www. who.int/news-room/commentaries/detail/modes-oftransmission-of-virus-causing-covid-19-implicationsfor-ipc-precaution-recommendations.
- Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;395(10223):497-506. doi:10.1016/ S0140-6736(20)30183-5
- 58. Vardavas CI, Nikitara K. COVID-19, and smoking: A systematic review of the evidence. *Tob Induc Dis.* **2020**;18:20. doi:10.18332/tid/119324
- Aghagoli G, Gallo Marin B, Soliman LB, Sellke FW. Cardiac involvement in COVID-19 patients: Risk factors, predictors, and complications: A review. *J Card Surg.* 2020;35(6):1302-1305. doi:10.1111/jocs.14538
- Richardson S, Hirsch JS, Narasimhan M, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*. 2020;323(20):2052-2059. doi:10.1001/jama.2020.6775
- Huang I, Lim MA, Pranata R. Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia A systematic review, meta-analysis, and meta-regression. *Diabetes Metab Syndr.* 2020;14(4):395-403. doi:10.1016/j. dsx.2020.04.018
- Zheng Z, Peng F, Xu B, et al. Risk factors of critical & mortal COVID-19 cases: A systematic literature review and meta-analysis. *J Infect.* 2020;S0163-4453(20)30234-6. doi:10.1016/j.jinf.2020.04.021

- 63. Alqahtani JS, Oyelade T, Aldhahir AM, et al. Prevalence, Severity, and Mortality associated with COPD and Smoking in patients with COVID-19: A Rapid Systematic Review and Meta-Analysis. *PLoS One.* 2020;15(5):e0233147. doi:10.1371/journal.pone.0233147
- 64. Ellinghaus D, Degenhardt F, Bujanda L, et al. Genomewide Association Study of Severe Covid-19 with Respiratory Failure. N Engl J Med. 2020;NEJMoa2020283. doi:10.1056/NEJMoa2020283
- 65. Zhao J, Yang Y, Huang H, Li D, Gu D, Lu X et al. Relationship between the ABO Blood Group and the COVID-19 Susceptibility. *Clinica Chimica Acta*. **2020**;509:220-3. doi: 10.1016/j.cca.2020.06.026.
- 66. Pearce C. Being of Bangladeshi origin doubles Covid-19 death risk finds PHE review. 2020. Available at URL: http://www.pulsetoday.co.uk/news/being-of-bangladeshi-origin-doubles-covid-19-death-risk-finds-phe-review/20040916.article.
- 67. Public Health, England. Disparities in the risk and outcomes of COVID-19. 2020. Available at URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892085/disparities review.pdf.
- Khunti K, Singh AK, Pareek M, Hanif W. Is ethnicity linked to incidence or outcomes of COVID-19?. *BMJ*. 2020;369:m1548. doi:10.1136/bmj.m1548
- Kirby T. Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. *Lancet Respir Med.* 2020;8(6):547-548. doi:10.1016/S2213-2600(20)30228-9
- Curfman G. Renin-Angiotensin-Aldosterone Inhibitors and Susceptibility to and Severity of COVID-19. *JAMA*. 2020;10.1001/jama.2020.11401. doi:10.1001/ jama.2020.11401.
- Fosbøl EL, Butt JH, Østergaard L, et al. Association of Angiotensin-Converting Enzyme Inhibitor or Angiotensin Receptor Blocker Use With COVID-19 Diagnosis and Mortality. *JAMA*. 2020;e2011301. doi:10.1001/jama.2020.11301
- 72. Zhang P, Zhu L, Cai J, et al. Association of Inpatient Use of Angiotensin-Converting Enzyme Inhibitors and Angiotensin II Receptor Blockers With Mortality Among Patients With Hypertension Hospitalized With COVID-19. Circ Res. 2020;126(12):1671-1681. doi:10.1161/CIRCRESAHA.120.317134
- Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic Treatments for Coronavirus Disease 2019 (COVID-19): A Review. *JAMA*. 2020;10.1001/jama.2020.6019. doi:10.1001/jama.2020.6019
- 74. Scavone C, Brusco S, Bertini M, et al. Current pharmacological treatments for COVID-19: What's next? *Br J Pharmacol.* **2020**;10.1111/bph.15072. doi:10.1111/bph.15072
- Cortegiani A, Ingoglia G, Ippolito M, Giarratano A, Einav S. A systematic review on the efficacy and safety of chloroquine for the treatment of COVID-19. *J Crit* Care. 2020;57:279-283. doi:10.1016/j.jcrc.2020.03.005
- Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical

- studies. *Biosci Trends*. **2020**;14(1):72-73. doi:10.5582/bst.2020.01047
- 77. Gautret P, Lagier JC, Parola P, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. *Int J Antimicrob Agents.* **2020**;105949. doi:10.1016/j. ijantimicag.2020.105949
- Boulware DR, Pullen MF, Bangdiwala AS, et al. A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. N Engl J Med. 2020;NEJMoa2016638. doi:10.1056/NEJMoa2016638
- 79. International Society of Antimicrobial Chemotherapy. Official Statement from International Society of Antimicrobial Chemotherapy (ISAC) Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial (Gautret P et al. PMID 32205204). Available at URL: https://www.isac.world/news-and-publications/official-isac-statement.
- 80. Ferner RE, Aronson JK. Chloroquine and hydroxychloroquine in COVID-19. *BMJ*. **2020**;369:m1432. doi:10.1136/bmj.m1432
- 81. Borba MGS, Almeida Val FF, Sampaio VS, Alexandre MAA, Melo GC, Brito M et al. Chloroquine diphosphate in two different dosages as adjunctive therapy of hospitalized patients with severe respiratory syndrome in the context of coronavirus (SARS-CoV-2) infection: Preliminary safety results of a randomized, double-blinded, phase IIb clinical trial (CloroCovid-19 Study). 2020. MedRxiv preprint doi: https://doi.org/10.1101/2020.04.07.20056424 (Available at URL: https://www.medrxiv.org/content/10.1101/2020.04.07.2 0056424v2.full.pdf).
- 82. European Medicine Agency. COVID-19: reminder of risk of serious side effects with chloroquine and hydroxychloroquine. 2020. Available at URL: https://www.ema.europa.eu/en/news/covid-19-reminder-risk-serious-side-effects-chloroquine-hydroxychloroquine.
- 83. Geleris J, Sun Y, Platt J, et al. Observational Study of Hydroxychloroquine in Hospitalized Patients with Covid-19. *N Engl J Med.* **2020**;382(25):2411-2418. doi:10.1056/NEJMoa2012410
- 84. Recovery Trial. No clinical benefit from use of hydroxychloroquine in hospitalized patients with COVID-19. 2020. Available at URL: https://www.recoverytrial.net/news/statement-from-the-chief-investigators-of-the-randomised-evaluation-of-covid-19-therapy-recovery-trial-on-hydroxychloroquine-5-june-2020-no-clinical-benefit-from-use-of-hydroxychloroquine-in-hospitalised-patients-with-covid-19.
- 85. Rosenberg ES, Dufort EM, Udo T, et al. Association of Treatment With Hydroxychloroquine or Azithromycin With In-Hospital Mortality in Patients With COVID-19 in New York State. *JAMA*. **2020**;323(24):2493-2502. doi:10.1001/jama.2020.8630
- 86. Mehra MR, Desai SS, Ruschitzka F, Patel AN. RETRACTED: Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis [retracted in: Lancet.

- 2020 Jun 5;:null]. *Lancet*. **2020**;S0140-6736(20)31180-6. doi:10.1016/S0140-6736(20)31180-6
- 87. The Lancet Editors. Expression of concern: Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis. *Lancet.* **2020**;395(10240):e102. doi:10.1016/S0140-6736(20)31290-3
- 88. NIH. NIH halts clinical trial of hydroxychloroquine. 20 June 2020. Available at URL: https://www.nhlbi.nih.gov/news/2020/nih-halts-clinical-trial-hydroxychloroquine.
- 89. Dhaka Tribune. 28 May 2020. EU governments ban malaria drug for Covid-19 https://www.dhakatribune.com/world/2020/05/28/eu-governments-ban-malaria-drug-for-covid-19.
- Beigel JH, Tomashek KM, Dodd LE, et al. Remdesivir for the Treatment of Covid-19 - Preliminary Report. N Engl J Med. 2020; NEJMoa2007764. doi:10.1056/ NEJMoa2007764
- 91. Wang Y, Zhang D, Du G, et al. Remdesivir in adults with severe COVID-19: a randomized, double-blind, placebo-controlled, multicentre trial. *Lancet*. **2020**;395(10236):1569-1578. doi:10.1016/S0140-6736(20)31022-9
- 92. Hung IF, Lung KC, Tso EY, et al. Triple combination of interferon beta-1b, lopinavir-ritonavir, and ribavirin in the treatment of patients admitted to hospital with COVID-19: an open-label, randomized, phase 2 trial. *Lancet.* **2020**;395(10238):1695-1704. doi:10.1016/S0140-6736(20)31042-4
- 93. Recovery Trial University of Oxford. Low-cost dexamethasone reduces death by up to one third in hospitalized patients with severe respiratory complications of COVID-19. 16 June 2020. Available at URL: https://www.recoverytrial.net/files/recovery_dexamethasone_statement_160620_v2final.pdf.
- 94. Mehra MR, Ruschitzka F, Patel AN. Retraction-Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis [retraction of: Lancet. 2020 May 22;:]. *Lancet.* 2020;395(10240):1820. doi:10.1016/S0140-6736(20)31324-6
- Bae S, Kim MC, Kim JY, et al. Notice of Retraction: Effectiveness of Surgical and Cotton Masks in Blocking SARS-CoV-2 [retraction of: Ann Intern Med. 2020 Apr 6;:]. Ann Intern Med. 2020;L20-0745. doi:10.7326/L20-0745
- Brennen S, Simon F, Howard PN, Nielsen RK. Types, sources, and claims of COVID-19 misinformation. 2020.
 Available at URL: https://reutersinstitute.politics.ox.ac. uk/types-sources-and-claims-covid-19-misinformation.
- 97. Gallagher F. Tracking hydroxychloroquine misinformation: How an unproven COVID-19 treatment ended up being endorsed by Trump. ABC News. 2020. Available at URL: https://abcnews.go.com/Health/tracking-hydroxychloroquine-misinformation-unproven-covid-19-treatment-ended/story?id=70074235.
- Kassam N. Disinformation and coronavirus. 2020.
 Available at URL: https://www.lowyinstitute.org/the-interpreter/disinformation-and-coronavirus.

- Rich D. Covid-19: In Cameroon, chloroquine therapy hailed by French expert becomes state protocol. 2020. Available at URL: https://www.france24.com/en/20200503-covid-19-in-cameroon-a-chloroquine-therapy-hailed-by-french-expert-becomes-state-protocol.
- 100. Kwasi ED. Chloroquine, coronavirus, and Ghana's preparedness: old hero to the rescure. 2020. Available at URL: https://www.myjoyonline.com/news/health/ chloroquine-coronavirus-and-ghanas-preparedness-oldhero-to-the-rescue/.
- 101. The Business Standard. Bangladesh recommends controversial drugs for Covid-19 treatment. 2020. Available at URL: https://tbsnews.net/coronavirus-chronicle/covid-19-bangladesh/bangladesh-recommends-controversial-drugs-covid-19.
- 102. Deccan herald. COVID-19: India gifts Bangladesh 1 lakh hydroxychloroquine tablets, 50,000 surgical gloves. 2020. Available at URL: https://www.deccanherald.com/international/world-news-politics/covid-19-india-gifts-bangladesh-1-lakh-hydroxychloroquine-tablets-50000-surgical-gloves-830150.html.
- 103. Kumar SU, Kumar DT, Christopher BP, Doss CGP. The Rise and Impact of COVID-19 in India. *Front Med.* **2020**;7:250. doi:10.3389/fmed.2020.00250
- 104. Tilangi P, Desai D, Khan A, Soneja M. Hydroxychloroquine prophylaxis for high-risk COVID-19 contacts in India: a prudent approach. *Lancet Infect Dis.* **2020**;S1473-3099(20)30430-8. doi:10.1016/S1473-3099(20)30430-8
- 105. Buasi S, Adebayo B. Nigeria, records chloroquine poisoning after Trump endorses it for coronavirus treatment. 2020 Available at URL: https://edition.cnn. com/2020/03/23/africa/chloroquine-trump-nigeria-intl/index.html.
- 106. Politi D. Nigeria Reports Chloroquine Poisonings as Trump Keeps Pushing Drug Against Coronavirus. 2020. Available at URL: https://slate.com/news-and-politics/2020/03/nigeria-chloroquine-poisonings-trump-pushing-drug-coronavirus.html.
- 107. Abena PM, Decloedt EH, Bottieau E, et al. Chloroquine and Hydroxychloroquine for the Prevention or Treatment of COVID-19 in Africa: Caution for Inappropriate Offlabel Use in Healthcare Settings. *Am J Trop Med Hyg.* **2020**;102(6):1184-1188. doi:10.4269/ajtmh.20-0290
- 108. Salo J. Nigeria reports poisonings from possible coronavirus drug chloroquine. 2020. Available at URL: https://nypost.com/2020/03/22/nigeriareports-poisonings-from-possible-coronavirus-drugchloroquine/.
- 109. World Health Organisation. Coronavirus disease (COVID-19) advice for the public: Myth busters. 2020. Available at URL: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters.
- 110. Al Javed H. Passengers from Europe land in Dhaka despite ban. 2020. Available at URL: https://www.dhakatribune.com/bangladesh/dhaka/2020/03/16/defying-bar-european-flight-lands-in-dhaka.
- 111. Maswood MH, Chowdhury SI. Bangladesh bans

- travelers' entry from Europe. 2020. Available at URL: https://www.newagebd.net/article/102202/bangladesh-bans-travellers-entry-from-europe.
- 112. BDnews24. Army to run coronavirus quarantine units in Dhaka's Ashkona, Diabari. 2020. Available at URL: https://bdnews24.com/bangladesh/2020/03/20/army-torun-coronavirus-quarantine-units-in-dhakas-ashkonadiabari.
- 113. WHO South East Asia. COVID19: WHO calls for stronger whole of society approach in South-East Asia Region. 3 April 2020. Available at URL: https://www.who.int/southeastasia/news/detail/03-04-2020-covid19-who-calls-for-stronger-whole-of-society-approach-in-south-east-asia-region.
- 114. Latif MB, Irin A, Ferdaus J. Socio-economic and health status of slum dwellers of the Kalyanpur slum in Dhaka city. *Bangladesh J Sci Res.* **2016**; 29 (1):73–83. doi: 10.3329/bjsr.v29i1.29760
- 115. Daily Star. 11 red zones declared in Chattogram city. 14 June 2020. Available at URL: https://www.thedailystar. net/coronavirus-update-news-11-red-zones-declared-in-chattogram-city-1914317.
- 116. World Bank. World Bank Fast-Tracks \$100 Million COVID-19 (Coronavirus) Support for Bangladesh. 03 April 2020. Available at URL: https://www.worldbank. org/en/news/press-release/2020/04/03/world-bank-fast-tracks-100-million-covid-19-coronavirus-support-for-bangladesh.
- 117. IMF. Bangladesh: Requests for Disbursement under the Rapid Credit Facility and Purchase under the Rapid Financing Instrument-Press Release; Staff Report; and Statement by the Executive Director for Bangladesh. 2020. Available at URL: https://www.imf.org/en/Publications/CR/Issues/2020/06/03/Bangladesh-Requests-for-Disbursement-under-the-Rapid-Credit-Facility-and-Purchase-under-the-49483.
- 118. Kamal RS. Fear, hatred, and stigmatization grip Bangladesh amid Covid-19 outbreak. 2020. Available at URL: https://tbsnews.net/thoughts/fear-hatred-and-stigmatization-grip-bangladesh-amid-covid-19-outbreak-61129.
- 119. Ali M, Ahsan GU, Khan HR, Hossain A. Mental wellbeing in the Bangladeshi healthy population during nationwide lockdown over COVID-19: an online cross-sectional survey. MedRxiv preprint, 2020. Available at URL: https://www.medrxiv.org/content/10.1101/2020.0 5.14.20102210v1.full.pdf.
- 120. Al Banna H, Sayeed A, Kundu S, Christopher E, Tasdik Hasan M, Begum MR, et al. The impact of the COVID-19 pandemic on the mental health of the adult population in Bangladesh: A nationwide cross-sectional study. 2020 Preprint. Available at URL: https://www.researchgate.net/publication/341607316_The_impact_of_the_COVID-19_pandemic_on_the_mental_health_of_the_adult_population_in_Bangladesh_A_nationwide_cross-sectional_study.
- 121. WHO. Community pharmacists are key players in COVID-19 response and must stay up-to-date on guidance. 2020. Available at URL: https://www.euro.who.int/en/health-topics/health-emergencies/

- coronavirus-covid-19/news/news/2020/5/community-pharmacists-are-key-players-in-covid-19-response-and-must-stay-up-to-date-on-guidance.
- 122.FIP. FIP Health Advisory Coronavirus SARS-CoV-2/COVID-19 PANDEMIC: Information and interim guidelines for pharmacists and the pharmacy workforce. Updated 19 March 2020. Available at URL: https://www.fip.org/files/content/priority-areas/coronavirus/Coronavirus-guidance-update-ENGLISH.pdf.
- 123. Nielsen JØ, Shrestha AD, Neupane D, Kallestrup P. Non-adherence to antihypertensive medication in low-and middle-income countries: a systematic review and meta-analysis of 92443 subjects. *J Hum Hypertens*. **2017**;31(1):14-21. doi:10.1038/jhh.2016.31
- 124. Banerjee A, Khandelwal S, Nambiar L, et al. Health system barriers and facilitators to medication adherence for the secondary prevention of cardiovascular disease: a systematic review. *Open Heart.* **2016**;3(2):e000438. doi:10.1136/openhrt-2016-000438
- 125. Lee ES, Vedanthan R, Jeemon P, et al. Quality Improvement for Cardiovascular Disease Care in Lowand Middle-Income Countries: A Systematic Review. *PLoS One.* **2016**;11(6):e0157036. doi:10.1371/journal.pone.0157036
- 126. Cadogan CA, Hughes CM. On the frontline against COVID-19: Community pharmacists' contribution during a public health crisis. *Res Social Adm Pharm*. **2020**;S1551-7411(20)30292-8. doi:10.1016/j. sapharm.2020.03.015
- 127. Abdulsalim S, Unnikrishnan MK, Manu MK, Alrasheedy AA, Godman B, Morisky DE. Structured pharmacist-led intervention program to improve medication adherence in COPD patients: A randomized controlled study. *Res Social Adm Pharm.* **2018**;14(10):909-914. doi:10.1016/j. sapharm.2017.10.008
- 128. Abdulsalim S, Unnikrishnan MK, Manu MK, et al. Impact of a Clinical Pharmacist Intervention on Medicine Costs in Patients with Chronic Obstructive Pulmonary Disease in India. *Pharmacoecon Open.* **2020**;4(2):331-342. doi:10.1007/s41669-019-0172-x
- 129. Pringle J, Coley KC. Improving medication adherence: a framework for community pharmacy-based interventions. *Integr Pharm Res Pract.* **2015**;4:175-183. doi:10.2147/IPRP.S93036.
- 130. Al-Quteimat OM, Amer AM. SARS-CoV-2 outbreak: How can pharmacists help? *Res Social Adm Pharm*. **2020**;S1551-7411(20)30238-2. doi:10.1016/j. sapharm.2020.03.018
- 131. Ung COL. Community pharmacist in public health emergencies: Quick to action against the coronavirus 2019-nCoV outbreak. *Res Social Adm Pharm.* **2020**;16(4):583-586. doi:10.1016/j. sapharm.2020.02.003.
- 132. Amariles P, Ledezma-Morales M, Salazar-Ospina A, Hincapié-García JA. How to link patients with suspicious COVID-19 to health system from the community pharmacies? A route proposal. *Res Social Adm Pharm.* **2020**;S1551-7411(20)30248-5. doi:10.1016/j. sapharm.2020.03.0070.
- 133. Marković-Peković V, Grubiša N, Burger J, Bojanić

- L, Godman B. Initiatives to Reduce Nonprescription Sales and Dispensing of Antibiotics: Findings and Implications. *J Res Pharm Pract.* **2017**;6(2):120-125. doi:10.4103/jrpp.JRPP 17 12.
- 134. Ongole JJ, Rossouw TM, Fourie PB, Stoltz AC, Hugo J, Marcus TS. Sustaining essential healthcare in Africa during the COVID19 pandemic. 2020. Available at URL: https://www.theunion.org/news-centre/news/body/IJTLD-June-0214_Ongole.pdf.
- 135. Hedima EW, Adeyemi MS, Ikunaiye NY. Community Pharmacists: On the frontline of health service against COVID-19 in LMICs. *Res Social Adm Pharm.* **2020**;S1551-7411(20)30385-5. doi:10.1016/j. sapharm.2020.04.013.
- 136. Markovic-Pekovic V, Skrbić R, Godman B, Gustafsson LL. Ongoing initiatives in the Republic of Srpska to enhance prescribing efficiency: influence and future directions. *Expert Rev Pharmacoecon Outcomes Res.* **2012**;12(5):661-671. doi:10.1586/erp.12.48.
- 137. Khan MS, Bory S, Rego S, et al. Is enhancing the professionalism of healthcare providers critical to tackling antimicrobial resistance in low- and middle-income countries? *Hum Resour Health*. **2020**;18(1):10. doi:10.1186/s12960-020-0452-7.
- 138. Mukokinya MMA, Opanga S, Oluka M, Godman B. Dispensing of Antimicrobials in Kenya: A Cross-sectional Pilot Study and Its Implications. *J Res Pharm Pract.* 2018;7(2):77-82. doi:10.4103/jrpp.JRPP 17 88.
- 139. Hayden JC, Parkin R. The challenges of COVID-19 for community pharmacists and opportunities for the future. *Ir J Psychol Med.* **2020**;1-6. doi:10.1017/ipm.2020.52.
- 140. The Business Standard. Pharma industry braces for raw material crisis. 17 June 2020. Available at URL: https://tbsnews.net/companies/pharma/pharma-industry-braces-raw-material-crisis-54640.
- 141. WHO Bangladesh. COVID 19 Situation Report 15. 2020. Available at URL: https://www.who.int/docs/default-source/searo/bangladesh/covid-19-who-bangladesh-situation-reports/who-ban-covid-19-sitrep-15-20200608.pdf?sfvrsn=c2b0efc8 4.
- 142. The Economist. Covid-19 infections are rising fast in Bangladesh, India, and Pakistan. June 2020. Available at URL: https://www.economist.com/asia/2020/06/06/covid-19-infections-are-rising-fast-in-bangladesh-india-and-pakistan.
- 143. Godman B, Haque M, McKimm J, et al. Ongoing strategies to improve the management of upper respiratory tract infections and reduce inappropriate antibiotic use, particularly among lower and middleincome countries: findings and implications for the future. Curr Med Res Opin. 2020;36(2):301-327. doi:1 0.1080/03007995.2019.1700947

- 144. Godman B, Basu D, Pillay Y, et al. Review of Ongoing Activities and Challenges to Improve the Care of Patients With Type 2 Diabetes Across Africa and the Implications for the Future. *Front Pharmacol.* **2020**;11:108. doi:10.3389/fphar.2020.00108.
- 145. Godman B, McCabe H, D Leong T. Fixed-dose drug combinations are they pharmacoeconomically sound? Findings and implications, especially for lower- and middle-income countries. *Expert Rev Pharmacoecon Outcomes Res.* **2020**;20(1):1-26. doi:10.1080/14737167. 2020.1734456
- 146. Godman B, Grobler C, Van-De-Lisle M, et al. Pharmacotherapeutic interventions for bipolar disorder type II: addressing multiple symptoms and approaches with a particular emphasis on strategies in lower and middle-income countries. *Expert Opin Pharmacother*. **2019**;20(18):2237-2255. doi:10.1080/14656566.2019.1 684473
- 147. Bochenek T, Abilova V, Alkan A, et al. Systemic Measures and Legislative and Organizational Frameworks Aimed at Preventing or Mitigating Drug Shortages in 28 European and Western Asian Countries. Front Pharmacol. 2018;8:942. doi:10.3389/fphar.2017.00942
- 148. Miljković N, Godman B, van Overbeeke E, et al. Risks in Antibiotic Substitution Following Medicine Shortage: A Health-Care Failure Mode and Effect Analysis of Six European Hospitals. Front Med. 2020;7:157. doi:10.3389/fmed.2020.00157
- 149. Almeida PHRF, Silva TBC, de Assis Acurcio F, et al. Quality of Life of Patients with Type 1 Diabetes Mellitus Using Insulin Analog Glargine Compared with NPH Insulin: A Systematic Review and Policy Implications. *Patient.* 2018;11(4):377-389. doi:10.1007/s40271-017-0291-3
- 150. Gad M, Salem A, Oortwijn W, Hill R, Godman B. Mapping of Current Obstacles for Rationalizing Use of Medicines (CORUM) in Europe: Current Situation and Potential Solutions. *Front Pharmacol.* 2020;11:144. doi:10.3389/fphar.2020.00144
- 151. Moorkens E, Vulto AG, Huys I, et al. Policies for biosimilar uptake in Europe: An overview. *PLoS One.* **2017**;12(12):e0190147. doi:10.1371/journal. pone.0190147
- 152. Council For International Organizations Of Medical Sciences. Medicines assessment during public health emergencies needs good science, best practices, and proper communication. 2020. Available at URL: https://cioms.ch/wp-content/uploads/2020/06/CIOMS_WGXII Statement.pdf.
- 153. EAC Secretariat. East African Community COVID-19 Response Plan. 2020. Available at URL: https://www.eac.int/coronavirus.