

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

A rapid assessment of health system impact of COVID-19 on selected urban slum population of Bangladesh: from the perspective of health service providers and users

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-057402
Article Type:	Original research
Date Submitted by the Author:	15-Sep-2021
Complete List of Authors:	Mahmood, Shehrin Shaila; ICDDR, Health Systems and Population Studies Division Hasan, Md. Zahid; ICDDR, Health Systems and Population Studies Division Hasan, A M Rumayan; ICDDR, Health Systems and Population Studies Division Rabbani, Md. Golam; ICDDR, Health System and Population Studies Division Begum, Farzana; ICDDR, Health Systems and Population Studies Division Yousuf, Tariq Bin ; Urban Resilience Project, Dhaka North City corporation Hanifi, Syed ; ICDDR, Health Systems and Population Studies Division Reidpath, Daniel; ICDDR, Health Systems and Population Studies Division Rasheed, Sabrina; ICDDR, Health systems and Population Studies Division
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1 **Title.** A rapid assessment of health system impact of COVID-19 on selected urban slum
2 population of Bangladesh: from the perspective of health service providers and users
3
4
5
6
7

8 **Authors:** Shehrin Shaila Mahmood^{1*}, Md. Zahid Hasan¹, A M Rumayan Hasan¹, Md. Golam
9 Rabbani¹, Farzana Begum¹, Tariq Bin Yousuf², Syed Manzoor Ahmed Hanifi¹, Daniel D
10 Reidpath¹, Sabrina Rasheed¹
11
12
13
14

15 **Affiliations:**

16 ¹ Health Systems and Population Studies Division, icddr,b, Dhaka, Bangladesh

17 ² Urban Resilience Project, Dhaka North City corporation, Dhaka, Bangladesh
18
19
20
21
22
23
24
25
26
27

28 ***Corresponding author**

29 Shehrin Shaila Mahmood, PhD

30 Postal address: Health Economics and Financing

31 Health Systems and Population Studies Division, icddr,b,

32 68 Shaheed Tajuddin Ahmed Sharani, Mohakhali, Dhaka-1212, Bangladesh.

33 Email: shaila@icddr.org
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

24 ABSTRACT

25 **Objective** We aimed to rapidly assess the health systems impact of COVID-19 in the urban
26 slums of Bangladesh.

27 **Design, Setting, and Participants** A cross-sectional survey with 476 households was conducted
28 during October-December 2020 in five selected urban slums of Dhaka North, Dhaka South, and
29 Gazipur city. In-depth interviews with purposively selected 22 slum dwellers and key informant
30 interviews with 16 local healthcare providers and 4 policymakers and technical experts were also
31 conducted.

32 **Outcome measures** The impact of the pandemic on the health systems was explored considering
33 the WHO defined six building blocks. Descriptive and systematic framework approaches were
34 applied to analyse the quantitative and qualitative data, respectively.

35 **Results** About 12% of members suffered from general illness and 25% reported chronic illness.
36 Over 80% sought healthcare and majority sought care from informal healthcare providers. 39%
37 of the recently delivered women sought healthcare in three months period. An overall reduction
38 in healthcare use was reported during lockdown period compared to pre-pandemic time.
39 Mismanagement and inefficient use of resources were reported as challenges of health financing
40 during the pandemic. Health information sharing was inadequate at the urban slums resulting
41 from the lack of community and stakeholder engagement (51% received COVID-19 related
42 information, 49% of respondents knew about the national hotline number for COVID-19
43 treatment). Shortage of human resources for health was reported to be acute during the pandemic
44 resulting from the shortage of specialist doctors and uneven distribution of health workforce.
45 COVID-19 test was inadequate due to the lack of adequate test facilities and stigma associated
46 with COVID-19. Lack of strong leadership and stakeholder engagement was seen as the barriers
47 to effective pandemic management.

48 **Conclusion** The findings of the current study are expected to support the government in tailoring
49 interventions and allocating resources more efficiently and timely.

50 **Strengths and limitations of this study**

- 51 • This study will be the first study that explored the impact of COVID-19 and the resulting
52 country-wide lockdown on the urban health system of Bangladesh through the WHO
53

54 defined six building blocks (i.e., service delivery, health workforce, health information
55 system, essential medicine, health financing, leadership/governance).

- 56 • The greatest strength of the study is that it took a holistic approach in exploring the health
57 system impact of COVID-19 on urban slum dwellers taking into account data from
58 community members, healthcare providers, and policymakers.
- 59 • This study was exploratory in nature, which did not allow us to make any causal inference.
- 60 • The study utilized the ongoing Urban Health and Demographic Surveillance System
61 (UHDSS) of icddr,b for its sampling frame, which may be representative of Dhaka division
62 but it would be more difficult to generalize the results to slums in other parts of the country.
- 63 • Response bias might exist in this study since data were collected over the phone, which is
64 unable to capture insights related to sensitive issues like stigma.

66 INTRODUCTION

67 In March 2020, COVID-19 was declared as a pandemic by the World Health Organization
68 (WHO) pointing to the sustained risk of further global spread [1]. To contain the spread of the
69 virus, “stay-at-home” orders or lockdowns were deployed across the world including Bangladesh
70 [2,3]. Being a developing country, the impact of this pandemic in Bangladesh was likely diverse
71 and multisectoral. The impact on access to healthcare has been acute with challenges including
72 fear of COVID-19 infection at health facilities [4,5] and economic hardship due to job loss or pay
73 cut [6–9].

74 The health sector in Bangladesh is under-budgeted and the per-capita expenditure on health from
75 the government have been low, around 27% of the total health expenses (THE), [10] where the
76 out-of-pocket expenses (OOPE) have remained the major source of healthcare financing
77 (constituting 74% of THE) [11]. The health service delivery in the country suffers chronically
78 from a lack of adequate human resources, supplies, medicines, and governance. For acute
79 illnesses, most people sought healthcare from unqualified, informal healthcare providers e.g.
80 drug stores, chambers of village doctors [12–14]. The challenges are even greater in urban
81 settings where access to healthcare is more complex in absence of strong public sector primary
82 healthcare (PHC) provision. In contrast, in rural areas, there is a strong network of PHC centers
83 run by the Ministry of Health and Family Welfare, in the urban areas PHC falls within the remit
84 of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC).

85 MLGRDC does not have the same kind of PHC network, and PHC in urban settings is fractured
86 and uncoordinated, with the poor linkage between the various levels of health service delivery
87 [15].

88 The impact of this weak urban health system mostly affects the low-income population, the
89 majority of whom live in the urban informal settlements (slums). Additionally, there are public
90 health concerns specific to the urban slums owing to overcrowding, unhygienic waste
91 management, and pollution [16]. With the outbreak of COVID-19, an air-borne disease, the
92 health systems impact was expected to be the greatest amongst the population of the urban slums
93 [17]. In addition, the ongoing economic shutdown caused by COVID-19 threatened millions of
94 livelihoods engaged in the informal sector with little or no financial protection for healthcare
95 [18]. Unfortunately, almost 18 months into the pandemic, there remains a paucity of information
96 about the nature and the extent of the impact, of the pandemic on health services in the urban
97 slums. Given the nature of the spread of the disease, it is essential to understand whether and
98 how COVID-19 affects the utilization of health services and OOPE during the pandemic.
99 Understanding this is particularly important if the Universal Health Coverage lead, to leave no
100 one behind, is to be taken seriously. Timely rapid assessments of the impact on the vulnerable
101 groups can support the government and policymakers to design and implement efficient
102 response plans. The current paper thus aims to assess the health systems impact of COVID-19
103 urban slums dwellers in Dhaka city.

105 **METHODOLOGY**

106 **Conceptual framework**

107 We explored the impact of COVID-19 and the resulting country-wide lockdown on the urban
108 health system of Bangladesh through the lens of WHO's six health systems' building blocks
109 (i.e. service delivery, health workforce, health information system, essential medicine, health
110 financing, leadership/governance)[19]. We explored how far health services were accessible
111 and available to the urban slum population; challenges faced by the urban healthcare
112 providers and the viewpoint of health policymakers towards healthcare provision in urban
113 slums of Dhaka city during the pandemic. Figure 1 illustrates the impact pathway guiding the
114 study.

115

1
2
3 116 (Figure 1 to be inserted here)
4 117

5 118 **Study design and setting**

6 119 An exploratory study design applying both quantitative and qualitative approaches was used. The
7
8 120 quantitative approach included a cross-sectional household survey. The survey was conducted
9
10 121 among the adult male and female household members aged between 18 and 80 years of an
11
12 122 existing Urban Health and Demographic Surveillance System (UHDSS) of icddr,b. The UHDSS
13
14 123 covers about 31,577 households in five slums of Dhaka North, South, and Gazipur City-
15
16 124 Corporations [20]. The qualitative approach included In-depth Interviews (IDI) with adult male
17
18 125 and female slum dwellers, Key Informant Interviews (KII) with healthcare providers providing
19
20 126 healthcare to slum dwellers, and with national-level health policymakers.
21
22 127

23 128 **Sample size**

24
25 129 A recent study conducted in the urban slums of Dhaka, Bangladesh found that 41% of the
26
27 130 respondents had an unwillingness to attend regular health services fearing COVID-19 infection
28
29 131 and unavailability of doctors [21]. We assumed that 50% of the slum population will, for similar
30
31 132 reasons, not utilize formal healthcare during the COVID-19 pandemic for general illnesses.
32
33 133 Using this proportion ($p=0.5$), with 95% confidence level and 5% precision level, an estimated
34
35 134 384 households were required for interview. Assuming a 10% non-response rate and 1.2 design
36
37 135 effect for five slums, 512 households were selected from the database of UHDSS. However, 476
38
39 136 households were finally interviewed (response rate 93%). For qualitative data, a total of 22 IDIs
40
41 137 with purposively selected male ($n=10$) and female ($n=12$) slum dwellers and 20 KIIs with
42
43 138 purposively selected local healthcare providers ($n=16$) and national level policymakers ($n=4$)
44
45 139 were conducted.
46
47 140

48 141 **Data collection**

49 142 The household survey was conducted in five slums of UHDSS namely, Korail, Mirpur,
50
51 143 Ershednagar, Shampur, and Dholpur from 31st October till 1st December 2020. We interviewed
52
53 144 the respondents over the phone since the face-to-face interview was not feasible during the
54
55 145 pandemic. During their routine data collection, the UHDSS surveillance workers took verbal
56
57 146 consent over the phone from the households and health care providers regarding their
58
59 147 participation in the current study. Only households agreeing to share their mobile numbers were
60

1
2
3 148 included in the sampling frame for the survey. Household survey data was collected using an
4
5 149 Android-based electronic questionnaire. Qualitative interviews with community members, health
6
7 150 care providers, and national level policy planners were conducted by phone till 15th January
8
9 151 2021.

10 152

11 12 153 **Study instrument**

13 154 Trained data collectors administered a pre-tested household survey in Bangla. Respondents were
14
15 155 provided BDT 200 [USD 2.37] using a mobile financial service compensating for their time
16
17 156 spent participating in the study. The survey collected information on household members' latest
18
19 157 episode of general illness, healthcare-seeking behaviour, and expenditure during the 14 days
20
21 158 preceding the survey and respondents' access to COVID-19 related information, 90 days
22
23 159 preceding the survey for Maternal, Newborn and Child Health (MNCH) services, and 12 months
24
25 160 preceding the survey for one major chronic illness e.g., Diabetes, Arthritis, Asthma,
26
27 161 Cardiovascular disease, and Hypertension. The IDIs with the slum dwellers explored their access
28
29 162 to healthcare during pandemic, information related to COVID-19, and challenges they faced in
30
31 163 accessing healthcare. The KIIs with the healthcare providers and the policymakers sought their
32
33 164 opinion and suggestions about the seven out of eight pillars of health system preparedness to
34
35 165 respond to the COVID-19 pandemic including (1) coordination, planning, and monitoring; (2)
36
37 166 risk communication and community engagement (3) surveillance, rapid response, and case
38
39 167 investigation; (4) Laboratories; (5) infection prevention and control; (6) case management; (7)
40
41 168 operational support and logistics [22].

42 169

43 170 **Statistical analysis**

44 171 The characteristics of households and respondents are presented as categorical variables with
45
46 172 frequency (n) and percentage (%). The median OOPE is presented in BDT [USD 1=BDT 83].
47
48 173 Health service utilization, source of care, and OOPE have been compared with the findings from
49
50 174 previous urban health surveys and health surveillance data. Quantitative analyses were
51
52 175 performed using Stata, version 14 [23].

53 176 A systematic framework approach was used for analyzing the qualitative data. On completion of
54
55 177 an IDI or KII, verbatim transcriptions were made. The transcripts were then read carefully and
56
57 178 matched with the records to determine missing information and divided under different themes

179 and codes. We generated a matrix using the categories derived from different themes and
180 subthemes. The findings under each main theme, subthemes, or category were presented for the
181 identification of key areas of interest. Triangulation of information was done for validating the
182 findings obtained from different sources.

183

184 **Patient and public involvement**

185 Patients or the public were not involved in the design, or conduct, or reporting, or dissemination
186 plans of our research.

187

188 **RESULTS**

189 **Socio-demographic and economic information of study households and their members**

190 We surveyed 476 households with a total of 2,140 members. The proportion of male and female
191 members was almost equal. About 32% of household members had no education. More than half
192 of the members were married (53%). About 67% of members were currently unemployed. The
193 highest proportion of the members belonged to the poorest-quintile (27%) and about 21%
194 belonged to the richest asset quintile (Table 1).

195

196 **(Table 1 to be inserted here)**

197

198 **Impact of COVID-19 on Urban Health Systems**

199 **Health service delivery**

200 *Healthcare utilization*

201 About 12% of the members suffered from general illness in the last 14-days preceding the survey
202 and 83% of them recovered from their illness by the day of the interview (Table 2). The majority
203 suffered from cough (33%), followed by fever (32%), pain/chest pain (12%), and diarrhoea
204 (4%). About 90% of those reporting illnesses, sought healthcare mostly from the local drug
205 stores (64%) followed by private hospitals (16%), and public hospitals (14%).

206

207 **(Table 2 to be inserted here)**

208

209 About 25% of individuals aged 40 years and above reported suffering from a chronic illness
210 (Table 3). Most of them suffered from Diabetes (24%) followed by Arthritis (20%), Asthma
211 (16%), Cardiovascular (13%), and Hypertension (9%). About 80% regularly sought treatment for
212 chronic illness. More than half of the members with chronic illness (56%) had received treatment
213 in the 3 months preceding the interview. Local drug stores were again the major source of
214 treatment (46%). About 37% of the members suffering from chronic illness did not seek care due
215 to financial constraints and around 18% refrained from seeking care due to fear of COVID-19
216 infection.

(Table 3 to be inserted here)

220 During the qualitative interviews, the respondents also spoke about more services utilization
221 during the pandemic compared to other times. Patients with COVID-19 like symptoms feared
222 being identified and stigmatized as COVID patients and referral to high-cost health facilities for
223 treatment if they were seeking treatment at a formal health facility. The cost of formal healthcare
224 was also an important deciding factor for using informal providers.

226 *During the first two months, I received many patients with different health problems along with*
227 *breathing difficulties. We usually suggest general drugs for breathing difficulty. (drug vendor,*
228 *KII-2)*

230 Among the mothers who utilized healthcare in the year preceding the survey, 39% of them
231 sought healthcare in three months period (Table 4). Of the 27 mothers reporting MNCH care
232 utilization about half reported using antenatal care (ANC), 30% used delivery care, and 21%
233 reported utilizing postnatal care (PNC) services. The majority of the ANC services were sought
234 from private facilities and NGO clinics. Eight out of total 10 deliveries reported were normal
235 deliveries of which about 38% (n=3) took place at home. Whereas seven out of ten (70%)
236 deliveries were institutional of which about 29% (n=2) were Caesarean section and the majority
237 of them took place at private facilities (n=4). PNC services were availed only by those who had
238 institutional deliveries.

239

240 (Table 4 to be inserted here)

241

242 *Healthcare provision*

243 An overall reduction in healthcare utilization was reported by urban healthcare providers during
244 the pandemic compared to pre-pandemic period. From the healthcare providers, we found that
245 the number of home deliveries in urban slums of Dhaka city increased and the number of normal
246 deliveries also increased at the facilities. Many mothers tried to deliver their babies at home with
247 assistance from traditional birth attendants but came to the facilities when TBAs could not help.

248

249 *Normal delivery at our hospital decreased during lockdown. We learned that they (pregnant*
250 *women) tried to have normal delivery at home. They fell at risk. Traditional birth attendants are*
251 *not trained to manage complications. We dealt with mothers who experienced complications*
252 *after home delivery during lockdown. (Physician, KII-7)*

253

254 *Challenges in health service delivery during pandemic*

255 In the context of COVID-19, both service recipients and service providers faced challenges in
256 accessing and providing services. Respondents from the community spoke about reduced hours
257 of the formal health facilities, shortage of doctors as they were deployed to manage the
258 pandemic, unavailability of specialists as they stopped attending, lack of physical examination
259 and requirement of COVID tests were some of the major barriers to access healthcare during
260 pandemic.

261 The health care providers talked about the lack of a triage system at the health facilities to
262 identify patients with COVID-19 symptoms, an (initial) shortage of Personal Protective
263 Equipment (PPE), challenges in maintaining proper safety measures, an increased workload, and
264 stress among the major challenges they faced in providing healthcare during the pandemic.

265

266 *Healthcare financing*

267 In terms of budget allocated to manage the pandemic, the policymaker and the technical expert
268 group members mentioned that the government with support from development partners were
269 able to mobilize resources to manage the pandemic. However, there were challenges in ensuring

270 efficient use of the resources. The inefficiency was more visible in Dhaka city where the
271 pandemic response strategy was rather rapid but unplanned. As mentioned by one respondent:

272
273 *In Dhaka city, there was urgency and thus there was mismanagement. As we heard, people*
274 *involved in the ministry of health and family welfare tried to release the fund which was in each*
275 *of the operation plans of different departments, and they could do it. Later the government*
276 *received funds from the donor agency. This was enough resource for the health sector..... It will*
277 *not be correct to say resource shortage hindered the implementation of activities to manage the*
278 *pandemic. (technical expert, KII-19)*

279
280 During discussions about the reasons for inefficiency related to spending existing resources,
281 respondents talked about existing government financial rules as an important barrier for rapid
282 spending of money during the pandemic. As one respondent said:

283
284 *A lot of money was misused ...you must have read in newspapers during pandemic.... I am not*
285 *sure whether it was adequate or not but there was not any lack of funds. To some extent, they*
286 *could not spend money due to the financial rules... There is tremendous political pressure.... The*
287 *physicians do not understand finance. The administrative officers/clerks of DGHS prepare and*
288 *manage those..... (technical expert, KII-17)*

289 290 *Out of pocket expense for healthcare during pandemic*

291 The median total OOPE per patient for treating general illness was BDT 315 in the 14-day
292 preceding the survey. About 96% of the care seekers required medicine for which the median
293 expenditure on medicine was BDT 300. In the three months preceding of survey, the median
294 OOPE for chronic illness was BDT 1,750. For MNCH care-related expenditure in the 3 months
295 preceding the survey, we found that 16 eligible mothers who took ANC incurred a median OOPE
296 of BDT 1,220. Most of the expenditure was related to medical components e.g., medicine,
297 diagnostic, etc. The median OOPE for delivery (n=10) was BDT 4,360. Total seven mothers who
298 took PNC services had a median OOPE of BDT 760 (Figure 2).

299
300 **(Figure 2 to be inserted here)**

1
2
3 301
4
5 302 Health information on COVID-19 prevention, management and treatment
6
7 303 Around 51% of the respondents mentioned receiving COVID-19 related messages in the 30 days
8
9 304 preceding the survey. The rest reported not receiving any message. 51% of the respondents were
10
11 305 not aware of the national hotline number that provides COVID-19 related treatment through
12 306 telemedicine (**Table 5**).

13 307
14
15 308 **(Table 5 to be inserted here)**
16
17 309

18 310
19
20 311 Television was the major source of COVID-19 related information for respondents (75%)
21 312 followed by neighbors (6.5%) and social media (5.5%). (Figure 3).
22
23 313

24 314 **(Figure 3 to be inserted here)**
25
26 315

27 316 The lack of access to COVID-19 related information in the general population was also reported
28
29 317 by the members of national technical committee for COVID-19 (KII respondents). The
30
31 318 respondents mentioned that, although the government took several prevention initiatives, many
32
33 319 of them were not effectively implemented. The experts from the technical committee concluded
34
35 320 that engaging community in prevention, health education and awareness-raising, to contain the
36
37 321 spreading of the virus, was important; however, the government initiative to engage the
38
39 322 community was inadequate. This was in contrast to the government officials we interviewed.
40
41 323 One respondent said:

42 324
43
44 325 *“DG health is not so active in engaging community in preventive intervention but they are*
45 326 *working. Bureau of health communication is also working with NGOs in this regard. However,*
46 327 *this is not enough for effective engagement of community in pandemic management.”(technical*
47
48 328 *expert, KII-19)*
49
50 329

1
2
3 330 Health workforce
4

5 331 Our findings indicate that the existing shortage of human resources in health in Bangladesh
6 332 became more acute in both public and private health facilities during the pandemic. This was due
7 333 to the unavailability of senior physicians to attend general patients during the lockdown period
8 334 and the re-assignment of physicians to attend COVID-19 patients. One respondent said:
9

10 335
11
12 336 “[The] Majority of the senior, experienced and specialized physicians did not attend patients.
13 337 Frontline health workers had to face the battle.” (technical expert, KII-18)
14
15
16
17 338

18 339 Deployment of human resources to tackle COVID-19 patients also resulted in a shortage of HR
19 340 in service delivery areas for general patients. The respondents also expressed their concern about
20 341 the concentration of doctors and nurses in Dhaka city to deal with the burden of the pandemic.
21
22 342 One respondent said:
23
24
25 343

26
27 344 Government has taken some good initiatives in response to Covid-19. You know the government
28 345 has recruited and deployed more than 2000 physicians and many other health staff on an urgent
29 346 basis. But there has been a problem in posting those physicians. The physicians have not been
30 347 posted at places where they are originally planned for. Due to political pressure or the influence
31 348 of Civil surgeons, many of them have been placed in urban areas or district level. (technical
32 349 expert, KII-17)
33
34
35
36
37 350

38
39 351 Safety of both patients and healthcare providers was another source of concern expressed. They
40 352 highlighted the absence of a triage system at the entry point of health facilities to be a major
41 353 obstacle in ensuring patient and provider safety from COVID-19 infection. One respondent said:
42
43
44 354

45
46 355 “In our facility, two staff members had been infected and we all had to go for isolation for 14
47 356 days. Therefore, there was no one to operate our facility. People have not received any treatment
48 357 from our facility at that time.” (Physicians, KII-1)
49
50
51 358

52
53
54
55
56
57
58
59
60

1
2
3 359 Moreover, the respondents stated that there was a lack of a standard incentive package from the
4 360 government to cover the health risks faced by frontline health workers, which led to discontent
5 361 among the health workers.
6
7
8 362

10 363 Medical products and technologies

11 364 The respondents from the slums stated that access to existing COVID-19 test facilities was
12 365 challenging for the urban slum dwellers due to the long waiting hours to get tested at public
13 366 facilities which were affordable for them and the high cost of the testing at the private facilities.
14
15
16
17 367

18 368 *Many of our patients do not want to do the Corona test. The private diagnostic facilities have*
19 369 *high charges for the test which the poor patients cannot afford. It is true that testing at public*
20 370 *facilities is a hassle. Many of our patients shared their experience that they have to stand in a*
21 371 *long queue and wait for a long time to get tested and then the reports take a long time. One*
22 372 *patient told me that he received his report after 15 days of giving sample. (healthcare provider,*
23 373 *KII-1)*
24
25
26
27
28

29 374
30 375 There was, moreover, a general lack of interest among slum dwellers to get tested because of the
31 376 stigma associated with testing positive for COVID-19 and the accompanying fear of losing one's
32 377 job.
33
34
35

36 378
37 379 *They do not want to go for doing Covid-19 test. If we refer them, they do not want to go because*
38 380 *they fear that the hospital will admit him and will not allow him to meet with his family members.*
39 381 *Community people would avoid him after knowing that he got infected. Thus, they do not want to*
40 382 *do the test. (healthcare provider, KII-04)*
41
42
43
44

45 383
46 384 Moreover, according to the technical experts who were interviewed, the limited number of
47 385 testing facilities resulted in limited availability of tests in the early stages of the pandemic. Not
48 386 only there were fewer testing centers, but also the slum dwellers were not aware of the testing
49 387 centers. One of the technical experts held the view that:
50
51
52

53 388
54
55
56
57
58
59
60

1
2
3 389 *“The lower-class people always experience discrimination. They are always deprived and in*
4 *terms of getting Covid-19 related health services, they have been deprived.”* (technical expert,
5 390
6 391 KII-17)
7

8 392
9

10 393 Leadership/ governance

11 394 A lack of strong leadership and strategic planning at the central level of the government was
12 identified as one of the major health system challenges during the pandemic by the technical
13 395
14 experts. Centralization of decision-making was seen as a barrier to the timely allocation and use
15 396
16 of resources in managing local challenges posed by the pandemic. One respondent said:
17 397
18

19 398

20 399 *“All decisions are made by one or two people. The WHO suggested involving all people in*
21 *relevant sectors in order to fight with the pandemic. This is not possible for the ministry of health*
22 400 *independently. Not all divisions of the government were involved. Things could have been*
23 401 *different if all sectors worked together.”* (technical expert, KII-19)
24 402
25
26

27 403

28 404 DISCUSSION

29 405 The study findings highlight the effect of the COVID-19 pandemic and the resulting country-
30 wide lockdown on the health systems of Bangladesh from the perspective of health service users
31 406
32 and providers in urban slums, as well as policymakers and members of the national technical
33 407
34 committee on COVID-19. The impact on the six different building blocks of health systems is
35 408
36 presented in the study [19].
37 409

38 410 Before pandemic, a study conducted in urban slums of Dhaka city in 2017 reported that 93% of
39 411
40 patients suffering from chronic illness [20]. Findings from our study showed that healthcare
41 412
42 seeking was adversely affected in the urban slums during the pandemic, particularly for patients
43 413
44 suffering from chronic illness (37% lower). The lower use of ANC, PNC, general outpatient
45 414
46 services, and immunization services was also reported in a study conducted by USAID [24].
47 415

48 416 One important finding is the rise in the demand for informal healthcare providers during the
49 pandemic period by slum dwellers; consistent with the finding of other studies conducted in
50 417
51 similar settings[25,26]. The utilization of health services provided by formal health facilities was
52 418
53 limited during this time due to such issues as shortened service hours, lack of physicians,
54 419
55 COVID-19 test requirements at the hospitals, and financial constraints. Two other studies also
56
57

1
2
3 420 reported that financial constraints and fear of COVID-19 infection acting as barriers to accessing
4
5 421 healthcare [27,28]. Unfortunately, the increased use of informal healthcare providers including
6
7 422 the traditional birth attendants puts patients at higher risk of malpractice. Healthcare providers
8
9 423 from the NGO-run clinics reported dealing with complicated maternity cases that had been
10
11 424 unsuccessfully managed by unskilled providers.

12 425 The health system also faced challenges from the limited supplies including PPE, shortage of
13
14 426 human resources, lack of screening mechanism to isolate COVID-19 patients from general
15
16 427 patients, and the workload and stress of healthcare providers. Due to the lack of a triage system
17
18 428 at the entry point of health facilities in urban areas, the healthcare providers and general patients
19
20 429 were always at risk of getting infected. The vulnerability of frontline healthcare providers during
21
22 430 the pandemic has also been reported elsewhere [25,29]. In an effort to protect both patients and
23
24 431 healthcare providers the system could benefit from establishing an easier triage system at the
25
26 432 entry point of all health facilities to separate patients presenting with COVID-19 like symptoms
27
28 433 from the rest. In addition, for certain health conditions, the use of remote healthcare through
29
30 434 telehealth services could prove to be crucial in ensuring that patients get healthcare without
31
32 435 compromising their own safety or that of the healthcare providers'. The national telehealth
33
34 436 service, Shastho Batayon (16263), was in operation during the pandemic; however, its reach was
35
36 437 found to be limited in the urban slums with only 49% of slum dwellers knowing about the
37
38 438 service.

39 439 Earlier studies have shown community engagement to be a crucial part of many health initiatives
40
41 440 [30,31] including initiatives for the management of communicable diseases [32] and maternal
42
43 441 and child health conditions [33]. More recently community engagement has been considered as a
44
45 442 fundamental component during outbreaks, such as the Ebola epidemic in 2014-2015 in West
46
47 443 Africa [34,35]. There was an overall lack of penetration of government initiatives for raising
48
49 444 awareness within the urban slum areas and 49% of the respondents mentioned not receiving any
50
51 445 COVID-19 related information in the three months preceding the survey. This could be
52
53 446 explained by the low level of community engagement activities of the government in managing
54
55 447 the pandemic. In managing the COVID-19 pandemic, the urban health system needed to have
56
57 448 expanded programs to engage community members effectively. In its absence, it is difficult to
58
59 449 ensure universal coverage of services. Studies published on COVID-19 have also highlighted the
60
61 450 importance of community engagement for COVID-19 prevention and control [30,36,37].

1
2
3 451 The health system of Bangladesh suffers chronically from a shortage of human resources for
4 452 health [38]. This shortage became more acute during the pandemic when a higher number of
5 453 doctors had to be placed at COVID-19 specialized hospitals to manage the sudden surge in cases.
6
7 454 As a consequence, there was a lack of adequate healthcare providers to treat general patients at
8
9 455 other health facilities. Furthermore, for their personal safety, and being among the high-risk
10 456 group for COVID-19, senior and specialized doctors stopped providing services or switched to
11 457 teleconsultation during the pandemic. In some places, service hours were shortened. In
12 458 combination, these changes to the health system hindered access to routine care and in many
13 459 cases delayed healthcare seeking for patients in urban Dhaka. The lack of physicians or general
14 460 patients during pandemic has also been reported elsewhere [24,25].
15
16 461 Delayed healthcare-seeking has far-reaching health implications which can lead to increased
17 462 complications and required longer and more intensive treatment. This is expected to have both
18 463 health and financial consequence on the population. The government of Bangladesh deployed an
19 464 additional 2,500 doctors and 5,000 nurses on as an ad hoc, rapid response to the pandemic [39].
20 465 It started in June 2020, which assisted the health system to gradually resume the other essential
21 466 health services in the country.
22
23 467 According to the findings, healthcare financing for pandemic management in Bangladesh
24 468 suffered more from inefficient planning and implementation rather than the lack of available
25 469 funds. The urgent requirement for fund disbursement, the centralized financial management, the
26 470 lack of efficient fund allocation mechanism during an emergency, and political influence all
27 471 hindered the efficient use of available resources to manage the pandemic. From a user's
28 472 perspective, the average OOPE for acute illness was found to be BDT 350 per patient which was
29 473 higher than the average OOP for urban slum dwellers reported in a study conducted in the pre-
30 474 pandemic period (BDT 280 per patient)[20]. This higher OOP may be attributable to the
31 475 unavailability of formal healthcare providers during the COVID-19 period and increased
32 476 referrals to the higher-cost formal providers. In order to ensure the financial protection of slum
33 477 dwellers, the social safety net programs of the government should be extended to include the
34 478 urban slum population. Health protection schemes need to be developed and implemented to
35 479 ensure universal health coverage during and after the pandemic.
36
37 480 According to the technical experts interviewed, the urban health system was not adequately
38 481 equipped to deal with the pandemic. Initially, there were very few test centres for COVID-19,

1
2
3 482 although these increased over time. The public test centres were affordable and were
4
5 483 overwhelmed with patients, resulting in long waiting times. The private centres were easier to
6
7 484 access but unaffordable for the urban slum dwellers. In addition to the cost and time
8
9 485 considerations, the study identified stigma associated with COVID-19 to be a major reason for a
10
11 486 lack of interest in testing among the slum dwellers of Dhaka city. Earlier studies conducted on
12
13 487 the urban poor population of Bangladesh have reported lower test rates among lower
14
15 488 socioeconomic classes and the stigma associate with COVID-19 discouraging people from
16
17 489 getting tested [25,26].

18
19 490 Finally, the study findings highlighted some challenges and loopholes in the national planning
20
21 491 that would require interventions from the various levels of the government and civil society. The
22
23 492 study identified a lack of coordination between the stakeholders from different sectors of the
24
25 493 health system (e.g., public, private, NGOs) as a major challenge in managing the pandemic [40].
26
27 494 Although NGOs with their extensive engagement at the grassroots level took up independent
28
29 495 initiatives to support the urban slum dwellers during the pandemic [26,41], their engagement in
30
31 496 the planning and implementation of government initiatives was negligible. Furthermore, the lack
32
33 497 of coordination between the different departments of urban health has been a long-standing
34
35 498 challenge for the urban health system [42].

36 499

37 500 CONCLUSIONS

38 501 The health system of Bangladesh is overburdened. Therefore, good governance and leadership
39
40 502 are needed in managing urban health during this pandemic. The adverse effect of the pandemic
41
42 503 has been acute on the health system which warrants the need for effective planning and sustained
43
44 504 investment in building a resilient health system for the country, particularly the urban health
45
46 505 system. The government of Bangladesh and other developing countries should take initiatives to
47
48 506 document all challenges of the health system faced during the pandemic and the best practices to
49
50 507 overcome the challenges. This will eventually help develop an effective pandemic preparedness
51
52 508 plan that is contextualized for the country settings and prepares the health system to tackle future
53
54 509 health emergencies.

55 510

1
2
3 511 **Acknowledgment** icddr,b acknowledges with gratitude the commitment of Swedish
4 512 International Development Cooperation Agency (Sida) to its research efforts and funding for this
5 513 study. icddr,b is also thankful to the Government of Bangladesh, Canada, Sweden and the UK
6 514 for providing core/unrestricted support.
7
8
9

10 515
11
12 516 **Ethics approval** This study was approved by the Institutional Review Board of icddr,b (Protocol
13 517 number: PR-200143). Research Assistants recorded audio consent from all the respondents, and
14 518 confidentiality, and anonymity was ensured before enrolment in the study.
15
16
17 519

18 520 **Contributors** SSM and DDR contributed to conceptualizing the research idea and study design.
19 521 SSM, MZH, AMRH conducted data analysis, writing, revising, and finalizing the manuscript
20 522 with the support of MGR, DDR, SR, and SMAH. All authors read, revised, and approved the
21 523 final version of the manuscript.
22
23
24 524

25
26 525 **Funding** This manuscript was produced with the support of Sida (Grant Number: GR-01455).
27 526 Views expressed in this paper do not necessarily reflect the views of the Sida authority.
28
29
30 527

31 528 **Competing interests** None declared.
32
33
34 529

35
36 530 **Participant consent for publication** Not required.
37
38 531

39 532 **Data availability statement** The dataset generated and/or analyzed during the current study is
40 533 not publicly available. However, it is available from the corresponding author on reasonable
41 534 request.
42
43
44 535

1
2
3 537 **REFERENCES**
4

- 5 538 1 WHO. Coronavirus disease 2019 (COVID-19) Situation Report-51. 2020.
6
7 539 <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
8
9 540 2 Flaxman S, Mishra S, Gandy A, *et al.* Estimating the effects of non-pharmaceutical
10 541 interventions on COVID-19 in Europe. 2020;584. doi:10.1038/s41586-020-2405-7
11
12 542 3 The Government of Bangladesh. Government of Bangladesh Cabinet Fighting with
13 543 coronavirus: press briefing of Cabinet Secretary. Dhaka: 2020.
14
15 544 https://cabinet.gov.bd/sites/default/files/files/cabinet.portal.gov.bd/notices/9abbd38f_f012_401c_a172_4654fc2ffada/corona_press_briefing.pdf
16
17 545
18
19 546 4 The Daily Prothom Alo. Fear and stigma in the context of corona epidemic in Bangladesh.
20 547 2020. [https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-](https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-corona-epidemic-in-bangladesh)
21
22 548 [corona-epidemic-in-bangladesh](https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-corona-epidemic-in-bangladesh)
23
24 549 5 The daily Dhaka Tribune. Covid-19: Fear leads hospitals to reject dying asthma patients.
25 550 2020.[https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-](https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-hospitals-to-reject-dying-asthma-patients)
26
27 551 [hospitals-to-reject-dying-asthma-patients](https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-hospitals-to-reject-dying-asthma-patients)
28
29 552 6 Rahman HZ and Matin I. Rapid Response Survey: Poverty Impact of COVID-19. Dhaka:
30 553 2020. <https://www.pprc-bd.org/pprc-covid-19-response/>
31
32 554 7 Siddiquee M.S.H and Faruk A. COVID-19's Impact on Bangladesh Economy. Dhaka:
33 555 2020. [https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-](https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-Impact-on-Bangladesh-Economy.pdf)
34
35 556 [Impact-on-Bangladesh-Economy.pdf](https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-Impact-on-Bangladesh-Economy.pdf)
36
37 557 8 Rahman HZ et al. Livelihoods , Coping and Recovery During COVID-19 Crisis
38 558 Livelihoods , Coping and Recovery During COVID-19 Crisis. Dhaka: 2020.
39
40 559 9 Khan H. Economic Impact of COVID-19 On Bangladesh: Agenda for Immediate Action
41 560 and Planning for the Future. Dhaka: 2020. <https://mpr.aub.uni-muenchen.de/100380/>
42
43 561 10 MOHFW. Bangladesh National Health Accounts 1997-2015. Dhaka: 2017.
44
45 562 11 The World Bank. Out-of-pocket expenditure (% of current health expenditure) -
46 563 Bangladesh. 2021.
47
48 564 <https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=BD> (accessed 4
49 565 Jul 2021).
50
51 566 12 Billah SM, Hoque DE, Rahman M, *et al.* Feasibility of engaging 'Village Doctors' in the
52 567 Community-based Integrated Management of Childhood Illness (C-IMCI): experience

- 1
2
3 568 from rural Bangladesh. *J Glob Health* 2018;**8**:20413. doi:10.7189/jogh.08.020413
- 4
5 569 13 Mahmood SS, Iqbal M, Hanifi SMA, *et al.* Are ‘Village Doctors’ in Bangladesh a curse or
6 a blessing? *BMC Int Health Hum Rights* 2010;**10**:18. doi:10.1186/1472-698X-10-18
- 7 570
8 571 14 Bloom G, Standing H, Lucas H, *et al.* Making health markets work better for poor people:
9 the case of informal providers. *Health Policy Plan* 2011;**26** Suppl 1:i45-52.
10 572 doi:10.1093/heapol/czr025
- 11 573
12 574 15 Govindaraj R, Raju D, Secci F, *et al.* *Health and Nutrition in Urban Bangladesh: Social*
13 *determinants and health sector governance*. Washington, DC.: : The World Bank 2018.
- 14 575
15 576 16 Razzaque A, Chowdhury R, Mustafa AG. Making Slums Visible: Studying Slums and
16 their Dynamics in Urban Bangladesh. In: Hossain MM, Majumder MAH, Chin B, *et al.*,
17 577 eds. *Slum Health in Bangladesh: Insights from Health and Demographic Surveillance*.
18 578 Dhaka: : icddr,b Special Publication no.: 154 2019.
- 19 579
20 580 17 Rejve K, Iqbal MJ. COVID-19: Bangladesh Multi-Sectoral Anticipatory Impact and
21 Needs Analysis. Dhaka: 2020.
- 22 581
23 582 18 World Economic Forum. Why Bangladesh is especially vulnerable to the coronavirus.
24 583 2020.
- 25 584 19 WHO. Everybody’s business--strengthening health systems to improve health outcomes:
26 585 WHO’s framework for action. Geneva, Switzerland: 2007.
- 27 586 https://www.who.int/healthsystems/strategy/everybodys_business.pdf
- 28 587 20 Hossain *et al.* Slum Health in Bangladesh: Insights from Health and Demographic
29 588 Surveillance. Dhaka: 2019.
- 30 589 <http://dspace.icddr.org/jspui/bitstream/123456789/9298/1/icddr-SP154.pdf>
- 31 590 21 Ria AF, Raha SA, Rana S, *et al.* Exploring the impact of covid-19 on adolescents in urban
32 591 slums in Dhaka, Bangladesh. Dhaka: 2020.
- 33 592 22 WHO. COVID-19 Strategic Preparedness and Response plan operational; planning
34 593 guidelines to support country preparedness and response WHO; 2020 [updated 2020 Feb
35 594 12; cited 2020 Mar 4]. 2020.
- 36 595 23 StataCorp. Stata Statistical Software: Release 14. 2016.
- 37 596 24 USAID. Estimating the effect of COVID-19 on total utilization of health services in
38 597 Bangladesh. 2021.
- 39 598 25 CARE Bangladesh. COVID-19: Bangladesh Multi-Sectoral Anticipatory Impact and

- 1
2
3 599 Needs Analysis Needs Assessment Working Group Date : Needs Assessment Working
4 Group. Published Online First: 2020.
5 600
6 601 [https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_a](https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_and_needs_analysis.pdf)
7 [nd_needs_analysis.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_and_needs_analysis.pdf)
8 602
9
10 603 26 Barkat A, Ahamed F, Mamun M, *et al.* Socio-economic assessment of COVID-19 under
11 National Urban Poverty Reduction Program. Dhaka, Bangladesh: 2020.
12 604
13 605 [https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-](https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-EconomicAssessmentCOVID-19-2021.pdf)
14 [EconomicAssessmentCOVID-19-2021.pdf](https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-EconomicAssessmentCOVID-19-2021.pdf)
15 606
16
17 607 27 Sakamoto M, Begum S, Ahmed T. Vulnerabilities to COVID-19 in Bangladesh and a
18 Reconsideration of Sustainable Development Goals. 2020;:1–15.
19 608
20 609 28 CARE, UNOPS and Uk. COVID-19 : Bangladesh Multi-Sectoral Anticipatory Impact
21 and Needs Analysis Needs Assessment Working Group Date : Needs Assessment
22 Working Group. 2020.
23 610
24 611
25 612 29 Swazo NK, Talukder MH, Ahsan MK. A Duty to treat ? A Right to refrain ? Bangladeshi
26 physicians in moral dilemma during COVID-19. 2020;6:1–23.
27 613
28
29 614 30 Gilmore B, Ndejjo R, Tchetchia A, *et al.* Community engagement for COVID-19
30 prevention and control: A rapid evidence synthesis. *BMJ Glob Heal* 2020;5:1–11.
31 615 doi:10.1136/bmjgh-2020-003188
32 616
33
34 617 31 Marston C, Renedo A, Miles S. Community participation is crucial in a pandemic. *Lancet*
35 2020;395:1676–8. doi:10.1016/S0140-6736(20)31054-0
36 618
37
38 619 32 Questa K, Das M, King R, *et al.* Community engagement interventions for communicable
39 disease control in low- A nd lower-middle-income countries: Evidence from a review of
40 systematic reviews. *Int J Equity Health* 2020;19:1–20. doi:10.1186/s12939-020-01169-5
41 621
42
43 622 33 Kuruvilla S, Bustreo F, Kuo T, *et al.* The Global strategy for women’s, children’s and
44 adolescents’ health (2016-2030): A roadmap based on evidence and country experience.
45 623 *Bull World Health Organ* 2016;94:398–400. doi:10.2471/BLT.16.170431
46 624
47
48 625 34 Gillespie A, Obregon R, Asawi R El, *et al.* Social mobilization and community
49 engagement central to the Ebola response in West Africa: Lessons for future public health
50 626 emergencies. *Glob Heal Sci Pract* 2016;4:626–46. doi:10.9745/GHSP-D-16-00226
51 627
52
53 628 35 Carter SE, O’Reilly M, Frith-Powell J, *et al.* Treatment Seeking and Ebola Community
54 Care Centers in Sierra Leone: A Qualitative Study. *J Health Commun* 2017;22:66–71.
55 629

- 1
2
3 630 doi:10.1080/10810730.2016.1216204
4
5 631 36 Shi Y, Jiang HL, Yang MX, *et al.* The precision of epidemiological investigation of
6 632 COVID-19 transmission in Shanghai, China. *Infect Dis Poverty* 2021;**10**:1–3.
7
8 633 doi:10.1186/s40249-021-00849-w
9
10 634 37 UN High Commissioner for Refugees (UNHCR). Risk Communication and Community
11 635 Engagement (RCCE) – COVID-19. 2020;:1–9.
12
13 636 <https://www.refworld.org/docid/5e84a8874.html>
14
15 637 38 WHO. Global Health Workforce Alliance: Bangladesh. 2021;:1–6.
16 638 <https://www.who.int/workforcealliance/countries/bgd/en/> (accessed 27 Feb 2021).
17
18 639 39 WHO. Bangladesh gradually resumes essential health services delivery disrupted due to
19 640 the COVID-19 pandemic. 2021;:1–6.[https://www.who.int/bangladesh/news/detail/24-12-](https://www.who.int/bangladesh/news/detail/24-12-2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-the-covid-19-pandemic)
20
21 641 [2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-](https://www.who.int/bangladesh/news/detail/24-12-2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-the-covid-19-pandemic)
22
23 642 [the-covid-19-pandemic](https://www.who.int/bangladesh/news/detail/24-12-2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-the-covid-19-pandemic) (accessed 27 Feb 2021).
24
25 643 40 Shammi M, Bodrud-Doza M, Towfiqul Islam ARM, *et al.* COVID-19 pandemic,
26 644 socioeconomic crisis and human stress in resource-limited settings: A case from
27
28 645 Bangladesh. *Heliyon* 2020;**6**. doi:10.1016/j.heliyon.2020.e04063
29
30 646 41 The World Bank Group. Global Responses to COVID-19 in slums and cities: Practices
31 647 from around the world. 2020;:1–120.
32
33 648 [http://pubdocs.worldbank.org/en/829971589899181351/May15-Response-to-COVID-in-](http://pubdocs.worldbank.org/en/829971589899181351/May15-Response-to-COVID-in-Slums-and-Cities.pdf)
34
35 649 [Slums-and-Cities.pdf](http://pubdocs.worldbank.org/en/829971589899181351/May15-Response-to-COVID-in-Slums-and-Cities.pdf)
36
37 650 42 Asian Development Bank. Local government institutional assessment: Urban Primary
38 651 Health Care Services Delivery Project. Dhaka, Bangladesh: 2015.
39
40 652 <https://www.adb.org/sites/default/files/linked-documents/42177-013-ban-oth-03.pdf>
41
42
43 653
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

654 **List of tables**655 **Table 1** Background characteristics of household members (N=2140)

Variables	n	%
Age in years		
≤14	631	29.5
15-29	682	31.9
30-39	349	16.3
40-49	224	10.5
50-59	131	6.1
≥60	123	5.8
Sex		
Male	1,064	49.7
Female	1,076	50.3
Education Level		
No education	680	31.8
Primary	701	32.8
Secondary and above	759	35.5
Occupation		
Currently unemployed	1,442	67.38
Service holder	261	12.20
Businessman	115	5.37
Informal worker	299	13.97
Others	23	1.07
Marital Status		
Married	1,130	52.8
Unmarried	776	36.3
Others	234	10.9
Regular earning person		
Yes	499	23.3
No	1,641	76.7
Household income group in last 30 days		
No income	546	25.5
≤ 8000	352	16.5
8001-14000	557	26.0
14001-20000	362	16.9
>20000	323	15.1
Asset quintiles		
Poorest	572	26.7
2nd	279	13.0
3rd	405	18.9
4th	433	20.2
Richest	451	21.1

656

658 **Table 2** Healthcare utilization for general illness or symptoms in 14 days

Variables	n	%
Suffered from general illness or symptoms		
Yes	251	11.7
No	1,889	88.3
Has the person recovered now?		
Yes	207	82.5
No	44	17.5
Self-reported illness/symptoms		
Cough	83	33.1
Fever	81	32.3
Pain/chest pain	31	12.4
Diarrhoea	11	4.4
Skin disease	10	4.0
Weakness	6	2.4
Shortness of breath	5	2.0
Injury/fractured	5	2.0
Others (e.g., vomiting, worms)	19	7.6
Did the person receive any treatment?		
Yes	227	90.4
No	24	9.6
Reason not to receive any treatment (multiple response)		
The problem was not critical	14	51.9
Financial constraints	8	29.6
Didn't sure about receiving treatment due to COVID-19	3	11.1
Others	5	7.4
How long after the onset of illness was treatment sought?		
The day the person got sick	27	11.9
One day later	114	50.2
Two days later	52	22.9
Three or more days later	34	15.0
Source of healthcare utilization.		
Drug stores	145	63.9
Private hospitals	37	16.3
Public hospitals	31	13.7
NGO hospitals	5	2.2
Others (e.g., homeopathic)	9	4

659

660 **Table 3** Chronic illness and healthcare utilization among the households' members aged 40 and
 661 above

Variables	n	%
Suffered any chronic illness		
Yes	120	25.1
No	358	74.9
Type of chronic disease		
Diabetes	29	24.2
Arthritis	24	20.0
Asthma	19	15.8
Cardiovascular disease	16	13.3
Hypertension	11	9.2
Psychological disorder	4	3.3
Chronic Ovarian disease	3	2.5
Liver disease	3	2.5
Others (e.g., Gastric, prolonged injury)	11	9.2
Have to take regular treatment for this disease.		
Yes	96	80.0
No	24	20.0
Sought treatment for this disease in last 3 months		
Yes	67	55.8
No	53	44.2
Reasons to not take treatment (multiple response)		
The problem was not critical	28	41.8
Financial constraint	25	37.3
Due to COVID-19	12	17.9
Others (e.g., no accompanying person)	3	3.0
Source of healthcare utilization.		
Public hospital	15	22.4
Private hospital	18	26.9
drug store	31	46.3
Others (e.g., homeopathic)	3	4.5

662

663 **Table 4** Utilization of maternity care (child delivery and pregnancy-related)

Variables	n	%
Sought maternity healthcare last year (delivery and pregnancy-related)		
Yes	69	13.4
No	445	86.6
Sought maternity healthcare in last three months (delivery and pregnancy-related)		
Yes	27	39.1
No	42	60.9
Reasons to not take treatment (multiple response)		
The problem was not critical	36	73.5
Financial constraint	7	14.3
Due to COVID-19 didn't take treatment	3	6.1
Others (e.g.,)	3	6.1
Maternity care received in last 3 months (multiple services)		
ANC	16	48.5
Delivery	10	30.3
PNC	7	21.2
Number of ANC		
Less or equal to 3 times	12	75.0
4 times plus	4	25.0
Source of ANC care		
Public hospital	1	6.3
Private hospital	7	43.8
NGO hospital	7	43.8
Others (e.g., trained birth attendant)	1	6.3
Type of delivery		
Normal delivery	8	80.0
Cesarean delivery	2	20.0
Place of delivery		
Home delivery	3	30.0
Institutional delivery	7	70.0
Source of delivery care		
Public hospital	2	28.5
Private hospital	4	57.1
NGO hospital	1	14.3
Number of PNC		
1 time	4	57.1
More than 1 times	3	42.9
Source of PNC		
Public hospital	2	28.6
Private hospital	3	42.9
NGO hospital	1	14.3
Others	1	14.3

664

665 **Table 5** Knowledge about access to COVID-19 related information

Variables	Yes; n (%)	No; n (%)
Do you have access to quarantine facility nearby your house/ workplace?	94 (19.8)	382 (80.25)
Did you receive any message on COVID-19 prevention and treatment?	244 (51.26)	232 (48.74)
Do you know any hotline number to contact in case of any symptoms of you or others?	234 (49.16)	242 (50.84)

666

667

For peer review only

1
2
3 668 **List of figures**

4
5 669 **Figure 1** Health system impact of COVID-19 on urban slum dwellers

6
7 670 **Figure 2** Median out-of-pocket expenditure for healthcare

8
9 671 **Figure 3** Source of information on COVID-19
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

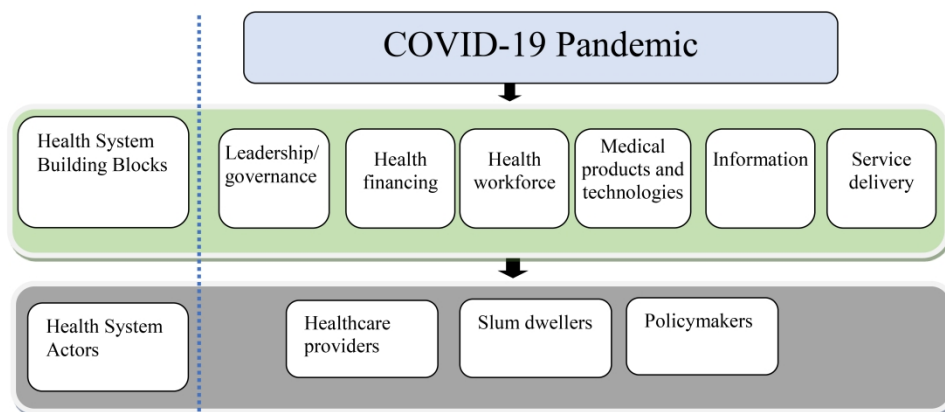


Figure 1 Health system impact of COVID-19 on urban slum dwellers

401x218mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

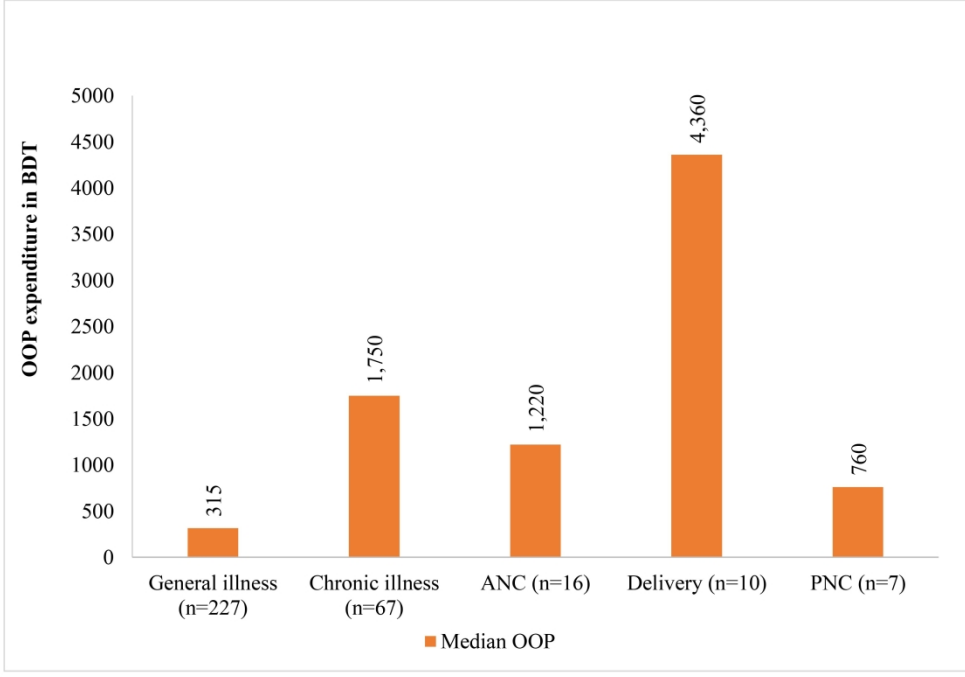


Figure 2 Median out-of-pocket expenditure for healthcare
314x217mm (300 x 300 DPI)

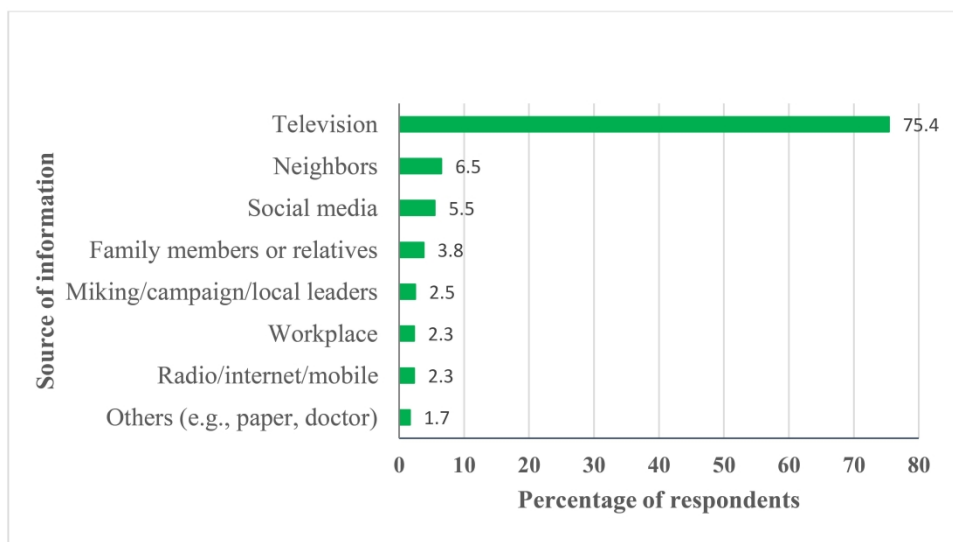


Figure 3 Source of information on COVID-19

371x217mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-11
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14 - 17
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Health system impact of COVID-19 on urban slum population of Bangladesh: a mixed-method rapid assessment study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-057402.R1
Article Type:	Original research
Date Submitted by the Author:	03-Feb-2022
Complete List of Authors:	Mahmood, Shehrin Shaila; Health Systems and Population Studies Division, icddr,b Hasan, Md. Zahid; Health Systems and Population Studies Division, icddr,b Hasan, A M Rumayan; Health Systems and Population Studies Division, icddr,b Rabbani, Md. Golam; Health Systems and Population Studies Division, icddr,b Begum, Farzana; Health Systems and Population Studies Division, icddr,b Yousuf, Tariq Bin ; Urban Resilience Project, Dhaka North City Corporation Hanifi, Syed Manzoor Ahmed; Health Systems and Population Studies Division, icddr,b, Reidpath, Daniel; Health Systems and Population Studies Division, icddr,b Rasheed, Sabrina; Health Systems and Population Studies Division, icddr,b
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Health services research, Health economics
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1 **Title.** Health system impact of COVID-19 on urban slum population of Bangladesh: a mixed-
2 method rapid assessment study

3
4 **Authors:** Shehrin Shaila Mahmood^{1*}, Md. Zahid Hasan¹, A M Rumayan Hasan¹, Md. Golam
5 Rabbani¹, Farzana Begum¹, Tariq Bin Yousuf², Syed Manzoor Ahmed Hanifi¹, Daniel D
6 Reidpath¹, Sabrina Rasheed¹

7
8 **Affiliations:**

9 ¹ Health Systems and Population Studies Division, icddr,b, Dhaka, Bangladesh

10 ² Urban Resilience Project, Dhaka North City Corporation, Dhaka, Bangladesh

11
12
13
14
15
16 ***Corresponding author**

17 Shehrin Shaila Mahmood, PhD

18 Postal address: Health Economics and Financing

19 Health Systems and Population Studies Division, icddr,b,

20 68 Shaheed Tajuddin Ahmed Sharani, Mohakhali, Dhaka-1212, Bangladesh.

21 Email: shaila@icddr.org

24 ABSTRACT

25 **Objective** We aimed to rapidly assess the health system impact of COVID-19 in the urban slums
26 of Bangladesh.

27 **Design, Setting, and Participants** A cross-sectional survey among 476 households was conducted
28 during October-December 2020 in five selected urban slums of Dhaka North, Dhaka South, and
29 Gazipur City Corporation. In-depth interviews with purposively selected 22 slum dwellers and key
30 informant interviews with 16 local healthcare providers and 4 policymakers and technical experts
31 were also conducted.

32 **Outcome measures** Percentage of people suffering from general illness, percentage of people
33 suffering from chronic illness, percentage of people seeking healthcare, percentage of people
34 seeking maternal care, health system challenges resulting from COVID-19.

35 **Results** About 12% of members suffered from general illness and 25% reported chronic illness.
36 Over 80% sought healthcare and the majority sought care from informal healthcare providers. 39%
37 of the recently delivered women sought healthcare in three months period. An overall reduction in
38 healthcare use was reported during the lockdown period compared to pre-pandemic time.
39 Mismanagement and inefficient use of resources were reported as challenges of health financing
40 during the pandemic. Health information sharing was inadequate at the urban slums resulting from
41 the lack of community and stakeholder engagement (51% received COVID-19 related information,
42 49% of respondents knew about the national hotline number for COVID-19 treatment). Shortage
43 of human resources for health was reported to be acute during the pandemic resulting from the
44 shortage of specialist doctors and uneven distribution of the health workforce. COVID-19 test was
45 inadequate due to the lack of adequate test facilities and stigma associated with COVID-19. Lack
46 of strong leadership and stakeholder engagement was seen as the barriers to effective pandemic
47 management.

48 **Conclusion** The findings of the current study are expected to support the government in tailoring
49 interventions and allocating resources more efficiently and timely during a pandemic.

50 **Strengths and limitations of this study**

- 51 • The greatest strength of the study is that it took a holistic approach in exploring the health
52 system impact of COVID-19 on urban slum dwellers taking into account data from
53 community members, healthcare providers, and policymakers.

- The study was a rapid assessment capturing insights on health system impact of COVID-19 which allowed timely evidence generation during a pandemic.
- One of the limitations of the study is it was exploratory in nature, which did not allow making any causal inference.
- The study utilized the ongoing Urban Health and Demographic Surveillance System (UHDSS) of icddr,b for its sampling frame, which may be representative of Dhaka division but it would be more difficult to generalize the results to slums in other parts of the country.
- The study was conducted over phone which could introduce response bias in terms of capturing sensitive issues like stigma.

INTRODUCTION

In March 2020, COVID-19 was declared as a pandemic by the World Health Organization (WHO) pointing to the sustained risk of further global spread [1]. To contain the spread of the virus, “stay-at-home” orders or lockdowns were deployed across the world including Bangladesh [2,3]. Being a developing country, the impact of this pandemic in Bangladesh was likely diverse and multisectoral. The impact on access to healthcare has been acute with challenges including fear of COVID-19 infection at health facilities [4,5] and economic hardship due to job loss or pay cut [6–9].

The health sector in Bangladesh is under-budgeted and the per-capita expenditure on health from the government have been low, around 27% of the total health expenses (THE), [10] where the out-of-pocket expenses (OOPE) have remained the major source of healthcare financing (constituting 74% of THE) [11]. The health service delivery in the country suffers chronically from a lack of adequate human resources, supplies, medicines, and governance. For acute illnesses, most people sought healthcare from unqualified, informal healthcare providers e.g. drug stores, chambers of village doctors [12–14]. The challenges are even greater in urban settings where access to healthcare is more complex in absence of strong public sector primary healthcare (PHC) provision. In contrast, in rural areas, there is a strong network of PHC centers run by the Ministry of Health and Family Welfare, in the urban areas PHC falls within the remit of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC). MLGRDC does not have the same kind of PHC network, and PHC in urban settings is fractured and uncoordinated, with the poor linkage between the various levels of health service delivery [15].

86 The impact of this weak urban health system mostly affects the low-income population, the
87 majority of whom live in the urban informal settlements (slums). Additionally, there are public
88 health concerns specific to the urban slums owing to overcrowding, unhygienic waste
89 management, and pollution [16]. With the outbreak of COVID-19, an air-borne disease, the health
90 systems impact was expected to be the greatest amongst the population of the urban slums [17]. In
91 addition, the ongoing economic shutdown caused by COVID-19 threatened millions of livelihoods
92 engaged in the informal sector with little or no financial protection for healthcare [18].
93 Unfortunately, almost 18 months into the pandemic, there remains a paucity of information about
94 the nature and the extent of the impact, of the pandemic on health services in the urban slums.
95 Given the nature of the spread of the disease, it is essential to understand whether and how
96 COVID-19 affects the utilization of health services and OOPE during the pandemic.
97 Understanding this is particularly important if the Universal Health Coverage lead, to leave no one
98 behind, is to be taken seriously. Timely rapid assessments of the impact on the vulnerable groups
99 can support the government and policymakers to design and implement efficient response plans.
100 The current paper thus aims to assess the health systems impact of COVID-19 urban slums
101 dwellers in Dhaka city.

103 **METHODOLOGY**

104 **Conceptual framework**

105 We explored the impact of COVID-19 and the resulting country-wide lockdown on the urban
106 health system of Bangladesh through the lens of WHO's six health systems' building blocks
107 (i.e. service delivery, health workforce, health information system, essential medicine, health
108 financing, leadership/governance)[19]. We explored how far health services were accessible
109 and available to the urban slum population; challenges faced by the urban healthcare providers
110 and the viewpoint of health policymakers towards healthcare provision in urban slums of Dhaka
111 city during the pandemic. Figure 1 illustrates the impact pathway guiding the study.

112
113 **(Figure 1 to be inserted here)**

115 **Study design and setting**

116 An exploratory study design applying both quantitative and qualitative approaches was used. The
117 quantitative approach included a cross-sectional household survey. We used the sampling frame

1
2
3 118 of an existing Urban Health and Demographic Surveillance System (UHDSS) of icddr,b. The
4
5 119 UHDSS covers about 31,577 households in five slums of Dhaka North, South, and Gazipur City-
6
7 120 Corporations [20]. We conducted interviews with adult male and female members (aged between
8
9 121 18 and 80 years) of the randomly selected household of the UHDSS. The inclusion criteria were
10
11 122 “households that are covered under the UHDSS in the selected slums”, “households that have an
12
13 123 active mobile phone number”, and “households that were residing at the study slum during
14
15 124 COVID1-19 pandemic and were interested to participate to our study”. Whereas, the exclusion
16
17 125 criteria included “households that are not included in UHDSS”, “households that don’t have an
18
19 126 active mobile phone number”, “households that left the slums before or at the beginning of
20
21 127 pandemic and was not interested to participated in our study”.
22
23 128 The qualitative approach included In-depth Interviews (IDI) with adult male and female slum
24
25 129 dwellers, Key Informant Interviews (KII) with healthcare providers providing healthcare to slum
26
27 130 dwellers, and with national-level health policymakers.
28
29 131

132 **Sample size**

30
31 133 A recent study conducted in the urban slums of Dhaka, Bangladesh found that 41% of the
32
33 134 respondents had an unwillingness to attend regular health services fearing COVID-19 infection
34
35 135 and unavailability of doctors [21]. We assumed that 50% of the slum population will, for similar
36
37 136 reasons, not utilize formal healthcare during the COVID-19 pandemic for general illnesses. Using
38
39 137 this proportion ($p=0.5$), with 95% confidence level and 5% precision level, an estimated 384
40
41 138 households were required for interview. Assuming a 10% non-response rate and 1.2 design effect
42
43 139 for five slums, 512 households matching the inclusion criteria were selected from the database of
44
45 140 UHDSS. However, 476 households were finally interviewed (response rate 93%). For qualitative
46
47 141 data, a total of 22 IDIs with purposively selected male ($n=10$) and female ($n=12$) slum dwellers
48
49 142 and 20 KIIs with purposively selected healthcare providers ($n=16$) from local drug stores and
50
51 143 public healthcare facilities, and national level policymakers ($n=4$) were conducted.
52
53 144

50 **Data collection**

51
52 146 The household survey was conducted in five slums of UHDSS namely, Korail, Mirpur, Shyampur,
53
54 147 Dholpur and Ershadnagar from 31st October till 1st December 2020. We interviewed the
55
56 148 respondents over the phone since the face-to-face interview was not feasible during the pandemic.
57
58
59
60

1
2
3 149 During their routine data collection, the UHDSS surveillance workers took verbal consent over the
4
5 150 phone from the households and health care providers regarding their participation in the current
6
7 151 study. Only households agreeing to share their mobile numbers were included in the sampling
8
9 152 frame for the survey. Household survey data was collected using an Android-based electronic
10
11 153 questionnaire. Qualitative interviews with community members, health care providers, and
12
13 154 national level policy planners were conducted by phone till 15th January 2021.
14
15 155

156 **Study instrument**

157 Trained data collectors administered a pre-tested household survey in Bangla. Respondents were
158 provided BDT 200 [USD 2.37] using a mobile financial service compensating for their time spent
159 participating in the study. The survey collected information on household members' latest episode
160 of general illness, healthcare-seeking behaviour, and expenditure during the 14 days preceding the
161 survey and respondents' access to COVID-19 related information, 90 days preceding the survey
162 for Maternal, Newborn and Child Health (MNCH) services, and 12 months preceding the survey
163 for one major chronic illness e.g., Diabetes, Arthritis, Asthma, Cardiovascular disease, and
164 Hypertension. The IDIs with the slum dwellers explored their access to healthcare during
165 pandemic, information related to COVID-19, and challenges they faced in accessing healthcare.
166 The KIIs with the healthcare providers and the policymakers sought their opinion and suggestions
167 about the seven out of eight pillars of health system preparedness to respond to the COVID-19
168 pandemic including (1) coordination, planning, and monitoring; (2) risk communication and
169 community engagement (3) surveillance, rapid response, and case investigation; (4) Laboratories;
170 (5) infection prevention and control; (6) case management; (7) operational support and logistics
171 [22]. During the data collection phase of the study the national COVID-19 vaccination programme
172 was yet to initiate in the country which limited the scope of the current study to comment on all
173 but one pillar (i.e. vaccination) of health system preparedness.

175 **Statistical analysis**

176 The characteristics of households and respondents are presented as categorical variables with
177 frequency (n) and percentage (%). The median OOPE is presented in BDT [USD 1=BDT 83].
178 Health service utilization, source of care, and OOPE have been compared with the findings from

179 previous urban health surveys and health surveillance data. Quantitative analyses were performed
180 using Stata, version 14 [23].

181 A systematic framework approach was used for analyzing the qualitative data. On completion of
182 an IDI or KII, verbatim transcriptions were made. The transcripts were then read carefully and
183 matched with the records to determine missing information and divided under different themes
184 and codes. We generated a matrix using the categories derived from different themes and
185 subthemes. The findings under each main theme, subthemes, or category were presented for the
186 identification of key areas of interest. Triangulation of information was done for validating the
187 findings obtained from different sources.

188

189 **Patient and public involvement**

190 Patients or the public were not involved in the design, or conduct, or reporting, or dissemination
191 plans of our research.

192

193 **RESULTS**

194 **Socio-demographic and economic information of study households and their members**

195 We surveyed 476 households with a total of 2,140 members. The proportion of male and female
196 members was almost equal. About 32% of household members had no education. More than half
197 of the members were married (53%). About 67% of members were currently unemployed. The
198 highest proportion of the members belonged to the poorest-quintile (27%) and about 21% belonged
199 to the richest asset quintile (Table 1).

200

201 **(Table 1 to be inserted here)**

202

203 **Impact of COVID-19 on Urban Health Systems**

204 **Health service delivery**

205 *Healthcare utilization*

206 About 12% of the members suffered from general illness in the last 14-days preceding the survey
207 and 83% of them recovered from their illness by the day of the interview (Table 2). The majority
208 suffered from cough (33%), followed by fever (32%), pain/chest pain (12%), and diarrhoea (4%).

209 About 90% of those reporting illnesses, sought healthcare mostly from the local drug stores (64%)
210 followed by private hospitals (16%), and public hospitals (14%).

211

212 **(Table 2 to be inserted here)**

213

214 About 25% of individuals aged 40 years and above reported suffering from a chronic illness (Table
215 3). Most of them suffered from Diabetes (24%) followed by Arthritis (20%), Asthma (16%),
216 Cardiovascular (13%), and Hypertension (9%). About 80% regularly sought treatment for chronic
217 illness. More than half of the members with chronic illness (56%) had received treatment in the 3
218 months preceding the interview. Local drug stores were again the major source of treatment (46%).
219 About 37% of the members suffering from chronic illness did not seek care due to financial
220 constraints and around 18% refrained from seeking care due to fear of COVID-19 infection.

221

222 **(Table 3 to be inserted here)**

223

224 During the qualitative interviews, the respondents also spoke about more services utilization
225 during the pandemic compared to other times. Patients with COVID-19 like symptoms feared
226 being identified and stigmatized as COVID patients and referral to high-cost health facilities for
227 treatment if they were seeking treatment at a formal health facility. The cost of formal healthcare
228 was also an important deciding factor for using informal providers.

229

230 *During the first two months, I received many patients with different health problems along with*
231 *breathing difficulties. We usually suggest general drugs for breathing difficulty. (drug vendor, KII-*
232 *2)*

233

234 Among the mothers who utilized healthcare in the year preceding the survey, 39% of them sought
235 healthcare in three months period (Table 4). Of the 27 mothers reporting MNCH care utilization
236 about half reported using antenatal care (ANC), 30% used delivery care, and 21% reported utilizing
237 postnatal care (PNC) services. The majority of the ANC services were sought from private
238 facilities and NGO clinics. Eight out of total 10 deliveries reported were normal deliveries of which
239 about 38% (n=3) took place at home. Whereas seven out of ten (70%) deliveries were institutional

240 of which about 29% (n=2) were Caesarean section and the majority of them took place at private
241 facilities (n=4). PNC services were availed only by those who had institutional deliveries.

242

243 **(Table 4 to be inserted here)**

244

245 *Healthcare provision*

246 An overall reduction in healthcare utilization was reported by urban healthcare providers during
247 the pandemic compared to pre-pandemic period. From the healthcare providers, we found that the
248 number of home deliveries in urban slums of Dhaka city increased and the number of normal
249 deliveries also increased at the facilities. Many mothers tried to deliver their babies at home with
250 assistance from traditional birth attendants but came to the facilities when TBAs could not help.

251

252 *Normal delivery at our hospital decreased during lockdown. We learned that they (pregnant*
253 *women) tried to have normal delivery at home. They fell at risk. Traditional birth attendants are*
254 *not trained to manage complications. We dealt with mothers who experienced complications after*
255 *home delivery during lockdown. (Physician, KII-7)*

256

257 *Challenges in health service delivery during pandemic*

258 In the context of COVID-19, both service recipients and service providers faced challenges in
259 accessing and providing services. Respondents from the community spoke about reduced hours of
260 the formal health facilities, shortage of doctors as they were deployed to manage the pandemic,
261 unavailability of specialists as they stopped attending, lack of physical examination and
262 requirement of COVID tests were some of the major barriers to access healthcare during pandemic.
263 The health care providers talked about the lack of a triage system at the health facilities to identify
264 patients with COVID-19 symptoms, an (initial) shortage of Personal Protective Equipment (PPE),
265 challenges in maintaining proper safety measures, an increased workload, and stress among the
266 major challenges they faced in providing healthcare during the pandemic.

267

268 *Healthcare financing*

269 In terms of budget allocated to manage the pandemic, the policymaker and the technical expert
270 group members mentioned that the government with support from development partners were able

271 to mobilize resources to manage the pandemic. However, there were challenges in ensuring
272 efficient use of the resources. The inefficiency was more visible in Dhaka city where the pandemic
273 response strategy was rather rapid but unplanned. As mentioned by one respondent:

274
275 *In Dhaka city, there was urgency and thus there was mismanagement. As we heard, people*
276 *involved in the ministry of health and family welfare tried to release the fund which was in each*
277 *of the operation plans of different departments, and they could do it. Later the government received*
278 *funds from the donor agency. This was enough resource for the health sector..... It will not be*
279 *correct to say resource shortage hindered the implementation of activities to manage the*
280 *pandemic. (technical expert, KII-19)*

281
282 During discussions about the reasons for inefficiency related to spending existing resources,
283 respondents talked about existing government financial rules as an important barrier for rapid
284 spending of money during the pandemic. As one respondent said:

285
286 *A lot of money was misused ...you must have read in newspapers during pandemic.... I am not*
287 *sure whether it was adequate or not but there was not any lack of funds. To some extent, they could*
288 *not spend money due to the financial rules... There is tremendous political pressure.... The*
289 *physicians do not understand finance. The administrative officers/clerks of DGHS prepare and*
290 *manage those..... (technical expert, KII-17)*

291
292 *Out of pocket expense for healthcare during pandemic*

293 The median total OOPE per patient for treating general illness was BDT 315 in the 14-day
294 preceding the survey. About 96% of the care seekers required medicine for which the median
295 expenditure on medicine was BDT 300. In the three months preceding of survey, the median OOPE
296 for chronic illness was BDT 1,750. For MNCH care-related expenditure in the 3 months preceding
297 the survey, we found that 16 eligible mothers who took ANC incurred a median OOPE of BDT
298 1,220. Most of the expenditure was related to medical components e.g., medicine, diagnostic, etc.
299 The median OOPE for delivery (n=10) was BDT 4,360. Total seven mothers who took PNC
300 services had a median OOPE of BDT 760 (Figure 2).

301

1
2
3 302 (Figure 2 to be inserted here)
4

5 303
6 304 Health information on COVID-19 prevention, management and treatment
7
8 305 Around 51% of the respondents mentioned receiving COVID-19 related messages in the 30 days
9
10 306 preceding the survey. The rest reported not receiving any message. 51% of the respondents were
11
12 307 not aware of the national hotline number that provides COVID-19 related treatment through
13
14 308 telemedicine (Table 5).

15 309
16
17 310 (Table 5 to be inserted here)
18

19 311
20 312
21
22 313 Television was the major source of COVID-19 related information for respondents (75%) followed
23
24 314 by neighbors (6.5%) and social media (5.5%). (Figure 3).

25 315
26
27 316 (Figure 3 to be inserted here)
28

29 317
30
31 318 The lack of access to COVID-19 related information in the general population was also reported
32
33 319 by the members of national technical committee for COVID-19 (KII respondents). The
34
35 320 respondents mentioned that, although the government took several prevention initiatives, many of
36
37 321 them were not effectively implemented. The experts from the technical committee concluded that
38
39 322 engaging community in prevention, health education and awareness-raising, to contain the
40
41 323 spreading of the virus, was important; however, the government initiative to engage the community
42
43 324 was inadequate. This was in contrast to the government officials we interviewed. One respondent
44
45 325 said:

46 326
47 327 “DG [Directorate General] health is not so active in engaging community in preventive
48
49 328 intervention but they are working. Bureau of health communication is also working with NGOs in
50
51 329 this regard. However, this is not enough for effective engagement of community in pandemic
52
53 330 management.” (technical expert, KII-19)
54

55 331
56
57
58
59
60

1
2
3 332 Health workforce

4
5 333 Our findings indicate that the existing shortage of human resources in health in Bangladesh became
6
7 334 more acute in both public and private health facilities during the pandemic. This was due to the
8
9 335 unavailability of senior physicians to attend general patients during the lockdown period and the
10
11 336 re-assignment of physicians to attend COVID-19 patients. One respondent said:

12 337
13
14 338 “[The] Majority of the senior, experienced and specialized physicians did not attend patients.
15
16 339 Frontline health workers had to face the battle.” (technical expert, KII-18)

17 340
18
19 341 Deployment of human resources to tackle COVID-19 patients also resulted in a shortage of HR in
20
21 342 service delivery areas for general patients. The respondents also expressed their concern about the
22
23 343 concentration of doctors and nurses in Dhaka city to deal with the burden of the pandemic. One
24
25 344 respondent said:

26 345
27
28 346 Government has taken some good initiatives in response to Covid-19. You know the government
29
30 347 has recruited and deployed more than 2000 physicians and many other health staff on an urgent
31
32 348 basis. But there has been a problem in posting those physicians. The physicians have not been
33
34 349 posted at places where they are originally planned for. Due to political pressure or the influence
35
36 350 of Civil surgeons, many of them have been placed in urban areas or district level. (technical expert,
37
38 351 KII-17)

39
40 352
41 353 Safety of both patients and healthcare providers was another source of concern expressed. They
42
43 354 highlighted the absence of a triage system at the entry point of health facilities to be a major
44
45 355 obstacle in ensuring patient and provider safety from COVID-19 infection. One respondent said:

46
47 356
48 357 “In our facility, two staff members had been infected and we all had to go for isolation for 14 days.
49
50 358 Therefore, there was no one to operate our facility. People have not received any treatment from
51
52 359 our facility at that time.” (Physicians, KII-1)

53
54
55
56
57
58
59
60 360

1
2
3 361 Moreover, the respondents stated that there was a lack of a standard incentive package from the
4 362 government to cover the health risks faced by frontline health workers, which led to discontent
5 363 among the health workers.
6
7
8 364

10 365 Medical products and technologies

11 366 The respondents from the slums stated that access to existing COVID-19 test facilities was
12 367 challenging for the urban slum dwellers due to the long waiting hours to get tested at public
13 368 facilities which were affordable for them and the high cost of the testing at the private facilities.
14
15
16
17 369

18
19 370 *Many of our patients do not want to do the Corona test. The private diagnostic facilities have high*
20 371 *charges for the test which the poor patients cannot afford. It is true that testing at public facilities*
21 372 *is a hassle. Many of our patients shared their experience that they have to stand in a long queue*
22 373 *and wait for a long time to get tested and then the reports take a long time. One patient told me*
23 374 *that he received his report after 15 days of giving sample. (healthcare provider, KII-1)*
24
25
26
27 375

28
29 376 There was, moreover, a general lack of interest among slum dwellers to get tested because of the
30 377 stigma associated with testing positive for COVID-19 and the accompanying fear of losing one's
31 378 job.
32
33
34 379

35
36 380 *They do not want to go for doing Covid-19 test. If we refer them, they do not want to go because*
37 381 *they fear that the hospital will admit him and will not allow him to meet with his family members.*
38 382 *Community people would avoid him after knowing that he got infected. Thus, they do not want to*
39 383 *do the test. (healthcare provider, KII-04)*
40
41
42
43 384

44
45 385 Moreover, according to the technical experts who were interviewed, the limited number of testing
46 386 facilities resulted in limited availability of tests in the early stages of the pandemic. Not only there
47 387 were fewer testing centers, but also the slum dwellers were not aware of the testing centers. One
48 388 of the technical experts held the view that:
49
50
51 389

52
53 390 *“The lower-class people always experience discrimination. They are always deprived and in terms*
54 391 *of getting Covid-19 related health services, they have been deprived.” (technical expert, KII-17)*
55
56
57
58
59
60

392

393 Leadership/ governance

394 A lack of strong leadership and strategic planning at the central level of the government was
395 identified as one of the major health system challenges during the pandemic by the technical
396 experts. Centralization of decision-making was seen as a barrier to the timely allocation and use
397 of resources in managing local challenges posed by the pandemic. One respondent said:

398

399 *“All decisions are made by one or two people. The WHO suggested involving all people in relevant*
400 *sectors in order to fight with the pandemic. This is not possible for the ministry of health*
401 *independently. Not all divisions of the government were involved. Things could have been different*
402 *if all sectors worked together.” (technical expert, KII-19)*

403 Supplementary table 1 presents an overview of the opinions of all the technical experts and the
404 healthcare providers in relation to the health system impact of COVID-19 pandemic
405 **(Supplementary table 1)**.

406

407 DISCUSSION

408 The study findings highlight the effect of the COVID-19 pandemic and the resulting country-wide
409 lockdown on the health systems of Bangladesh from the perspective of health service users and
410 providers in urban slums, as well as policymakers and members of the national technical
411 committee on COVID-19. The impact on the six different building blocks of health systems is
412 presented in the study [19] **(Supplementary table 1)**.

413 Before pandemic, a study conducted in urban slums of Dhaka city in 2017 reported that 93% of
414 patients suffering from chronic illness [20]. Findings from our study showed that healthcare
415 seeking was adversely affected in the urban slums during the pandemic, particularly for patients
416 suffering from chronic illness (37% lower). The lower use of ANC, PNC, general outpatient
417 services, and immunization services was also reported in a study conducted by USAID [24].

418 One important finding is the rise in the demand for informal healthcare providers during the
419 pandemic period by slum dwellers; consistent with the finding of other studies conducted in similar
420 settings[25,26]. The utilization of health services provided by formal health facilities was limited
421 during this time due to such issues as shortened service hours, lack of physicians, COVID-19 test
422 requirements at the hospitals, and financial constraints. Two other studies also reported that

1
2
3 423 financial constraints and fear of COVID-19 infection acting as barriers to accessing healthcare
4 [27,28]. Unfortunately, the increased use of informal healthcare providers including the traditional
5 424 birth attendants puts patients at higher risk of malpractice. Healthcare providers from the NGO-
6 425 run clinics reported dealing with complicated maternity cases that had been unsuccessfully
7 426 managed by unskilled providers.
8 427

9
10
11 428 The health system also faced challenges from the limited supplies including PPE, shortage of
12 429 human resources, lack of screening mechanism to isolate COVID-19 patients from general
13 430 patients, and the workload and stress of healthcare providers. Due to the lack of a triage system at
14 431 the entry point of health facilities in urban areas, the healthcare providers and general patients were
15 432 always at risk of getting infected. The vulnerability of frontline healthcare providers during the
16 433 pandemic has also been reported elsewhere [25,29]. In an effort to protect both patients and
17 434 healthcare providers the system could benefit from establishing an easier triage system at the entry
18 435 point of all health facilities to separate patients presenting with COVID-19 like symptoms from
19 436 the rest. In addition, for certain health conditions, the use of remote healthcare through telehealth
20 437 services could prove to be crucial in ensuring that patients get healthcare without compromising
21 438 their own safety or that of the healthcare providers'. The national telehealth service, Shastho
22 439 Batayon (16263), was in operation during the pandemic; however, its reach was found to be limited
23 440 in the urban slums with only 49% of slum dwellers knowing about the service.

24 441 Earlier studies have shown community engagement to be a crucial part of many health initiatives
25 442 [30,31] including initiatives for the management of communicable diseases [32] and maternal and
26 443 child health conditions [33]. More recently community engagement has been considered as a
27 444 fundamental component during outbreaks, such as the Ebola epidemic in 2014-2015 in West
28 445 Africa [34,35]. There was an overall lack of penetration of government initiatives for raising
29 446 awareness within the urban slum areas and 49% of the respondents mentioned not receiving any
30 447 COVID-19 related information in the three months preceding the survey. This could be explained
31 448 by the low level of community engagement activities of the government in managing the
32 449 pandemic. In managing the COVID-19 pandemic, the urban health system needed to have
33 450 expanded programs to engage community members effectively. In its absence, it is difficult to
34 451 ensure universal coverage of services. Studies published on COVID-19 have also highlighted the
35 452 importance of community engagement for COVID-19 prevention and control [30,36,37].
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 453 The health system of Bangladesh suffers chronically from a shortage of human resources for health
4 454 [38]. This shortage became more acute during the pandemic when a higher number of doctors had
5 455 to be placed at COVID-19 specialized hospitals to manage the sudden surge in cases. As a
6 456 consequence, there was a lack of adequate healthcare providers to treat general patients at other
7
8 457 health facilities. Furthermore, for their personal safety, and being among the high-risk group for
9 458 COVID-19, senior and specialized doctors stopped providing services or switched to
10 459 teleconsultation during the pandemic. In some places, service hours were shortened. In
11 460 combination, these changes to the health system hindered access to routine care and in many cases
12 461 delayed healthcare seeking for patients in urban Dhaka. The lack of physicians or general patients
13 462 during pandemic has also been reported elsewhere [24,25].

14
15 463 Delayed healthcare-seeking has far-reaching health implications which can lead to increased
16 464 complications and required longer and more intensive treatment. This is expected to have both
17 465 health and financial consequence on the population. The government of Bangladesh deployed an
18 466 additional 2,500 doctors and 5,000 nurses on as an ad hoc, rapid response to the pandemic [39]. It
19 467 started in June 2020, which assisted the health system to gradually resume the other essential health
20 468 services in the country.

21 469 According to the findings, healthcare financing for pandemic management in Bangladesh suffered
22 470 more from inefficient planning and implementation rather than the lack of available funds. The
23 471 urgent requirement for fund disbursement, the centralized financial management, the lack of
24 472 efficient fund allocation mechanism during an emergency, and political influence all hindered the
25 473 efficient use of available resources to manage the pandemic. From a user's perspective, the average
26 474 OOP for acute illness was found to be BDT 350 per patient which was higher than the average
27 475 OOP for urban slum dwellers reported in a study conducted in the pre-pandemic period (BDT 280
28 476 per patient)[20]. This higher OOP may be attributable to the unavailability of formal healthcare
29 477 providers during the COVID-19 period and increased referrals to the higher-cost formal providers.
30 478 In order to ensure the financial protection of slum dwellers, the social safety net programs of the
31 479 government should be extended to include the urban slum population. Health protection schemes
32 480 need to be developed and implemented to ensure universal health coverage during and after the
33 481 pandemic.

34 482 According to the technical experts interviewed, the urban health system was not adequately
35 483 equipped to deal with the pandemic. Initially, there were very few test centres for COVID-19,

1
2
3 484 although the number increased over time. The public test centres were affordable and were
4
5 485 overwhelmed with patients, resulting in long waiting times. The private centres were easier to
6
7 486 access but unaffordable for the urban slum dwellers. In addition to the cost and time considerations,
8
9 487 the study identified stigma associated with COVID-19 to be a major reason for a lack of interest
10
11 488 in testing among the slum dwellers of Dhaka city. Earlier studies conducted on the urban poor
12
13 489 population of Bangladesh have reported lower test rates among lower socioeconomic classes and
14
15 490 the stigma associate with COVID-19 discouraging people from getting tested [25,26].

16 491 Finally, the study findings highlighted some challenges and loopholes in the national planning that
17
18 492 would require interventions from the various levels of the government and civil society. The study
19
20 493 identified a lack of coordination between the stakeholders from different sectors of the health
21
22 494 system (e.g., public, private, NGOs) as a major challenge in managing the pandemic [40].
23
24 495 Although NGOs with their extensive engagement at the grassroots level took up independent
25
26 496 initiatives to support the urban slum dwellers during the pandemic [26,41], their engagement in
27
28 497 the planning and implementation of government initiatives was negligible. Furthermore, the lack
29
30 498 of coordination between the different departments of urban health has been a long-standing
31
32 499 challenge for the urban health system [42].

31 500

32 501 **CONCLUSIONS**

33
34 502 The health system of Bangladesh is overburdened. Therefore, good governance and leadership are
35
36 503 needed in managing urban health during this pandemic. The adverse effect of the pandemic has
37
38 504 been acute on the health system which warrants the need for effective planning and sustained
39
40 505 investment in building a resilient health system for the country, particularly the urban health
41
42 506 system. The government of Bangladesh and other developing countries should take initiatives to
43
44 507 document all challenges of the health system faced during the pandemic and the best practices to
45
46 508 overcome the challenges. This will eventually help develop an effective pandemic preparedness
47
48 509 plan that is contextualized for the country settings and prepares the health system to tackle future
49
50 510 health emergencies.

50 511

1
2
3 512 **Acknowledgment** icddr,b acknowledges with gratitude the commitment of Swedish International
4 513 Development Cooperation Agency (Sida) to its research efforts and funding for this study. icddr,b
5 514 is also thankful to the Government of Bangladesh, Canada, Sweden and the UK for providing
6 515 core/unrestricted support.
7
8
9

10 516
11
12 517 **Ethics approval** This study was approved by the Institutional Review Board of icddr,b (Protocol
13 518 number: PR-200143). Research Assistants recorded audio consent from all the respondents, and
14 519 confidentiality, and anonymity was ensured before enrolment in the study.
15
16

17 520
18
19 521 **Contributors** SSM and DDR contributed to conceptualizing the research idea and study design.
20 522 SSM, MZH, AMRH conducted data analysis, writing, revising, and finalizing the manuscript with
21 523 the support of MGR, FB, TBY, SMAH, DDR, and SR. All authors read, revised, and approved the
22 524 final version of the manuscript.
23
24
25

26 525
27 526 **Funding** This manuscript was produced with the support of Sida (Grant Number: GR-01455).
28 527 Views expressed in this paper do not necessarily reflect the views of the Sida authority.
29
30

31 528
32 529 **Competing interests** None declared.
33
34

35 530
36 531 **Participant consent for publication** Not required.
37
38

39 532
40 533 **Data availability statement** The dataset generated and/or analyzed during the current study is not
41 534 publicly available. However, it is available from the corresponding author on reasonable request.
42
43

44 535
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

537 **REFERENCES**

- 538 1 WHO. Coronavirus disease 2019 (COVID-19) Situation Report-51. 2020.
539 <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- 540 2 Flaxman S, Mishra S, Gandy A, *et al.* Estimating the effects of non-pharmaceutical
541 interventions on COVID-19 in Europe. 2020;584. doi:10.1038/s41586-020-2405-7
- 542 3 The Government of Bangladesh. Government of Bangladesh Cabinet Fighting with
543 coronavirus: press briefing of Cabinet Secretary. Dhaka: 2020.
544 https://cabinet.gov.bd/sites/default/files/files/cabinet.portal.gov.bd/notices/9abbd38f_f012_401c_a172_4654fc2ffada/corona_press_briefing.pdf
- 546 4 The Daily Prothom Alo. Fear and stigma in the context of corona epidemic in Bangladesh.
547 2020. [https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-](https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-corona-epidemic-in-bangladesh)
548 [corona-epidemic-in-bangladesh](https://en.prothomalo.com/opinion/analysis/fear-and-stigma-in-the-context-of-corona-epidemic-in-bangladesh)
- 549 5 The daily Dhaka Tribune. Covid-19: Fear leads hospitals to reject dying asthma patients.
550 2020.[https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-](https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-hospitals-to-reject-dying-asthma-patients)
551 [hospitals-to-reject-dying-asthma-patients](https://www.dhakatribune.com/health/coronavirus/2020/06/09/covid-19-fear-leads-hospitals-to-reject-dying-asthma-patients)
- 552 6 Rahman HZ and Matin I. Rapid Response Survey: Poverty Impact of COVID-19. Dhaka:
553 2020. <https://www.pprc-bd.org/pprc-covid-19-response/>
- 554 7 Siddiquee M.S.H and Faruk A. COVID-19's Impact on Bangladesh Economy. Dhaka:
555 2020. [https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-](https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-Impact-on-Bangladesh-Economy.pdf)
556 [Impact-on-Bangladesh-Economy.pdf](https://bigd.bracu.ac.bd/wp-content/uploads/2021/01/Working-Paper_COVID-19s-Impact-on-Bangladesh-Economy.pdf)
- 557 8 Rahman HZ et al. Livelihoods , Coping and Recovery During COVID-19 Crisis Livelihoods
558 , Coping and Recovery During COVID-19 Crisis. Dhaka: 2020.
- 559 9 Khan H. Economic Impact of COVID-19 On Bangladesh: Agenda for Immediate Action
560 and Planning for the Future. Dhaka: 2020. <https://mpr.aub.uni-muenchen.de/100380/>
- 561 10 MOHFW. Bangladesh National Health Accounts 1997-2015. Dhaka: 2017.
- 562 11 The World Bank. Out-of-pocket expenditure (% of current health expenditure) -
563 Bangladesh. 2021.
564 <https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=BD> (accessed 4 Jul
565 2021).
- 566 12 Billah SM, Hoque DE, Rahman M, *et al.* Feasibility of engaging ‘Village Doctors’ in the
567 Community-based Integrated Management of Childhood Illness (C-IMCI): experience from

- 1
2
3 568 rural Bangladesh. *J Glob Health* 2018;**8**:20413. doi:10.7189/jogh.08.020413
- 4
5 569 13 Mahmood SS, Iqbal M, Hanifi SMA, *et al.* Are ‘Village Doctors’ in Bangladesh a curse or
6 a blessing? *BMC Int Health Hum Rights* 2010;**10**:18. doi:10.1186/1472-698X-10-18
- 7 570
8 571 14 Bloom G, Standing H, Lucas H, *et al.* Making health markets work better for poor people:
9 the case of informal providers. *Health Policy Plan* 2011;**26** Suppl 1:i45-52.
10 572 doi:10.1093/heapol/czr025
- 11 573
12 574 15 Govindaraj R, Raju D, Secci F, *et al.* *Health and Nutrition in Urban Bangladesh: Social*
13 *determinants and health sector governance*. Washington, DC.: : The World Bank 2018.
- 14 575
15 576 16 Razzaque A, Chowdhury R, Mustafa AG. Making Slums Visible: Studying Slums and their
16 Dynamics in Urban Bangladesh. In: Hossain MM, Majumder MAH, Chin B, *et al.*, eds.
17 *Slum Health in Bangladesh: Insights from Health and Demographic Surveillance*. Dhaka: :
18 icddr,b Special Publication no.: 154 2019.
- 19 577
20 578 17 Rejve K, Iqbal MJ. COVID-19: Bangladesh Multi-Sectoral Anticipatory Impact and Needs
21 Analysis. Dhaka: 2020.
- 22 579
23 580 18 World Economic Forum. Why Bangladesh is especially vulnerable to the coronavirus. 2020.
- 24 581
25 582 19 WHO. Everybody’s business--strengthening health systems to improve health outcomes:
26 WHO’s framework for action. Geneva, Switzerland: 2007.
- 27 583
28 584 https://www.who.int/healthsystems/strategy/everybodys_business.pdf
- 29 585
30 586 20 Hossain *et al.* Slum Health in Bangladesh: Insights from Health and Demographic
31 Surveillance. Dhaka: 2019.
- 32 587
33 588 <http://dspace.icddr.org/jspui/bitstream/123456789/9298/1/icddr-SP154.pdf>
- 34 589 21 Ria AF, Raha SA, Rana S, *et al.* Exploring the impact of covid-19 on adolescents in urban
35 slums in Dhaka, Bangladesh. Dhaka: 2020.
- 36 590
37 591 22 WHO. COVID-19 Strategic Preparedness and Response plan operational; planning
38 guidelines to support country preparedness and response WHO; 2020 [updated 2020 Feb
39 12; cited 2020 Mar 4]. 2020.
- 40 592
41 593 23 StataCorp. Stata Statistical Software: Release 14. 2016.
- 42 594
43 595 24 USAID. Estimating the effect of COVID-19 on total utilization of health services in
44 Bangladesh. 2021.
- 45 596
46 597 25 CARE Bangladesh. COVID-19 : Bangladesh Multi-Sectoral Anticipatory Impact and Needs
47 Analysis Needs Assessment Working Group Date : Needs Assessment Working Group.
- 48 598
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 599 Published Online First: 2020.
4
5 600 [https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_a](https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_and_needs_analysis.pdf)
6
7 601 [nd_needs_analysis.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/covid_nawg_anticipatory_impacts_and_needs_analysis.pdf)
8
9 602 26 Barkat A, Ahamed F, Mamun M, *et al.* Socio-economic assessment of COVID-19 under
10
11 603 National Urban Poverty Reduction Program. Dhaka, Bangladesh: 2020.
12 604 [https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-](https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-EconomicAssessmentCOVID-19-2021.pdf)
13
14 605 [EconomicAssessmentCOVID-19-2021.pdf](https://www.undp.org/content/dam/undp/library/covid19/undp-bd-Socio-EconomicAssessmentCOVID-19-2021.pdf)
15
16 606 27 Sakamoto M, Begum S, Ahmed T. Vulnerabilities to COVID-19 in Bangladesh and a
17
18 607 Reconsideration of Sustainable Development Goals. 2020;:1–15.
19
20 608 28 CARE, UNOPS and Uk. COVID-19 : Bangladesh Multi-Sectoral Anticipatory Impact and
21
22 609 Needs Analysis Needs Assessment Working Group Date : Needs Assessment Working
23
24 610 Group. 2020.
25
26 611 29 Swazo NK, Talukder MH, Ahsan MK. A Duty to treat ? A Right to refrain ? Bangladeshi
27
28 612 physicians in moral dilemma during COVID-19. 2020;6:1–23.
29
30 613 30 Gilmore B, Ndejjo R, Tchetchia A, *et al.* Community engagement for COVID-19
31
32 614 prevention and control: A rapid evidence synthesis. *BMJ Glob Heal* 2020;5:1–11.
33
34 615 doi:10.1136/bmjgh-2020-003188
35
36 616 31 Marston C, Renedo A, Miles S. Community participation is crucial in a pandemic. *Lancet*
37
38 617 2020;395:1676–8. doi:10.1016/S0140-6736(20)31054-0
39
40 618 32 Questa K, Das M, King R, *et al.* Community engagement interventions for communicable
41
42 619 disease control in low- A nd lower-middle-income countries: Evidence from a review of
43
44 620 systematic reviews. *Int J Equity Health* 2020;19:1–20. doi:10.1186/s12939-020-01169-5
45
46 621 33 Kuruvilla S, Bustreo F, Kuo T, *et al.* The Global strategy for women’s, children’s and
47
48 622 adolescents’ health (2016-2030): A roadmap based on evidence and country experience.
49
50 623 *Bull World Health Organ* 2016;94:398–400. doi:10.2471/BLT.16.170431
51
52 624 34 Gillespie A, Obregon R, Asawi R El, *et al.* Social mobilization and community engagement
53
54 625 central to the Ebola response in West Africa: Lessons for future public health emergencies.
55
56 626 *Glob Heal Sci Pract* 2016;4:626–46. doi:10.9745/GHSP-D-16-00226
57
58 627 35 Carter SE, O’Reilly M, Frith-Powell J, *et al.* Treatment Seeking and Ebola Community Care
59
60 628 Centers in Sierra Leone: A Qualitative Study. *J Health Commun* 2017;22:66–71.
629
630 629 doi:10.1080/10810730.2016.1216204

- 1
2
3 630 36 Shi Y, Jiang HL, Yang MX, *et al.* The precision of epidemiological investigation of
4 COVID-19 transmission in Shanghai, China. *Infect Dis Poverty* 2021;**10**:1–3.
5 631 doi:10.1186/s40249-021-00849-w
6 632
7
8 633 37 UN High Commissioner for Refugees (UNHCR). Risk Communication and Community
9 Engagement (RCCE) – COVID-19. 2020;:1–9.
10 634 <https://www.refworld.org/docid/5e84a8874.html>
11 635
12 636 38 WHO. Global Health Workforce Alliance: Bangladesh. 2021;:1–6.
13 637 <https://www.who.int/workforcealliance/countries/bgd/en/> (accessed 27 Feb 2021).
14 638 39 WHO. Bangladesh gradually resumes essential health services delivery disrupted due to the
15 COVID-19 pandemic. 2021;:1–6. [https://www.who.int/bangladesh/news/detail/24-12-](https://www.who.int/bangladesh/news/detail/24-12-2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-the-covid-19-pandemic)
16 639 2020-bangladesh-gradually-resumes-essential-health-services-delivery-disrupted-due-to-
17 640 the-covid-19-pandemic (accessed 27 Feb 2021).
18 641
19 642 40 Shammi M, Bodrud-Doza M, Towfiqul Islam ARM, *et al.* COVID-19 pandemic,
20 socioeconomic crisis and human stress in resource-limited settings: A case from
21 643 Bangladesh. *Heliyon* 2020;**6**. doi:10.1016/j.heliyon.2020.e04063
22 644
23 645 41 The World Bank Group. Global Responses to COVID-19 in slums and cities: Practices from
24 around the world. 2020;:1–120.
25 646 [http://pubdocs.worldbank.org/en/829971589899181351/May15-Response-to-COVID-in-](http://pubdocs.worldbank.org/en/829971589899181351/May15-Response-to-COVID-in-Slums-and-Cities.pdf)
26 647 Slums-and-Cities.pdf
27 648
28 649 42 Asian Development Bank. Local government institutional assessment: Urban Primary
29 Health Care Services Delivery Project. Dhaka, Bangladesh: 2015.
30 650 <https://www.adb.org/sites/default/files/linked-documents/42177-013-ban-oth-03.pdf>
31 651
32 652
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

653 **List of tables**654 **Table 1** Background characteristics of household members (N=2140)

Variables	n	%
Age in years		
≤14	631	29.5
15-29	682	31.9
30-39	349	16.3
40-49	224	10.5
50-59	131	6.1
≥60	123	5.8
Sex		
Male	1,064	49.7
Female	1,076	50.3
Education Level		
No education	680	31.8
Primary	701	32.8
Secondary and above	759	35.5
Occupation		
Currently unemployed	1,442	67.38
Service holder	261	12.20
Businessman	115	5.37
Informal worker	299	13.97
Others	23	1.07
Marital Status		
Married	1,130	52.8
Unmarried	776	36.3
Others	234	10.9
Regular earning person		
Yes	499	23.3
No	1,641	76.7
Household income group in last 30 days		
No income	546	25.5
≤ 8000	352	16.5
8001-14000	557	26.0
14001-20000	362	16.9
>20000	323	15.1
Asset quintiles		
Poorest	572	26.7
2nd	279	13.0
3rd	405	18.9
4th	433	20.2
Richest	451	21.1

655

657 **Table 2** Healthcare utilization for general illness or symptoms in 14 days

Variables	n	%
Suffered from general illness or symptoms		
Yes	251	11.7
No	1,889	88.3
Has the person recovered now?		
Yes	207	82.5
No	44	17.5
Self-reported illness/symptoms		
Cough	83	33.1
Fever	81	32.3
Pain/chest pain	31	12.4
Diarrhoea	11	4.4
Skin disease	10	4.0
Weakness	6	2.4
Shortness of breath	5	2.0
Injury/fractured	5	2.0
Others (e.g., vomiting, worms)	19	7.6
Did the person receive any treatment?		
Yes	227	90.4
No	24	9.6
Reason not to receive any treatment (multiple response)		
The problem was not critical	14	51.9
Financial constraints	8	29.6
Didn't sure about receiving treatment due to COVID-19	3	11.1
Others	5	7.4
How long after the onset of illness was treatment sought?		
The day the person got sick	27	11.9
One day later	114	50.2
Two days later	52	22.9
Three or more days later	34	15.0
Source of healthcare utilization.		
Drug stores	145	63.9
Private hospitals	37	16.3
Public hospitals	31	13.7
NGO hospitals	5	2.2
Others (e.g., homeopathic)	9	4

658

659 **Table 3** Chronic illness and healthcare utilization among the households' members aged 40 and
 660 above

Variables	n	%
Suffered any chronic illness		
Yes	120	25.1
No	358	74.9
Type of chronic disease		
Diabetes	29	24.2
Arthritis	24	20.0
Asthma	19	15.8
Cardiovascular disease	16	13.3
Hypertension	11	9.2
Psychological disorder	4	3.3
Chronic Ovarian disease	3	2.5
Liver disease	3	2.5
Others (e.g., Gastric, prolonged injury)	11	9.2
Have to take regular treatment for this disease.		
Yes	96	80.0
No	24	20.0
Sought treatment for this disease in last 3 months		
Yes	67	55.8
No	53	44.2
Reasons to not take treatment (multiple response)		
The problem was not critical	28	41.8
Financial constraint	25	37.3
Due to COVID-19	12	17.9
Others (e.g., no accompanying person)	3	3.0
Source of healthcare utilization.		
Public hospital	15	22.4
Private hospital	18	26.9
drug store	31	46.3
Others (e.g., homeopathic)	3	4.5

661

662 **Table 4** Utilization of maternity care (child delivery and pregnancy-related)

Variables	n	%
Sought maternity healthcare last year (delivery and pregnancy-related)		
Yes	69	13.4
No	445	86.6
Sought maternity healthcare in last three months (delivery and pregnancy-related)		
Yes	27	39.1
No	42	60.9
Reasons to not take treatment (multiple response)		
The problem was not critical	36	73.5
Financial constraint	7	14.3
Due to COVID-19 didn't take treatment	3	6.1
Others (e.g.,)	3	6.1
Maternity care received in last 3 months (multiple services)		
ANC	16	48.5
Delivery	10	30.3
PNC	7	21.2
Number of ANC		
Less or equal to 3 times	12	75.0
4 times plus	4	25.0
Source of ANC care		
Public hospital	1	6.3
Private hospital	7	43.8
NGO hospital	7	43.8
Others (e.g., trained birth attendant)	1	6.3
Type of delivery		
Normal delivery	8	80.0
Cesarean delivery	2	20.0
Place of delivery		
Home delivery	3	30.0
Institutional delivery	7	70.0
Source of delivery care		
Public hospital	2	28.5
Private hospital	4	57.1
NGO hospital	1	14.3
Number of PNC		
1 time	4	57.1
More than 1 times	3	42.9
Source of PNC		
Public hospital	2	28.6
Private hospital	3	42.9
NGO hospital	1	14.3
Others	1	14.3

663

664 **Table 5** Knowledge about access to COVID-19 related information

Variables	Yes; n (%)	No; n (%)
Do you have access to quarantine facility nearby your house/workplace?	94 (19.8)	382 (80.25)
Did you receive any message on COVID-19 prevention and treatment?	244 (51.26)	232 (48.74)
Do you know any hotline number to contact in case of any symptoms of you or others?	234 (49.16)	242 (50.84)

665

666

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

667 **List of figures**

668 **Figure 1** Health system impact of COVID-19 on urban slum dwellers

669 **Figure 2** Median out-of-pocket expenditure for healthcare

670 **Figure 3** Source of information on COVID-19

For peer review only

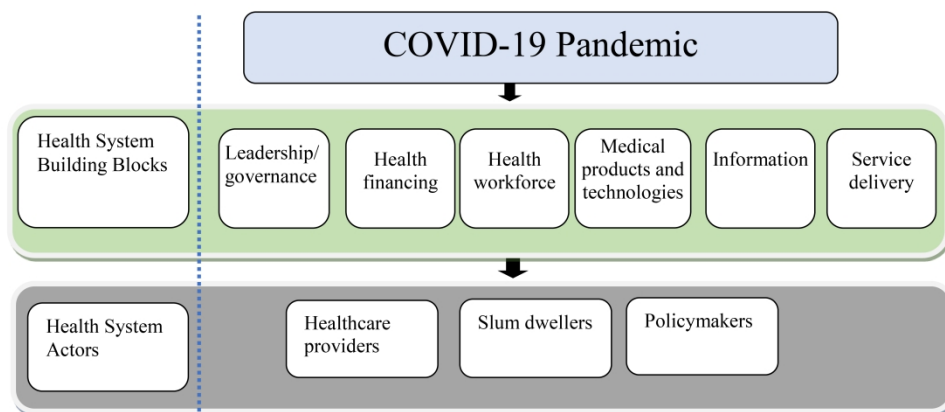


Figure 1 Health system impact of COVID-19 on urban slum dwellers

401x218mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

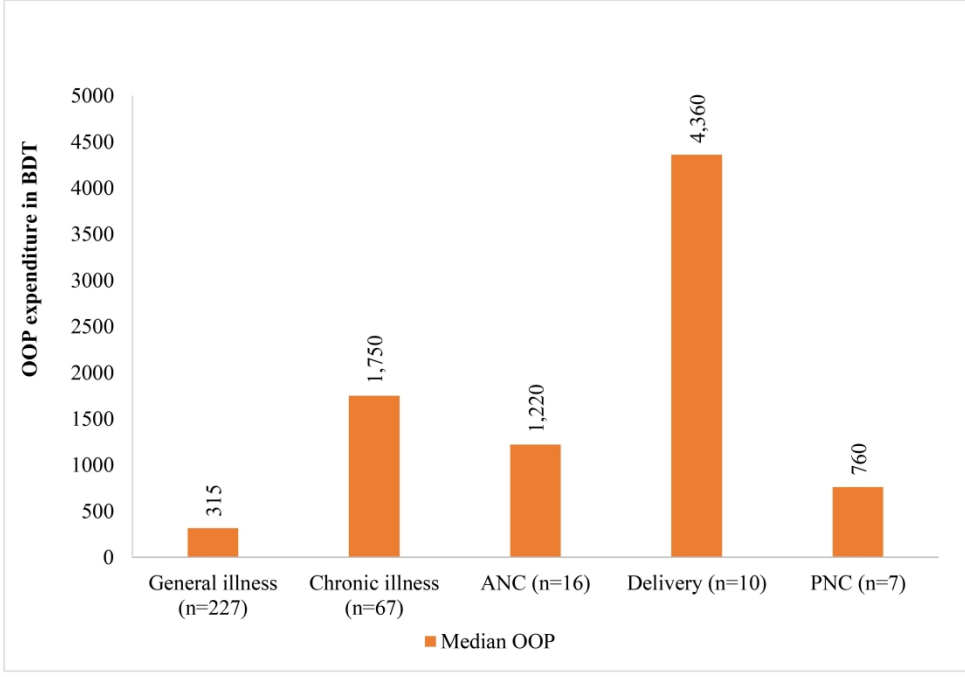


Figure 2 Median out-of-pocket expenditure for healthcare
314x217mm (300 x 300 DPI)

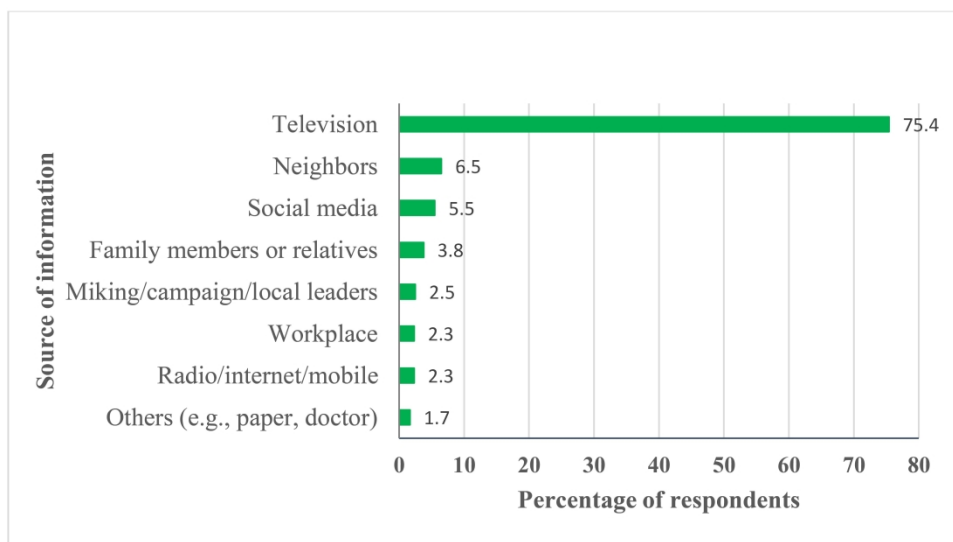


Figure 3 Source of information on COVID-19

371x217mm (300 x 300 DPI)

Supplementary Table 1 Opinion of the key informants regarding the six building blocks of health system.

Theme (health system building blocks)	Respondent type	Quotation (opinion)
Health service delivery	Drug Vendor (informal healthcare provider) (KII-2)	<i>“During the first two months, I received many patients with different health problems along with breathing difficulties. We usually suggest general drugs for breathing difficulty.”</i>
	Formal healthcare provider (KII-7)	<i>“Normal delivery at our hospital decreased during lockdown. We learned that they (pregnant women) tried to have normal delivery at home. They fell at risk. Traditional birth attendants are not trained to manage complications. We dealt with mothers who experienced complications after home delivery during lockdown.”</i>
Healthcare financing	Technical Expert (KII-19)	<i>“In Dhaka city, there was urgency and thus there was mismanagement. As we heard, people involved in the ministry of health and family welfare tried to release the fund which was in each of the operation plans of different departments, and they could do it. Later the government received funds from the donor agency. This was enough resource for the health sector..... It will not be correct to say resource shortage hindered the implementation of activities to manage the pandemic.”</i>
	Technical Expert (KII-17)	<i>“A lot of money was misused ...you must have read in newspapers during pandemic.... I am not sure whether it was adequate or not but there was not any lack of funds. To some extent, they could not spend money due to the financial rules... There is tremendous political pressure.... The physicians do not understand finance. The administrative officers/clerks of DGHS prepare and manage those.....”</i>
Health information on COVID-19 prevention, management and treatment	Technical Expert (KII-19)	<i>“DG [Directorate General] health is not so active in engaging community in preventive intervention but they are working. Bureau of health communication is also working with NGOs in this regard. However, this is not enough for effective engagement of community in pandemic management.”</i>
Health workforce	Technical Expert (KII-18)	<i>“[The] Majority of the senior, experienced and specialized physicians did not attend patients. Frontline health workers had to face the battle.”</i>

	Technical Expert (KII-17)	<i>Government has taken some good initiatives in response to Covid-19. You know the government has recruited and deployed more than 2000 physicians and many other health staff on an urgent basis. But there has been a problem in posting those physicians. The physicians have not been posted at places where they are originally planned for. Due to political pressure or the influence of Civil surgeons, many of them have been placed in urban areas or district level.”</i>
	Formal healthcare provider (KII-1)	<i>“In our facility, two staff members had been infected and we all had to go for isolation for 14 days. Therefore, there was no one to operate our facility. People have not received any treatment from our facility at that time.”</i>
Medical products and technologies	Formal healthcare Provider (KII-1)	<i>“Many of our patients do not want to do the Corona test. The private diagnostic facilities have high charges for the test which the poor patients cannot afford. It is true that testing at public facilities is a hassle. Many of our patients shared their experience that they have to stand in a long queue and wait for a long time to get tested and then the reports take a long time. One patient told me that he received his report after 15 days of giving sample.”</i>
	Formal healthcare Provider (KII-04)	<i>“They do not want to go for doing Covid-19 test. If we refer them, they do not want to go because they fear that the hospital will admit him and will not allow him to meet with his family members. Community people would avoid him after knowing that he got infected. Thus, they do not want to do the test.”</i>
	Technical Expert (KII-17)	<i>“The lower-class people always experience discrimination. They are always deprived and in terms of getting Covid-19 related health services, they have been deprived.”</i>
Leadership/ governance	Technical Expert (KII-19)	<i>“All decisions are made by one or two people. The WHO suggested involving all people in relevant sectors in order to fight with the pandemic. This is not possible for the ministry of health independently. Not all divisions of the government were involved. Things could have been different if all sectors worked together.”</i>

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5-6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-11
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	

		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14 - 17
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.