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Article

Comparative Clinical management, treatment pattern and medications of COVID-19 practiced at Dhaka city in Bangladesh: a randomized cross-sectional study

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Abstract

Before introducing of COVID-19 vaccines the management of COVID-19 was mainly performed by repurposing of existing drugs and adopting the traditional practice. Later on vaccine immunization was introduced in addition to repurposing of drugs and traditional practice. The present study aimed to identify the treatment pattern of COVID-19 along with the traditional practices followed in Bangladesh and justify their purposes of use. For this purpose, a randomized cross-sectional prescriptive study was conducted among COVID-19 survivors who received treatment from hospitals or staying at home to collect their prescriptions, other medical records, and interview on to discuss on different aspects of their disease conditions and treatment. The patients' prescriptions and interview reports were used to identify mostly used classes of drugs, their frequency and other traditional practices followed by the patients suggested by doctors. These prescriptions were then analyzed to establish a treatment pattern followed by the common people of Bangladesh. The data were collected from a total of 184 participants (age between 18 years to 80 years old) of COVID-survivors of both sexes residing in different locations of Dhaka city in Bangladesh during 10 March 2021 to 30 July 2021. Among the 184 participants, 123 were from non-hospitalized and 61 from hospitalized patients. The numbers of male COVID-19 patients were higher than that of female. We found that COVID-19 patients were treated with several classes of medications. The major classes of medicaments used were antiviral drugs (Ivermectin, Remdisivir, Favipiravir), antibiotics (Azithromycin, Doxycycline, Amoxicillin+Clavulanic acid, Cefuroxime, Cefixime, Moxifloxacin, Gemifloxacin, Levofloxacin, Meropenem), anticoagulants (Rivaroxaban, Enoxaparin, Betrixaban), and nutritional supplements (Vitamin C, Vitamin D, Vitamin B complex, Zinc, Multivitamin, Daflon, Pancreatin, Calcium+Amino acid). Traditional healing practices were also followed by patients at home including inhalation of water vapor, consumption of spiced tea, physical exercises, and gurgling with hot water with verbal suggestion or without the suggestion of the physicians. The treatment pattern of COVID-19 was mostly symptomatic. Although the treatment pattern and the type of repurposing drugs were mostly followed WHO and country guidelines, the frequent use of antibiotics and corticosteroids were not in compliance with the above guidelines. The COVID-19 treatment pattern practiced in Bangladesh was mostly found to be symptomatic which was aligned with the guidelines of WHO and drug administration of Bangladesh except the use irrational and frequent use of antibiotics and corticosteroids.

Keywords: Commercial drug, Formulated drug, Fexofenadine hydrochloride, Quality control parameters, Quality of medicine

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Introduction

Coronavirus, known as SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2), is a deadly virus that turned out to be a devastating outbreak all over the world. It became highlighted on 31st December 2019 as the China health authority alerted WHO (world health organization) about a new type of severe pneumonia of very different etiology in the main city of Hubei Province of China, Wuhan. The cases had been reported since December 8, 2019, and many patients worked at or lived around the local Huanan Seafood Wholesale Market although other early cases had no exposure to this market (Lu et al., 2020). On January 07, a novel corona virus, originally abbreviated as 2019-nCoV by WHO, was identified from the throat swab sample of patient (Hui et al., 2020). This pathogen was later renamed as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Coronavirus Study Group (Gorbalenya et al., 2020), and the disease was named coronavirus disease 2019 (COVID-19) by the WHO.

As of 30 January 2020, 7736 confirmed and 12,167 suspected cases had been reported in China and 82 confirmed cases were detected in 18 other countries (Burki et al., 2020). In the same day, WHO declared the SARS-CoV-2 outbreak as a Public Health Emergency of International Concern (PHEIC) (Burki et al., 2020). As of 13 December 2021, coronavirus was spread in 222 countries and territories with 269,468,311 confirmed cases of COVID-19 and 5,304,248 deaths (WHO, 2021). Bangladesh is not also an exception. On 8 March 2020, the first case of COVID-19 was confirmed in Bangladesh. Between 8 March and 15 May 2020, according to the Directorate General of Health Services (DGHS) on behalf of the Ministry of Health in Bangladesh, there were 20,065 COVID-19 confirmed cases by rt-PCR including 298 related death cases where the case fatality rate (CFR) was 1.48%, highest confirm case was identified on 15 May which was 1202 and highest death was figured out on 13 May, 2020 (Hossain et al., 2020). The pandemic of COVID-19 badly affected in Bangladesh likewise other countries. The government tried its best to tackle this devastating situation. According to WHO Bangladesh report, there were 1,579,710 confirmed cases of COVID-19 with 28,031 deaths in Bangladesh between 03 January 2020 to 13 December 2021 COVID-19, 2021).

Later on vaccines from various sources were introduced in Bangladesh and the number of COVID-19 cases and death rate due to COVID-19 were reduced significantly. Yet, parallel treatment for COVID-19 infected patients was practiced with the repurposing of drugs and other treatment mentioned earlier. However, diversity of SARS-CoV-2 and frequent change of new variants was a great challenge towards the effectiveness of vaccines [8]. Furthermore, adequate production, allocation, storage conditions and affordable prices for purchasing were some of the major challenges in the way of sufficient production, supply, and chain management and to ensure its efficacy and safety (Polack et al., 2020; Folegatti et al., 2020; Wouters et al., 2021; Hossen et al., 2020).

Prior to sufficient availability and supply of COVID-19 vaccines, the only treatment options for COVID-19 patients was repurposing of drugs. The recovery rate of COVID-19 patients could be increased by applying several evidence-based repurposed antiviral drugs that slow down the replication of SARS-CoV-2 and/or decrease disease symptoms (Hossain et al., 2021). According to NIH guidelines, the recommended repurposing drugs that could be used in COVID-19 patients were Remdisivir, Dexamethasone (alternatively prednisolone or methylprednisolone could be used) and Baricitinib, used evaluating the conditions of the patients. WHO recommended differently towards the treatment procedure. Remdisivir, hydroxychloroquine, azithromycin were recommended for the COVID-19 patients. Later on, Remdisivir and hydroxychloroquine were withdrawn from the suggested guideline, the later was suspected to cause various heart diseases (Lepere et al., 2021; Alam et al., 2021). According to NIH guidelines, Remdisivir can be considered administering to inpatient hospital with constant monitoring in severe cases, though renal insufficiency is a major point of contraindication in this usage (NIH, 2021). The treatment pattern in Bangladesh was represented in the website of the directorate general of health services (DGHS), Government of the Peoples' Republic of Bangladesh, where several drugs were recommended for the treatment purposes of COVID-19 patients. Based on the severity and symptoms, the drugs such as, Paracetamol, Chloroquine, Remdisivir, Corticosteroids, Favipiravir, Tocilizumab, Interleukin, etc. were recommended in this guideline (NIH, 2021; Rahman and Rahman, 2020)..

In Bangladesh, the prevention and treatment of COVID-19 was managed by a blend of repurposing of drugs, immunization, oxygen and ventilation support and by applying traditional practice and intake of vitamins and other supplements. However, enough research has not been conducted so far to present a clear picture on the clinical practice, treatment pattern and medications used for the management of COVID-19 patients in Bangladesh as well as nobody has justified those practice with the standard practice and guidelines given by WHO and/or followed by other developed countries of the world. That's why the present study was carried out to investigate the medicaments of COVID-19

patients living in Dhaka city in Bangladesh including repurposing and conventional medicines and justify the rationality of the medicines used based on diagnosis, symptoms and underlying co morbidities as well as to compare the WHO and DGHS guidelines.

Materials and Methods

Study subjects, consent, and ethical aspect

The study participants were representative (184 COVID-19 patients of age 18-80 years) of COVID-19 survivals living at Dhaka city in Bangladesh. The study subjects (COVID-19 patients) were randomly selected from different COVID-19 hospitals, clinics as well as who received treatment staying at home. The consent of the patients was obtained before conducting the study. The objectives, significance, risk and benefits, etc. of the study were explained to the patients before getting their consent for participation in the study. The COVID-19 survivals who could provide written prescription of physicians and willingly agreed to participate were included in the study. An ethical approval for the study protocol was obtained from the institutional review board (IRB) for human ethics of the State University of Bangladesh before conducting the study (Protocol approval no: 2020-12-15/SUB/H-ERC/0002).

Collection of data

After getting informed consent, the patients were asked to provide a photocopy or picture of their prescriptions along with other medical reports (if available). Additionally the patients were also asked about the medicines they have taken (according to or without prescriptions provided by health care practitioners), the dose and dosage regimen of the medicines, and the management policies followed by them throughout the treatment period. Besides, the severity of their diseases, complications, and other questions relating to COVID-19 and it's treatment were asked for better clarification and evaluation of the justification of their prescriptions. The prescriptions were collected physically as well as through online platform (email, messenger, whatsapp, etc.). Interview/discussion with the patients were performed face to face as well as by phone call or audio/video call using messenger, whatsapp, imo, viber or online zoom meeting.

The data were collected from prescriptions and discussion with 184 COVID-19 survivors (hospitalized and non-hospitalized). The data collection period was from 10 March 2021 to 30 July 2021. The name and personal information of the patients were kept confidential and the patients were coded with patients ID starting from P-01 to P-184. Among the study subjects, 61 patients were hospitalized and received treatment in hospital, and 123 patients received COVID-19 treatments staying at home as per the prescriptions of physicians. The collected data of medicaments and other traditional practice which were advised to follow by the physicians as a part of their treatment procedure have been summarized in Table 1 and Table 2.

Results

Demographic characteristics of the patients

Among total 184 patients, 61.4% was male and 38.6% female (Figure 1a). In case of 61 hospitalized patients, male patients were more (55.7%) than female ones (44.3%); and among the 123 non-hospitalized patients, male patients were 64.2% and female patients were 35.8% (Figure 1A). We have divided the patients in two groups according to age. Among 184 patients, 59.8% patient was below 40 years and 40.2% above 40 years. When we considered only hospitalized patients, 49.2% was below 40 years and 50.8% was above 40 years. For non-hospitalized patients, 65% was below 40 years and 35% was above that age. These data has been summarized in Figure 1B.

Clinical management of COVID-19 patients in Bangladesh

COVID-19 confirmation test

All the patients of this study were tested positive in the confirmed COVID test by various recognized national and private organizations solely designated for tests.

Biochemical tests/ analysis

Several biochemical tests were suggested like CBC with ESR, serum ferritin, D-Dimer, Chest X-ray and HRCT which was acknowledged by patients while conversation and observation of treatment records.

Physical observation

COVID-19 patients' symptoms were noted and listed (Table 3). Common symptoms include fever, headache, body ache, chest tightness, cough, sore throat breathing difficulty etc. Comorbidities for instance hypertension, diabetes, insomnia, kidney disease etc. were also identified through diagnosis.

Figure 1

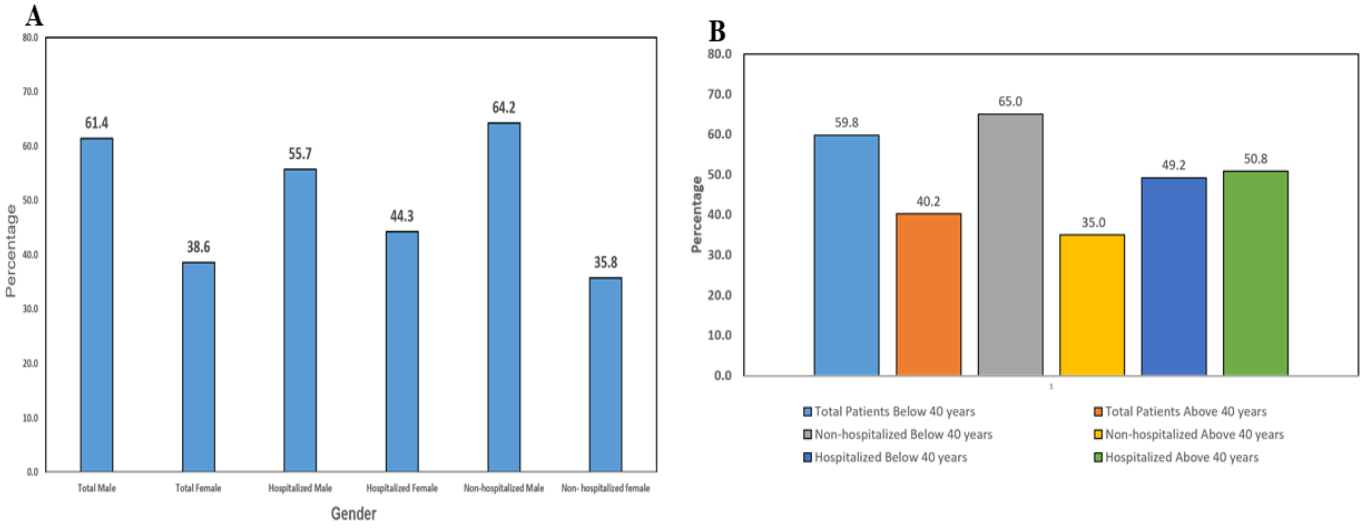

Figure1. Demographic characteristics of patients; (A) Percentage of male and female patients according to their sex in case of COVID-19 patients.; (B) Percentage of male and female patients according to their age group (below and above 40 years) in case of COVID-19 patients.

Oxygen saturation

Typical problem arisen from COVID pneumonia was hypoxia which means low oxygen saturation level in blood. It was one of the major complications of COVID-19 that the oxygen saturation drops all of a sudden in COVID patients. So, every patient was suggested to monitor his/her oxygen saturation level on a regular basis regardless of staying at home or hospital.

Ventilation

Severe patients were transferred to ICU and under ventilation. Those who were unable to breathe were under artificial methods to assist breathing (ventilator).

Treatment

Various drugs were prescribed both for symptomatic and prophylactic treatment to the patients according to their age, symptoms and stage of infection.

Treatment procedure of COVID-19 patients in Bangladesh

Moving forward towards the treatment procedure, several classes of drugs were found including antiviral, antibiotic, antipyretic, antitussive, corticosteroid, mucolytes, anxiolytic, anticoagulant, antihistamine, vitamin and mineral supplements, and bronchodilators. Occasionally monoclonal antibody, antidiabetic, antihypertensive, antiprotozoal and cholesterol-lowering agents were also prescribed summarized in Table 1.

Categories of drugs used for the treatment of COVID-19 patients

Repurposing of antiviral drugs

Among the antiviral drugs, Ivermectin, Remdisivir and Favipiravir were used. The topmost and only antiviral drug prescribed in non-hospitalized patients was Ivermectin having a frequency of 56 prescriptions out of 122 (46%) (Fig. 2A). In the case of hospitalized patients, Ivermectin and Remdisivir were in 17 and 25 prescriptions respectively (28% and 41% respectively) whereas Favipiravir use was very low consuming 1 prescription (2%) (Fig. 2B).

Repurposing of antibiotics

During COVID pandemic, the mostly commonly used antibiotics were Azithromycin (class: Macrolide), Doxycycline (class: tetracycline), Amoxicillin and Clavulanic acid combination (class: Penicillin), Cefuroxime, Cefixime (class: cephalosporin), Moxifloxacin, Gemifloxacin and Levofloxacin (Fluoroquinolone) and Meropenem (class: carbapenem). Considering the use of antibiotics, Azithromycin was prevalent (28%, 17 prescriptions), followed by Penicillin and Fluoroquinolone (23%, 14 prescriptions), Meropenem (16%, 10 prescriptions), Doxycycline (11%, 7 prescriptions) and Cephalosporin (7%, 4 prescriptions) - all for hospitalized patients (Fig. 2B). For non-hospitalized ones, Azithromycin was mostly prescribed covering 46 prescriptions (37%), while Fluoroquinolone, Doxycycline, Cephalosporin and Penicillin were in 5, 38, 8 and 2 prescriptions respectively (4%, 28%, 7% and 2% respectively) (Fig. 2A).

Table 1: Medicaments followed by non-hospitalized patients diagnosed with COVID-19 at Dhaka city in Bangladesh

Name of Drug Classes		No. of Prescriptions	Percentage (%)
Antiviral	Ivermectin	56	46
	Favipiravir	6	5
Antihistamine		56	46
Bronchodilator		24	20
Montelukast		46	37
Immunosuppressant		1	1
Antitussive		16	13
Antibiotics	Penicillin	2	2
	Fluoroquinolone	5	4
	Azithromycin	46	37
	Tetracycline	35	28
	Cephalosporin	8	7
Nutritional supplements	Vitamin C	73	59
	Vit D	33	27
	Zinc/Zinc + Vit B	57	46
	Multivitamin	4	3
	Amino acid-Calcium/Calcium	2	2
Antiparasitic	Metronidazole	5	4
Mucolytes		1	1
PPI		12	10
Anxiolytics		3	2
Antihypertensive		5	4
Anticoagulant		20	16
Antipyretic	Paracetamol	94	76
Antiemetic	Domperidone	4	3

Antihistamines

Mostly used antihistamine was Fexofenadine; however Rupatadine and Ebastin were occasionally prescribed. Antihistamines were prescribed in 21 cases (34%) of hospitalized patients (Fig. 2b). One of the highest prescribed drug classes are Antihistamine (46%) found in 56 prescriptions of non-hospitalized patients (Fig. 2a).

Anticoagulants

The main anticoagulant drugs used were Rivaroxaban and Enoxaparin; however, Betrixaban was also given in few cases. In the case of hospitalized patients, anticoagulants were used most frequently covering 34 prescriptions among 61 prescriptions (56%) (Fig. 2b). For non-hospitalized ones, anticoagulants were prescribed in 20 cases (16%) (Fig. 2a).

Bronchodilators

Montelukast was the most commonly used bronchodilator. Other used bronchodilators include Salbutamol, Salmetrelol and Fluticasone combination, Bumetanide, Budesonide and Doxophylline. Montelukast was one of the most popular drugs being in 32 prescriptions (52%) whereas other Bronchodilator use was in 23 cases (38%) in hospitalized patients (Fig. 2b).

Table 2: Medicaments followed by hospitalized patients diagnosed with COVID-19 in Dhaka city, Bangladesh

Name of Drug Classes		No. of Prescriptions	Percentage (%)
Antiviral	Ivermectin	17	28
	Remdisivir	25	41
	Favipiravir	1	2
Antihistamine		21	34
Bronchodilator		23	38
Montelukast		32	52
Immunosuppressant		20	33
Antitussive		13	21
Antibiotic	Penicillin	14	23
	Fluoroquinolone	14	23
	Azithromycin	17	28
	Meropenem	10	16
	Tetracycline	7	11
	Cephalosporin	4	7
Nutritional supplements	Vitamin C	31	51
	Vit D	23	38
	Zinc/Zinc + Vit B	35	57
	Daflon	1	2
	Pancreatin	1	2
	Multivitamin	4	7
	Amino acid-Calcium	1	2
Immunomodulators		9	15
Analgesic (for headache)	Aspirin	1	2
	Topiramate	1	2
Mucolytes		3	5
PPI		13	21
Anxiolytics		7	11
Antihypertensive		12	20
Cholesterol Lowering agent		3	5
Antidiabetic	Insulin	6	10
	Sitagliptin	1	2
	Lenagliptin	2	3
	Metformin	2	3
Anticoagulant		34	56
Antipyretic	Paracetamol	35	57
Antiemetic	Domperidone	1	2

Table 3: Evaluation of the rationality of prescribed medicines relating to diagnosis of COVID-19 and co-morbidities in Dhaka city, Bangladesh (Supplement file). The file can be downloaded by from the following link: https://docs.google.com/document/d/1CZ3l-2nXshs8HZRCo1RngN4SNsihJiUh/edit?usp=drive_link&ouid=106824604932196570023&rtpof=true&sd=true

Fig 2A

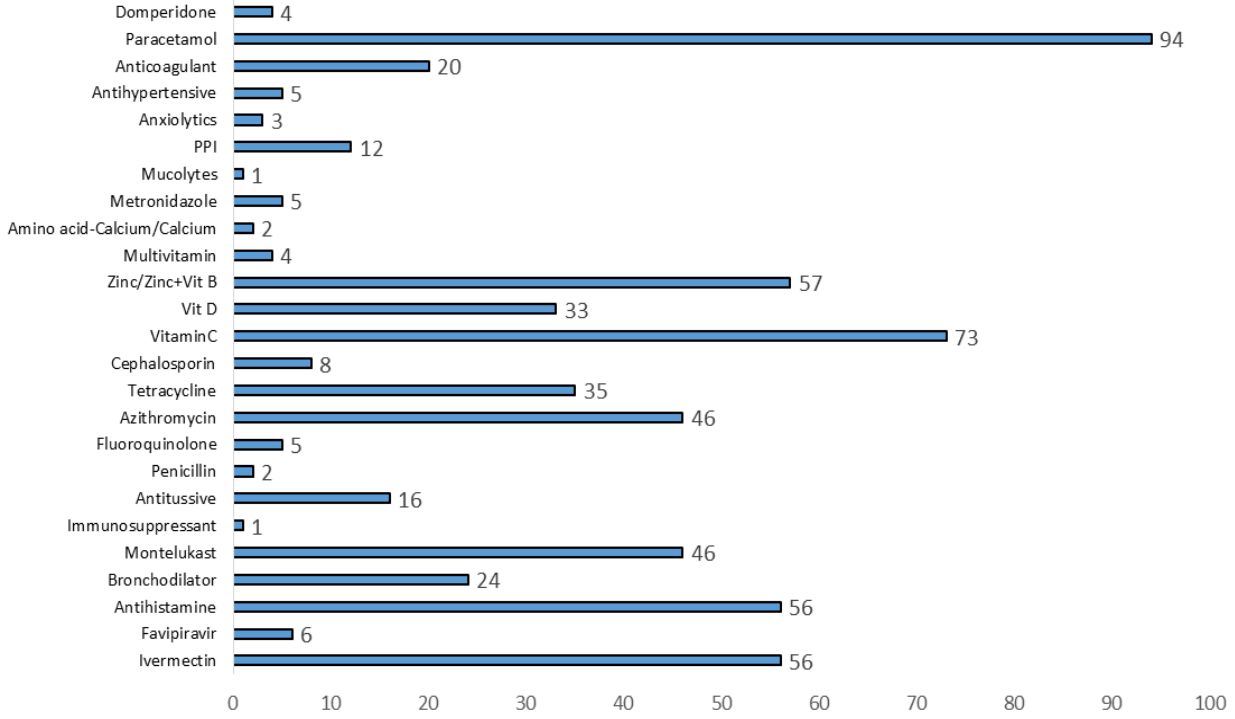

Fig 2B

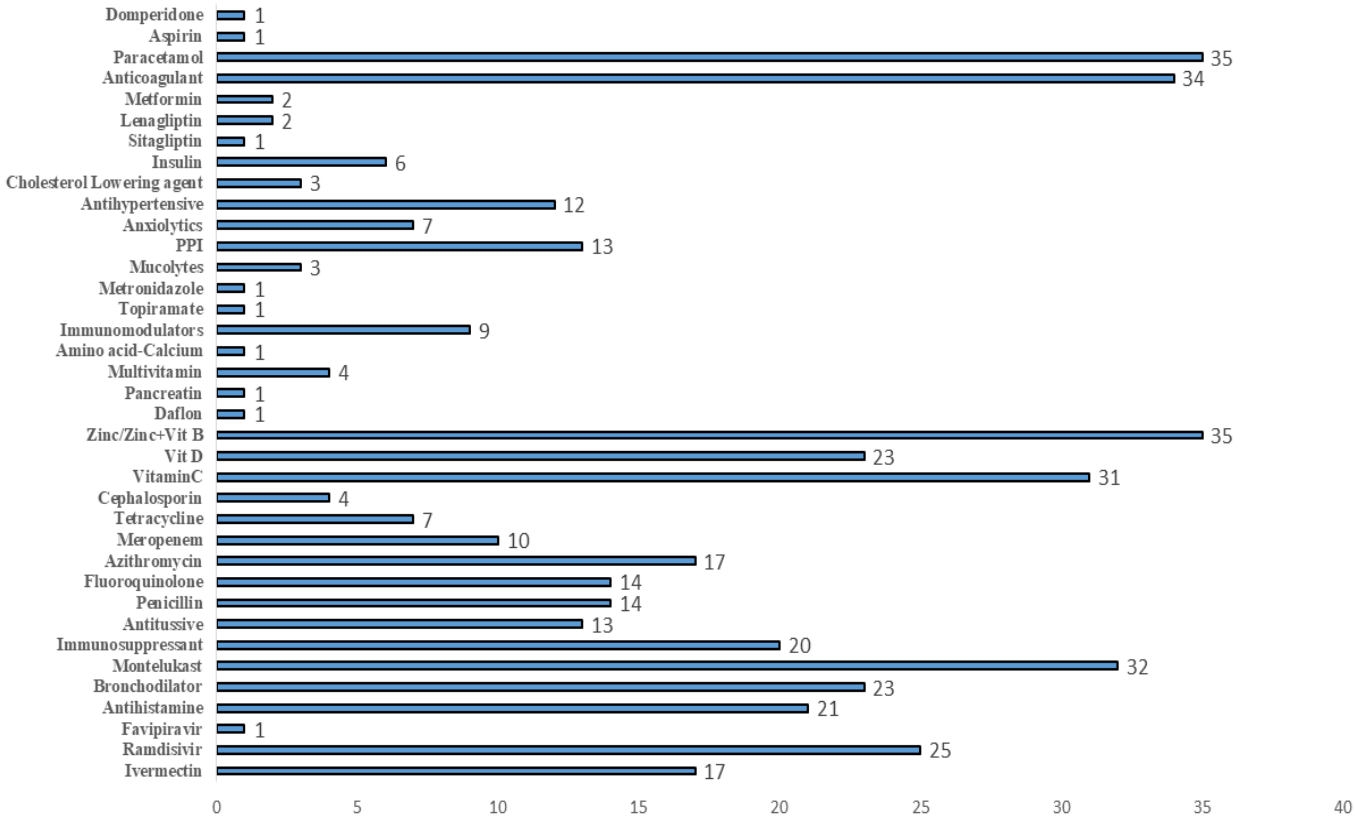

Figure 2. Frequency of drugs prescribed; (A) Frequency of different drug classes prescribed for the COVID-19 patients received treatment from home; (B) Frequency of different drug classes prescribed for the COVID-19 patients admitted to hospital and under specialists' observation due to severe condition.

Bronchodilators were in 24 prescriptions (20%) of non-hospitalized patients. Montelukast was prescribed alongside in 46 prescriptions (37%) (Fig. 2a).

Immunosuppressants

The only prescribed immunosuppressant corticosteroid was Dexamethasone. Dexamethasone was suggested for 20 cases (33%) in hospitalized cases (Fig. 2b). For non-hospitalized patients (Fig. 2a), the prescription frequency for this drug was very much less, only 1 prescription (1%).

Antitussive agents

Dextromethorphan, Butamirate citrate and its combination with Phenylephrine and Tripolidin and Bromohexine HCl were the drugs used as an antitussive. For hospitalized patients, antitussives were prescribed for 13 cases (21%) and for the non-hospitalized group, antitussives were prescribed in 16 prescriptions (13%).

Nutritional supplements

Frequently used nutritional supplements were found to be Vitamin C and D, Zinc, Combination of Zinc and Vitamin B, Multivitamins, Daflon, Pancreatin and Calcium-Amino acid combination. Vitamin supplements were present in all the prescriptions of hospitalized patients (Fig. 2b), whereas Vitamin C was found in 31 prescriptions (51%), Vitamin D in 23 prescriptions (38%), Zinc and zinc-Vitamin B combination in 35 prescriptions (57%), Multivitamin in 4 Prescriptions (7%) and Pancreation, Daflon and Amino acid- Calcium combination, all these three have frequency of 1 prescription (2% each). One of the most popular sections of the drug in non-hospitalized cases is a nutritional supplement (Fig. 2a). In this section, vitamin C was the most popular one consuming 73 prescriptions (59%), other supplements are Multivitamin, Amino acid-Calcium combination, Zinc and Zinc-Vitamin B combination and Vitamin D which were in 4, 2, 57 and 33 prescriptions, respectively (3%, 2%, 46% and 27%, respectively).

Paracetamol

Paracetamol is the only antipyretic drug used for the management of COVID-19. It was found that paracetamol was used in case of 35 prescriptions (Fig. 2b) of hospitalized patients (57%) and 94 prescriptions (76%) for non-hospitalized patients (Fig. 2a).

Drugs used for the treatment of comorbidities of COVID-19 patients or to support COVID-19 symptoms

Tocilizumab, Baricitinib and Lubiprostone were used in severe COVID-19 patients in prescriptions of the hospitalized segment as immunomodulators. Clonazepam, Bromazepam, Flupentixol-Malitracen and Diltiazem were used as anxiolytics and antiulcerants (proton-pump inhibitors) used were found to be esomeprazole and famotidine. For antiemetic and mucolytes the drugs suggested were Domperidone and N-acetyl cysteine, respectively. Ezetimib, Rosuvastatin and Atorvastatin were popular cholesterol-lowering agents. Sitagliptin, Lenagliptin, Metformin and Insulin were prescribed as antidiabetic drugs. Mostly used antihypertensive agents were Verapamil, Amlodipine, Amlodipine-Olmesartan combination, Losartan and Bisprolol and antiprotozoal was Metronidazole. Topiramate was also in the list.

Other drugs used for hospitalized patients (Fig. 2B) were found to be mucolytes for 3 cases (5%), proton-pump inhibitors (PPI) for 13 cases (21%) and anxiolytics for 7 cases (11%). Antihypertensives, Cholesterol-lowering agents and immunomodulators were only in 12, 3 and 9 prescriptions, respectively (20%, 5% and 15%, respectively). Antidiabetic drugs were used in the frequency of 2 cases for Lenagliptin and Metformin (3%), 6 cases for insulin (10%) and 1 case for Sitagliptin (2%). Topiramate (for severe headache), Domperidone (for vomiting tendency) and aspirin (blood-thinning agent) were found in 1 prescription each (2%). Other classes of drugs were not much frequent in non-hospitalized patients (Fig. 2a). PPI was prescribed in 12 prescriptions (10%), anxiolytics, antihypertensives, mucolytes, domperidone and metronidazole were prescribed in 3, 5, 1, 4 and 5 prescriptions, respectively (2%, 4%, 1%, 3%, 4%). All of them were prescribed according to the comorbidities or symptoms of the patient.

Traditional home remedies

Several traditional home remedies were suggested by the healthcare practitioners during COVID-19 pandemic was summarized in Table 1 and Table 2. Almost all of the patients who were being treated from staying at home were suggested to inhale water vapour thrice a day. It has been well accepted now that this method has reduced the severity of illness in a good number of cases while the mechanism is still unclear (17). Other suggestions include tea consumption which is made with cinnamon, clove, cardamom, ginger, black pepper, honey etc., having lots of citrus fruits, gurgle with hot water and some exercises were also suggested to eradicate difficulty breathing and chest tightness.

Patients being hospitalized were more severe in condition and were unable to practice the above-mentioned methods. They were frequently applied nebulization, oxygen supplement, ventilation in more severe cases and were under constant monitoring of oxygen saturation.

Discussion

From the treatment pattern, it was observed that most of the drugs are being used to cure the secondary effects of COVID-19. While some antiviral drugs were used to fight against the prevailing virus, antibiotics were used to prevent the secondary lung infection caused by bacteria. Despite being an antiparasitic, ivermectin was used for antiviral purposes for the treatment of COVID-19 patients. Ivermectin is generally used with a variety of doses depending on the weight of the patient but in the case of COVID-19 patients the mostly used dose was 18 mg irrespective of the body weight. Although there is no confirmed mechanism of action of Ivermectin on COVID-19, yet it the drug is used as it has plummeted the mortality rate significantly in Bangladesh. Ivermectin proved its antiviral effect against COVID-19 pathogen *in vitro* but the drug is still under clinical trial to understand its clinical efficacy and safety (Pawar et al., 2020; Chaccour et al., 2020). Most of the other classes of drugs like antitussive, antihistamine, bronchodilators, etc. are used according to the symptoms of the patients (Table 3). For example, patients having cough as a symptom was prescribed with antitussive (Dextromethorphan, Bromhexine etc.) and those who suffered from chest tightness were given bronchodilators (Salbutamol, Doxophylline, Montelukast, etc.). Antihistamines were prescribed for common cold symptoms like runny nose etc. Patients bearing fever, body ache and headache were prescribed with Paracetamol for its analgesic and antipyretic role.

SARS-Cov-2 has shown two types of properties, it can be classified as symptomatic and asymptomatic having a different degree of infectiousness (Caly et al., 2020). It is assumed that those having strong immunity are a victim of asymptomatic COVID-19 and it is an immunity which forbids the disease becoming severe. Multiple cases supported this fact and as a result, immune boosting supplements became a part of COVID-19 treatment. Several supplements especially Zinc and its combination with Vitamin B complex, Vitamin C, Vitamin D were the most popular ones. Apart from the mentioned ones, daflon, multivitamin, calcium (both alone and in combination with amino acid) and mucolytes were prescribed in some cases.

Post-COVID-19 heart attack and coagulation have taken a vicious shape in the patients (Sayampanathan et al., 2021). To avoid this complication, anticoagulant rivaroxaban and enoxaparin were prescribed in almost all the cases; betrixaban was used instead in the case of only one patient. Other classes of drugs used were antihypertensive, antidiabetic, anxiolytic drugs which were prescribed particularly in the case of patients diagnosed with hypertension, diabetes mellitus and sleeping disturbances, respectively. The only steroid drug used for COVID-19 treatment was dexamethasone and it was used in case of sustained fever. Domperidone was prescribed for patients having vomiting tendency and metronidazole was present if the patient had diarrhea as a symptom. Some drugs from the class statin were used for obese patients.

Immunomodulators were used in severe COVID-19 patients. Baricitinib was used from the early phase. It has shown the antiviral property by inducing interferon-mediated immune response (Sayampanathan et al., 2021). Lubiprostone was used for one case for a similar indication. Tocilizumab has been observed to use in case of severe COVID-19 patients. As pneumonia is the most serious complication of COVID-19 infection, tocilizumab interacts with the pro-inflammatory interleukin-6 that eventually suppresses the pneumonitis produced by the virus afterwards (Shi et al., 2020).

Along with the medicines, doctors also suggested following some traditional practices to the patients who were at home (Favalli et al., 2020). These include vapors inhaling, masala tea and citrus fruit consumption, monitoring oxygen saturation and exercise to clear the airway. Among these, steam inhalation was the most effective way to improve the condition. Sometimes a number of traditional plants were suggested to add to the hot water and then inhale the steam. Some phytochemicals of these suggested plants are proven to be effective to help people combating the SARS-CoV-2 virus (Perrone et al., 2020). For hospitalized patients, under ICU observations, were mostly supported with oxy-gen and oxygen saturation was monitored regularly. Severe patients were under ventilation. Patients with less severe complications were monitored under the COVID-19 unit with symptomatic treatments.

One most serious problem detected from the treatment pattern was irrational use of dexamethasone in patients having comorbidities like hypertension, diabetes and hypercholesterolemia. Dexamethasone is generally contraindicated in case of those patients, but the survey showed that it was prescribed even in case of the patients were diagnosed with the above-mentioned comorbidities. When the practiced treatment pattern was compared with the WHO and DGHS guidelines, it was found several deviations from the international and national treatment guidelines for COVID-19. According to WHO guidelines (Alam et al., 2021), symptomatic treatment was recommended in mild, moderate and severe

patients but the antibiotic has not been suggested unless there is a strong evidence for secondary bacterial infection. When the treatment pattern was evaluated in comparison to the DGHS instructions (https://dghs.gov.bd/index.php/bd/publication/guideline), it was found that along with the symptomatic treatment, low molecular weight heparin (enoxaparin/rivaroxaban) was also recommended for thromboprophylaxis. Remdisivir was recommended in severe cases and must be given under the observation of a clinician. Both the guidelines suggested dexamethasone in critical COVID-19 patients.

The antibiotic guideline of the DGHS was the same as with the WHO guidelines. The predominant deviation of treatment found in our study was the use of antibiotics in COVID-19 patients. In all the patients (mild, moderate and severe) antibiotics were prescribed regardless of secondary bacterial infections. The irrational and frequent use of antibiotics in COVID-19 management would be alarming as random use of antibiotics may lead to antibiotic resistance. Another difference was seen in the dexamethasone prescription, as patients who were not critical but only had long term fever were prescribed with this drug.

The affected and mortality rate in Bangladesh were relatively low during COVID-19 pandemic compared to other countries for several reasons. As the use of drugs is not restricted in Bangladesh, multiple drugs were being used which eventually has become beneficial. Also people in Bangladesh were exposed to lots of microorganisms and environmental pollutions which made the herd immunity to be strong. The people may be immunized against other viruses like COVID-19, which served positively in this pandemic.

It must be said that the continuous evolving new evidences, exclusive large sample data, geo-graphical location, and type of studies (observational, retrospective, small-sized clinical trials, or independent case series) are some limitations in this study. So, we feel the need for a multi-centered, large sample-sized, randomized, placebo-controlled trial on appropriate COVID-19 patients to reach a proper conclusion on the selection of right choice of treatment, management and medications.

Conclusion

In reality, the continuing COVID-19 pandemic was a matter of national and international health concern and it was a matter of survival and death. Before the launching of effective and safe vaccines or other medications, the management of COVID-19 was adopted by repurposing of drugs, applying traditional systems of medicines, and many other complementary and alternative medicines and treatment systems. In this study, we tried to investigate the evaluation of the use of repurposing and conventional medicaments against COVID-19 patients in Bangladesh depending on their diagnosis, symptoms and underlying comorbidities as well as to compare the practiced treatment and medications with the guidelines of the WHO and the DGHS. Our study has been found a number of deviations of treatment patterns from the international and national guidelines. In the basis of practical cases, according to COVID-19 prescription data, the most usable drugs (antiviral, antitussive, antihistamine, bronchodilators, anticoagulant, Immunomodulators, several supplements, some traditional practices, etc.) showed a significant number of patient's improvements regarding COVID-19 related complication as well as reduced the number of mortality rate though in some cases irrationally used of dexamethasone were also present. As a developing country to compete with the devastating condition of COVID-19, Bangladesh should focus on scaling up the current clinical management, treatment pattern and type of medications to fight against the COVID-19 and similar other pandemic or epidemic infections in future.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions Statement

Conceptualization: TJ and MMRS; collection of prescription and interview of the patients: TJ, SAl, MLN and SAk; manuscript draft writing: TJ, SAl and MLN; Review, and editing: MMRS; editing and final manuscript preparation: TJ, project supervision: MMRS. All authors have read and agreed to publish the manuscript.

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Data Availability Statement

Data relevant to the study is already included to the article or attached in the supplements. Raw data will be provided on reasonable request upon contacting with the corresponding.

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