Prevalence of COVID-19 symptoms, risk factors, and health behaviors in host and refugee communities in Cox's Bazar: a representative panel study.

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ABSTRACT (216 words)

Objective. We study the prevalence of COVID-19 symptoms in refugee and host communities and their correlates with current and pre-COVID-19 living conditions.
Methods. We administered a phone-based survey to a sample of 909 households in Cox's Bazar which was drawn from a household panel representative of Rohingya refugees and the host population. We conducted a symptoms checklist to assess COVID-19 risk based on the WHO guidelines. We included questions covering returning migration, employment, and food security. We asked additional questions on health knowledge and behaviors to a random subsample (n=460).
Findings. 24·6% of camp residents and 13·4% of those in host communities report at least one common symptom of COVID-19. Among those seeking treatment, a plurality did so at a pharmacy (42·3% in camps, 69·6% in host communities). While most respondents report good respiratory hygiene, between 76·7% (camps) and 52·2% (host community) had attended a communal prayer in the previous week. Another 47·4% (camps) 34·4% (host community) had attended a non-religious social gathering. The presence of returning migrants, respondent mobility, and food insecurity strongly predict COVID-19 symptoms.
Conclusion. COVID-19 symptoms are highly prevalent in Cox's Bazar, especially in refugee camps. Attendance at religious and social events threatens efforts to contain the spread of the disease. Pharmacies and religious leaders are promising outlets to disseminate life-saving information.

MAIN MANUSCRIPT (2,988 words)

Introduction

The global population of forcibly displaced persons, at an all-time high of more than 70 million by the end of 2018, is immensely vulnerable to COVID-19. Eighty percent of the world's 25.9 million refugees reside in low-income and middle-income countries, often in overcrowded camps, with health systems struggling to cope with the needs of the host population.[1-3] Shortages of diagnostic tests, personal protective equipment (PPE), and treatment infrastructure imply that behavioral change interventions have an important role in slowing disease spread in refugee contexts. On top of potential supply-chain constraints, UNHCR's plan for COVID-19 prevention and response among refugees populations, announced in March 2020, has an unmet funding need of USD 255 million.[4,5] This paper documents the health status and behaviors of refugees and the host population in Southern Bangladesh, providing scarce but essential data on the prevalence of COVID-19 symptoms and associated risk factors in a humanitarian setting. Understanding those risk factors, in conjunction with the information seeking and COVID-19 prevention practices in these populations, offers clear and urgently needed guidance on the design of behavioral change interventions .[6]

We study the prevalence of common symptoms of COVID-19 and its correlates among Rohingya refugee camps and Bangladeshi host communities in Cox's Bazar. The district is currently home to almost 860,000 stateless Rohingya refugees, the vast majority of whom reside in densely populated camps and depend on emergency aid to cover daily needs.[7] We document how the prevalence of COVID-19 symptoms is associated with transmission vectors, compliance with various social distancing recommendations, and current and mid-2019 living conditions. We also describe trusted information sources of refugees and hosts, and the preferred healthcare providers of each group.

There is very limited data to guide the design and targeting of interventions in Cox's Bazar. Using a representative sample of both refugee and host communities, we provide some of the first evidence on the prevalence of symptoms indicative of COVID-19 and other illnesses and their associations with

community- and individual-level risk factors. We provide a window into the relationship between forced displacement and COVID-19 risk and some guidance for policy design.

Our survey revealed that 24·6% of camp residents and 13·4% of those living in host communities report at least one of the three most common symptoms of COVID-19 (according to the World Health Organization's dedicated website as of April 27, 2020 these are: fever, dry cough, and fatigue). Households in communities where a migrant returned in the two weeks prior to the survey or that report being unable to buy essential food items in the previous seven days exhibit greater prevalence of symptoms. Attendance at social and religious events is widespread - especially in the Rohingya refugee population - and is strongly correlated with COVID-19 symptoms.

Our data strongly suggests that informational interventions should focus on reducing mobility within and outside the community - and that doing so is pressing in refugee camps. We find that, while a large fraction of respondents is cognizant of the importance of wearing masks in public, attendance to religious and social events remains high across Cox's Bazar. Camp dwellers are significantly more likely than those in host communities to attend both types of gatherings.

Trusted sources of information and preferred health providers among those reporting symptoms differ across refugee and host communities, but a plurality of respondents from both subpopulations sought treatment at a pharmacy and trusted the advice of friends, neighbors, and acquaintances. These findings suggest that pharmacists, as the front-line healthcare workers, should receive training, PPE, and other supportive interventions. The importance of friends, neighbors, and acquaintances recommends a social influence campaign, where members of the general public are incentivized to share information about COVID-19 and to nudge others in their community to adhere to public health recommendations. It may also be necessary to involve community leaders like Imams to discourage people from gathering in large groups for religious services.

Methods

Sample. We administered a phone-based survey to a sample of 1,255 households between April 11 and 17, 2020 to assess the health status, health behaviors, and livelihoods of households across Cox's Bazar. Of those, 909 were reachable by phone and 899 consented to be surveyed. The sample for this study was taken from the Cox's Bazar Panel Survey (CBPS), a longitudinal study tracking 5,020 households across Cox's Bazar that is divided almost equally between refugee camps (n=2,493) and host communities (n=2,527). The Primary Sampling Units (PSUs) in host communities are mauzas, the lowest administrative unit in Bangladesh. We stratified mauzas into areas within 15 kilometers from camps and areas farther away from camps. The PSU for refugee communities were camp blocks, as defined by the International Organization for Migration Needs and Population Monitoring Round 12 (NPM12).

The baseline survey of the CBPS was collected between April and July 2019. In each household, we administered a household-level questionnaire covering a number of topics including the value of assets held by the household and income from different sources. In addition, we randomly selected two adults aged 15 or older for detailed interviews covering a wide range of topics, including detailed questions on labor market outcomes and trauma and mental health. For the present survey, we asked to speak with at least one of the two randomly selected adults. We were able to interview 704 out of the 909 randomly selected adults that were interviewed in 2019. In households where none of the adults interviewed in 2019 were available to be interviewed, we administered the questionnaire to another adult member.

Outcome measures. We administered a checklist of symptoms based on the WHO and CDC guidelines. We used the three most common symptoms featured on the WHO dedicated COVID-19 website on April 27, 2020 to produce our preferred measure of COVID-19 risk: having at least one of the symptoms (fever, dry cough, and fatigue or tiredness).

We report descriptive statistics for respondents in each group and a number of proxies for living conditions, including household income and wealth, and mental health. We define household wealth as the total value of all assets owned by the household and grouped households within one of three strata (camps, communities within 15 kilometers from camps, and communities farther away) in quintiles. We measured lifetime trauma using the Harvard Trauma Questionnaire (HTQ)[8] and depressive mood using the 9-item version of the Patient Health Questionnaire (PHQ-9).[9] We used a cut-off point of PHQ-9 equal to or above 10 as a screener for depression.[10]

Ethical Considerations. We provided appropriate consent on the nature of the questions and the costs and benefits from taking part in the study. The questionnaire included questions to identify incorrect beliefs (myths) about how COVID-19 is transmitted. The e-survey had embedded filters to detect such cases and prompt enumerators to read an informational note based on the WHO guidelines ("Myth Busters"). In addition, for high-risk households - those in which at least one member had either common symptoms of COVID-19 or an underlying condition - the e-survey prompted enumerators to read a message describing when and how to seek medical attention. All of these messages were based on the most recent version of the WHO guidelines available at the time of the survey. We received ethical approval from Innovations for Poverty Action (IRB # 14742).

Results

Living conditions in refugee camps and host communities. Data from the 2019 CBPS baseline survey shows that refugee households have significantly lower levels of income and assets (Table 1) compared to members of the host community. The poorest households (first quintile) in refugee and host communities hold assets for an average value of 5·5 USD and 224·2 USD ($p < 0·001$) and earn an average monthly income of 0·7 USD and 35·5 USD ($p < 0·001$), respectively.

As expected, housing conditions that favor community transmission are more often observed in camps (Table 1). Only 1·2% of households in camps, but 55·3% of those in host communities, have a private toilet ($p < 0·001$) and as many as 31·3% of households in camps share a toilet with more than 25 people, compared to 0% in the host community ($p < 0·001$). Sharing a water source with a large number of users is also commonplace in camps, where 62·1% report sharing water facilities with more than 25 users, whereas only 6·6% of the host community do so ($p < 0·001$).

Our 2020 survey (April 11-17) shows that 72·1% of camp dwellers and 59·2% of hosts were unable to buy essential food items in the seven days prior to being surveyed ($p < 0·001$). Of those, 53·7%-63·3% (camps and host communities, respectively) resorted to buying lower quality or cheaper food items ($p=0·032$) and 42·8%-46·6% skipped meals or reduced food portions ($p=0·399$).

Prevalence and correlates of COVID-19 symptoms. Respondents in refugee camps are almost twice as likely as hosts to report having had fever (13·9% and 6·6% respectively, $p=0·001$) and dry cough (9·5% and 5·4% respectively, $p=0·037$) in the previous week (Table 2). Furthermore, camp residents are more likely to show at least one of the three most common symptoms of COVID-19 (18·1% and 11·0% respectively, $p < 0·001$).

They are also more likely to report symptoms that are not indicative of COVID-19, including mucus production and wet cough (3·7% versus 1·7%), but the difference is not statistically significant (p=0·101). Taken together, these results suggest that the observed differences in self-reported health are concentrated specifically in COVID-19 symptoms.

Our regression analysis suggests that residents of refugee and host communities are equally vulnerable to COVID-19 when exposed to similar living standards. Although the prevalence of COVID-19 symptoms is higher among refugee populations compared to hosts, we show that the difference is no longer statistically significant at the 5% level (Table 9, columns 3-4) after adjusting for basic sociodemographic characteristics and pre-COVID living conditions, such as toilet sharing, employment, and household assets.

After controlling for baseline characteristics, returning migration is the strongest predictor of COVID-19 symptoms. Respondents in communities where at least one migrant returned in the previous two weeks are more likely to report at least one symptom of COVID-19 (Adjusted OR 3·67, 95% CI 1·97-6·84, p < 0·001). Spending at least one day away from home in the same period is also strongly positively correlated with showing one symptom (2·15, 1·27-3·62, p =0·004).

Gender is the second strongest predictor of COVID-19 symptoms (Table 9, columns 3-4), with women being significantly more likely to report at least one symptom (2·44, 1·36-4·39, p=0·003). We conjecture that the gender gap in self-reported symptoms is partially explained by differences in willingness to report ill health. The gender gap in self-reported physical and somatoform symptoms is well documented in the literature.[11-13]

Respondents who report having been unable to buy essential food items in the week prior to the survey are also more likely to report at least one symptom of COVID-19 (2·31, 1·27-4·19, p=0·006). Our data does not allow us to establish the direction of the relationship or the mechanisms through which economic stress and illness influence each other. Future research is necessary to understand the extent to which an inadequate diet and housing conditions may have increased the susceptibly of food insecure households to a variety of health conditions.

Surprisingly, given the link between psychological stress and immunity,[14-16] we find that lifetime trauma and depression severity are not significantly correlated with COVID-19 symptoms.

Treatment-seeking behavior. For those who experienced at least one symptom of any health condition (see Table 2 for a breakdown), pharmacies were the first stop for advice and treatment (69·6% and 42·3% in host communities and camps respectively, p < 0·001) (Table 3). Among refugees, health information providers in camps are the second most-common healthcare provider (35·8% visited one to treat their symptoms).

Knowledge about COVID-19 and health behaviors. A survey module administered to a subsample of respondents revealed that trusted sources of advice on COVID-19 prevention vary greatly across refugees and hosts, but information provided by friends and acquaintances is important for both (58·8% and 62·9% of respondents respectively, p=0·437) (Table 4). Among refugees, NGOs are also trusted sources (53·5%), followed by informational campaigns on the street (41·6%) and local leaders (e.g., block majhees). Among hosts, newspapers, radio, and TV are the most trusted sources of information (81·4%), and social media is cited by many (51·7%).

We also find that that the vast majority of respondents are cognizant of the importance of good respiratory and household hygiene practices. Between 85·9% and 78·8% of respondents (camps and host communities respectively, p=0·087) correctly believe that exposure to asymptomatic carriers can spread the virus. Between 93·1%-91·4% (p=0·580) believe that touching a surface or object with the virus on it can infect them (Table 5). Further, 89·9%-94·7% (p=0·128) have a surgical or homemade mask to wear outside of their home, and 87·9%-99·9% (p=0·005) report having covered their mouth and nose with a bent elbow when coughing or sneezing.

While most respondents report good respiratory hygiene knowledge and practices, attendance at religious and social gatherings threatens efforts to slow the spread of the disease (Table 6). Between 76·7%-58·0% of male respondents (camps and host communities, p=0·006) report having attended a special religious event (such as the Friday Jummah prayers) in the week prior to the survey. Only 23·3% of male respondents in refugee camps avoided attending prayers on other days, compared to 48·8% of hosts ($p < 0·001$). (These questions were only administered to men, since our baseline survey showed that nearly all our respondents identify as Muslim and women rarely attend religious gatherings.) The average number of days in which male respondents attended a religious event is 4 and 2·2 respectively ($p < 0·001$). Camp dwellers were also more likely to attend non-religious social gatherings: only 52·6% avoided social events, compared to 65·6% of those in host communities (p=0·016).

Among those who decided to stay at home all day in the week prior to the survey, fear of getting infected and the recommendations from authorities were the main reasons for not leaving their house (Table 7). Between 58·8%-61.4% (camps and host community, p=0·689) stayed home to avoid getting infected. Another 64.9%-53·0% (p=0·067) stayed in because it was recommended by the central Government or a local authority, and 8·1%-37·1% ($p < 0·001$) stayed at home because there was a mandatory lockdown.

Lastly, we find some evidence that fear is breeding stigma in some communities (Table 5). Nearly one-third of refugees and hosts (30·9% and 35·1% respectively, p=0·406) report that suspected carriers of COVID-19 were prevented from receiving treatment in their community.

Discussion

Due to crowding and limited access to basic sanitation, refugee camps render their dwellers vulnerable to infectious diseases like COVID-19. These conditions pose an important health risk to camp inhabitants and the host population.[17] This study is among the first documenting the prevalence of COVID-19 symptoms and risk factors in a representative sample of both refugee and host communities.

Camp residents report COVID-19 symptoms almost twice as frequently as members of the host community. We also document differences in self-reported non-COVID-19 symptoms, but these are not statistically significant. While this suggests that COVID-19 is much more prevalent in the refugee population, we cannot definitively exclude two alternative explanations. The first is that refugees experience higher rates of other common illnesses with overlapping symptoms. The second is that some refugees over report adverse life events and health outcomes, as some anecdotal evidence suggests[18].

Strict social distancing and hygiene can be virtually impossible to implement in impoverished communities and refugee camps. Moreover, these measures may jeopardize the livelihoods and basic subsistence of low-income households.[19] Our data suggests that most respondents understand how COVID-19 is transmitted and practice good respiratory hygiene, yet they continue to engage in risky behaviors like social

gatherings and communal prayers. Further, despite their limited participation in paid employment, attendance to religious services at prayer halls is much higher in camps. This suggests that a lack of knowledge about COVID-19 does not appear to explain the continued participation in social gatherings.

Our results offer some directions for policy responses that encourage preventative behaviors without threatening the livelihoods of the poor. Reducing attendance at communal prayer is critical and providing more information about how COVID-19 is transmitted is unlikely to be discouraging enough. Contacting Imams and advocating for alternatives that have been widely adopted in other parts of the Muslim world could be pivotal in our setting. Pharmacists on the front lines of the pandemic in Cox's Bazar will need PPE and training to treat and educate their patients about COVID-19. Friends and acquaintances are among the most trusted sources of information. Hence, social influence interventions – for instance, where members of the general public are incentivized to share information about the disease and protective behaviors - may be decisive.[20]

A lesson from the AIDS and SARS outbreaks is that emerging infectious diseases can spark fear in the general population and stigma at the community level, more so when the number of deaths is high. Fighting discrimination against those affected by the disease is important to control the epidemic, as those infected may delay seeking care or be denied their right to treatment.[21-23] Our data confirms that this is already the case in Cox's Bazar, to some extent. Nearly one-third of respondents in refugee and host communities report that suspected carriers of COVID-19 were prevented from receiving medical attention. Training pharmacists - one of the most trusted healthcare providers across Cox's Bazar - and health information providers in camps to identify and correct false beliefs could help reduce stigma and its negative effects on those affected by COVID-19.

Lastly, our findings are consistent with past research showing a gender gap in symptom reporting. It has been previously reported that fear to be perceived as weak or a hypochondriac makes some men reluctant to report symptoms and seek treatment.[24,25] Research and health screening programs relying on self-reported data to identify potential hotspots of COVID-19 should consider targeting men and adapting the design of their interventions to account for these attitudes.

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Competing interests: None declared

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Table 1. Respondent characteristics

Data are n (%) for all variables except household income and assets. All estimates shown here are unweighted. The average value of all assets is expressed in US dollars (95% CI), using an exchange rate of 1 USD= 84·80 BDT

	Refugee camps (n=367)	Host community (n=532)	p-value
Gender			
Male	221 (60·2%)	300 (56·4%)	0·254
Female	146 (39·8%)	232 (43·6%)	0·254
Age (2019)			
15-24	88 (24·0%)	82 (15·4%)	0·001
25-34	110 (30·0%)	126 (23·7%)	0·035
35-44	43 (11·7%)	110 (20·7%)	p < 0·001
45+	54 (14·7%)	83 (15·6%)	0·716
Educational level (2019)			
Less than primary	229 (62·4%)	227 (42·7%)	p < 0·001
Primary completed	45 (12·3%)	129 (24·2%)	p < 0·001
Secondary completed	21 (5·7%)	42 (7·9%)	0·210
Household assets value (2019 USD)			
1st quintile	5·5 (4·7-6·4)	224·2 (187·8-260·6)	p < 0·001
2nd quintile	18·3 (16·9-19·7)	1163·3 (1087·0-1239·5)	p < 0·001
3rd quintile	41·4 (38·9-43·9)	2883·3 (2723·1-3043·5)	p < 0·001
4th quintile	83·9 (78·0-89·7)	6305·2 (5831·6-6778·9)	p < 0·001
5th quintile	208·0 (183·8-232·2)	27902·7 (22967·5-32837·8)	p < 0·001
Household income (2019 USD)			
1st quintile	0·7 (0·5-1·0)	35·5 (31·7-39·4)	p < 0·001
2nd quintile	10·3 (9·4-11·2)	91·5 (88·5-94·4)	p < 0·001
3rd quintile	25·7 (24·1-27·4)	145·4 (140·2-150·6)	p < 0·001
4th quintile	53·2 (50·4-55·9)	224·3 (214·6-233·9)	p < 0·001
5th quintile	128·7 (110·1-147·4)	493·5 (433·1-553·8)	p < 0·001
Employment (2019-2020)			
Worked past 7 days, 2019 (men)	79 (45·1%)	162 (76·1%)	p < 0·001
Worked past 7 days, April 2020 (men)	21 (9·6%)	62 (20·7%)	0·001
Worked past 7 days, 2019 (women)	6 (5·0%)	58 (30·9%)	p < 0·001
Worked past 7 days, April 2020 (women)	1 (0·7%)	11 (4·7%)	0·029
Food insecurity (2020)			

Was able to buy essential food items (last 7 days)	102 (27·9%)	217 (40·8%)	p < 0·001
Resorted to lower quality or cheaper food (if unable to buy essential food, last 7 days)	123 (53·7%)	167 (63·3%)	0·032
Skipped meals or reduced its size (if unable to buy essential food, last 7 days)	98 (42·8%)	123 (46·6%)	0·399
Water, sanitation, and crowding (2019)			
How many people do you share sanitation facilities with?			
None, private	7 (1·9%)	294 (55·3%)	p < 0·001
1-10	113 (30·8%)	106 (19·9%)	p < 0·001
11-25	60 (16·3%)	0 (0·0%)	p < 0·001
More than 25	115 (31·3%)	0 (0·0%)	p < 0·001
How many people do you share water facilities with?			
None, private	3 (0·8%)	174 (32·7%)	p < 0·001
1-10	33 (9·0%)	172 (32·3%)	p < 0·001
11-25	31 (8·4%)	20 (3·8%)	0·003
More than 25	228 (62·1%)	35 (6·6%)	p < 0·001
What is the size of your household?			
1-3	68 (18·5%)	89 (16·7%)	0·485
4-6	194 (52·9%)	339 (63·7%)	0·001
More than 6	105 (28·6%)	104 (19·5%)	0·002
How many rooms does your household occupy?			
1	69 (23·4%)	83 (20·7%)	0·396
2-3	220 (74·6%)	251 (62·6%)	0·001
More than 3	6 (2·0%)	67 (16·7%)	p < 0·001
Trauma and Clinical Depression (2019)			
Experienced at most one trauma event	60 (16·3%)	209 (39·3%)	p < 0·001
Experienced two or more trauma events	307 (83·7%)	323 (60·7%)	p < 0·001
Screened positive for depression (PHQ-9 = >10)	91 (31·0%)	101 (25·3%)	0·097

Table 2. Prevalence of symptoms

Data are percentages (95% CI) for all variables except household assets· The average value of all assets is expressed in US dollars (95% CI), using an exchange rate of 1 USD= 84·80 BDT

	Refugee camps (n=365)	Host community (n=532)	p-value
Fever	13·9% (10·1-17·6)	6·6% (4·3-8·9)	0·001
Dry cough	9·5% (6·3-12·7)	5·4% (3·4-7·5)	0·037
Wet cough or sputum/mucus production	3·7% (1·8-5·6)	1·7% (0·2-3·2)	0·101
Shortness of breath or difficulty breathing	1·0% (-0·0-2·1)	0·3% (-0·0-0·7)	0·212
Sore throat	2·1% (0·8-3·5)	1·5% (0·4-2·6)	0·455
Headache	10·6% (7·3-13·9)	7·8% (5·2-10·3)	0·190
Diarrhea	2·6% (0·9-4·3)	1·2% (0·1-2·3)	0·177
Fatigue or malaise	7·4% (4·4-10·5)	4·0% (2·2-5·8)	0·060
Body aches (muscle or joint pain)	6·9% (4·3-9·6)	9·6% (6·6-12·7)	0·194
Runny nose or nasal congestion	6·7% (4·0-9·3)	5·0% (3·0-7·1)	0·342
Loss of taste or smell	2·7% (1·0-4·5)	0·9% (0·1-1·7)	0·064
One of the following: Fever, dry cough, or fatigue	18·1% (13·9-22·3)	11·0% (8·1-13·9)	0·006
Two of the following: Fever, dry cough, or fatigue	5·5% (2·9-8·2)	2·0% (0·7-3·3)	0·018
Three of the following: Fever, dry cough, or fatigue	0·5% (-0·1-1·1)	0·4% (-0·2-0·9)	0·749
At least one of the following: Fever, dry cough, or fatigue	24·6% (20·1-29·2)	13·4% (10·4-16·4)	p < 0·001

Table 3. Health providers chosen by respondents and household members showing at least one symptom

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps (n=120)	Host community (n=138)	p-value
Community clinic / Upazila or union health complex	13·3% (6·9-19·6)	6·6% (1·7-11·4)	0·102
Hospital	8·2% (3·4-13·1)	7·2% (2·7-11·6)	0·755
Doctor in private chamber	5·4% (1·6-9·1)	15·7% (8·8-22·6)	0·011
At home	13·0% (6·7-19·4)	19·0% (9·7-28·2)	0·302
Pharmacy store	42·3% (32·4-52·3)	69·6% (60·3-78·9)	p < 0·001
Traditional practitioner	3·0% (-0·5-6·4)	0·7% (-0·7-2·2)	0·252
Over phone with a doctor or medical practitioner	0·0% (·-·)	4·5% (0·8-8·2)	0·018
Mobile clinic	0·0% (·-·)	1·0% (-1·0-3·0)	0·318
Health information providers in camps	35·8% (26·0-45·6)	0·0% (·-·)	p < 0·001

Table 4 Trusted sources of information on COVID-19 prevention and advice

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps	Host community	p-value
	(n=176)	(n=278)	
Newspapers, radio, or TV	22·4% (15·7-29·1)	81·4% (76·0-86·7)	p < 0·001
Informational calls/SMS	7·7% (3·9-11·6)	16·3% (11·4-21·3)	0·008
Employer, work colleague, and others at work	4·9% (2·1-7·7)	7·2% (3·8-10·5)	0·305
Family and relatives	24·6% (17·8-31·3)	35·1% (28·3-42·0)	0·033
Friends, neighbors, and acquaintances	58·8% (50·7-66·9)	62·9% (56·5-69·2)	0·437
NGO	53·5% (45·6-61·3)	4·6% (1·9-7·3)	p < 0·001
Social media (Facebook, Twitter, etc.)	14·8% (9·3-20·3)	51·7% (44·5-58·8)	p < 0·001
Informational campaigns on the street	41·6% (33·6-49·7)	49·2% (42·2-56·1)	0·167
Door-to-door informational campaign	31·5% (24·2-38·9)	12·1% (8·0-16·1)	p < 0·001
Local or community leaders (including block majhees)	44·3% (36·3-52·4)	24·0% (17·6-30·3)	p < 0·001

Table 5 Knowledge about COVID-19 transmission and respiratory hygiene practices in the last 7 days

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps	Host community	p-value
	(n=176)	(n=279)	
Do you think that people who show no symptoms of being sick can spread a virus or contagious disease?	85·7% (80·5-91·0)	78·8% (72·9-84·7)	0·087
Do you think it is possible to contract a virus or contagious disease by touching a surface or object that has the virus on it?	93·1% (88·7-97·6)	91·4% (87·1-95·7)	0·580
Do you have a surgical or homemade cloth mask to cover your mouth or nose when you leave your house?	89·9% (84·4-95·4)	94·7% (91·9-97·6)	0·128
In the last 7 days, did you cover your mouth and nose with a bent elbow when coughing/sneezing?	87·9% (81·6-94·2)	99·9% (94·6-105·2)	0·005
People showing symptoms are not allowed to leave their house	82·1% (75·6-88·6)	78·9% (73·8-84·1)	0·451
People showing symptoms are not allowed to receive treatment in the community	30·9% (23·6-38·1)	35·1% (28·4-41·8)	0·406

Table 6. Social distancing in the last 7 days

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps	Host community	p-value
	(n=186)	(n=248)	
Stayed at home all day, without going out or receiving visits			
Average number of days	3·2 (2·7-3·7)	4·0 (3·6-4·5)	0·021
% Who stayed at home every day	24·5% (17·4-31·7)	37·1% (29·3-44·9)	0·020
% Who left house at least on one day to do some work	8·1% (3·9-12·4)	13·3% (8·9-17·7)	0·097
Attended social gatherings (for example, visit family and friends, drink tea at a stall, etc.)			
Average number of days	2·3 (1·8-2·8)	1·3 (1·1-1·6)	0·001
% Who did not attend social gatherings any day	52·6% (44·0-61·2)	65·6% (59·6-71·6)	0·016
Kept a distance of at least two meters (6 feet) to people outside of your household			
Average number of days	3·9 (3·5-4·4)	4·2 (3·8-4·6)	0·509
% Who kept safety distance every day	33·7% (25·9-41·5)	41·2% (34·0-48·5)	0·165
Attended prayers at a mosque or prayer hall during other days (Men only)			
Average number of days	4·0 (3·4-4·6)	2·2 (1·7-2·7)	p < 0·001
% Who did not attend prayers any day	23·3% (14·6-32·0)	48·8% (39·2-58·5)	p < 0·001
Attended Friday Jummah prayers at a mosque (or the special weekly prayers, for other religions)? (%) (Men only)	76·7% (67·9-85·5)	58·0% (48·2-67·7)	0·006

Table 7. Reasons why people stayed at home all day, without receiving visits

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps	Host community	p-value
	(n=117)	(n=173)	
There was a mandatory lockdown	8·1% (3·1-13·0)	37·1% (28·7-45·4)	p < 0·001
It was recommended by the government / local (or camp) authority	64·9% (55·0-74·8)	53·0% (45·0-60·9)	0·067
It was recommended by health experts	13·2% (7·0-19·5)	9·6% (5·1-14·1)	0·359
I was asked to stay at home by a family member, friend, or other acquaintance	33·7% (23·6-43·9)	27·6% (20·0-35·1)	0·341
I was worried about getting infected	58·8% (49·1-68·5)	61·4% (53·3-69·5)	0·689
There was no work	18·9% (11·4-26·4)	26·1% (18·5-33·7)	0·190
Worked from home	24·2% (15·5-33·0)	21·1% (15·6-26·7)	0·556

Table 8. Percentage of respondents exposed to each transmission vector (last 2 weeks)

Data are estimated percentages with 95% CIs in parentheses. Estimates are weighted to account for survey design and non-response.

	Refugee camps (n=365)	Host community (n=532)	p-value
Spent at least 1 day away from home for any purpose	49·4% (44·3-54·4)	54·7% (49·7-59·6)	0·145
Destination (most recent trip)			
Elsewhere within this village/camp	95·8% (92·8-98·9)	83·6% (79·3-87·9)	p < 0·001
Cox's Bazar	4·2% (1·1-7·2)	15·3% (10·9-19·7)	p < 0·001
Chittagong	0·0% (·-·)	0·5% (-0·5-1·4)	0·309
At least one immigrant returned to community or home village	6·0% (3·4-8·5)	13·4% (10·0-16·7)	0·001
Place of origin (last arrival)			
Cox's Bazar	70·5% (52·2-88·9)	25·5% (12·1-38·9)	p < 0·001
Chittagong	15·9% (2·6-29·2)	42·3% (26·0-58·5)	0·017
Dhaka	3·7% (-3·7-11·1)	7·2% (-2·5-17·0)	0·578
Outside of Bangladesh	0·0% (·-·)	21·5% (10·8-32·2)	·

Table 9. Multivariate analysis of factors associated with COVID-19 risk

Data are adjusted odds ratio (95% CI). Estimates are weighted to account for survey design and non-response.

	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	**p-value**
Refugee camp				
Host community	1 (reference)	..	1 (reference)	..
Refugee camp	2·23 (1·50-3·31)	p < 0·001	1·96 (0·89-4·32)	0·094
Were you able to buy essential food items? (last 7 days)				
Yes	1 (reference)	..	1 (reference)	..
No	2·03 (1·25-3·29)	0·004	2·31 (1·27-4·19)	0·006
Has any migrant returned to your community? (last 2 weeks)				
No	1 (reference)	..	1 (reference)	..
Yes	3·30 (1·89-5·76)	p < 0·001	3·67 (1·97-6·84)	p < 0·001
Have you spent at least 1 day away from home? (last 2 weeks)				
No	1 (reference)	..	1 (reference)	..
Yes	1·67 (1·07-2·61)	0·023	2·15 (1·27-3·62)	0·004
Gender				
Male	1 (reference)	..	1 (reference)	..
Female	1·94 (1·23-3·07)	0·004	2·44 (1·36-4·39)	0·003
Trauma events experienced (2019)				
One or none			1 (reference)	..
Two or more			1·12 (0·66-1·90)	0·665
Sociodemographic characteristics (2019)				
Age	NO		YES	
Educational level completed	NO		YES	
Number of households with whom shares a toilet	NO		YES	
Employment status	NO		YES	
Value of household assets	NO		YES	..