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Analyzing the factors breaching preparedness and non-pharmaceutical interventions to contain Coronavirus Disease 2019 in Bangladesh: a knowledge, attitude and practice-based cross-sectional study

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Abstract

Abstract Background: Considering the lack of definitive drug or vaccine, the non-pharmaceutical interventions need to be implemented to control the current coronavirus disease (COVID-19) outbreak, notably in countries with limited resources like Bangladesh. So, the study targeted the university students of Bangladesh as the representatives of the millennials to determine their level of awareness regarding COVID-19. Methods: A cross-sectional study was designed to determine the knowledge, attitude and practices with a co-produced perception section regarding COVID-19 among university students in Bangladesh. The survey was conducted from 16 to 23rd March, 2020. Descriptive and inferential analyses were performed with statistical significance defined as $p < 0.05$. Result: Among 1393 students participated in the study, about one-third of them had a positive attitude towards COVID-19 issues, although only 6.9% had good knowledge. While the majority of the participants followed sneezing/ coughing etiquette, frequent hand washing/sanitizing, limited body contact and public transport, etc., both good knowledge and positive attitude were significantly associated with respondents' good practices. But despite the satisfactory hand hygiene behaviors, awareness is required about the type of sanitizers and the importance of washing hands for 20seconds. Promoting health educative activities through Facebook might be considered to improve the knowledge level, especially to raise awareness about rare symptoms and asymptomatic transmission. However, bazaars might be the potential point of the outbreak that needs to be controlled. Conclusion: The study supports the concerning lack of knowledge among the students along with suggesting the issues to be addressed for successful containment of COVID-19.

Introduction

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) causing the coronavirus disease 2019 (COVID-19) pandemic is currently affecting 213 countries and territories with more than 5.1 million confirmed cases around the world[1]. Besides, 13·8% to 24.9% of infected individuals develop severe cases yielding an age stratified hospitalisation rate up to as high as 18.4% for [?]80 years aged individuals[2]. Also, 30% of hospitalized cases are assumed to require critical care based on early reports from the UK, China and Italy[3,4]. The case fatality rate of the symptomatic patients was initially reported as 1.1% in Wuhan, China, but later found to be elevated up to 7.5% in Italy[2]. Recently the mortality rate has been revised to be 5*6% and 15*2% for China and outside of China respectively[5]. This revised data clearly shows the global limitation of preparedness to combat a pandemic in the context of the ongoing struggle to find the definitive treatment or vaccine for COVID-19 along with the limited facility of supportive treatment[6]. Hence, the

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non-pharmaceutical interventions (NPIs) at both personal and community levels are of high priority to contain COVID-19, especially in countries with inadequate diagnostic and supportive treatment facilities like Bangladesh. The first three COVID-19 cases in this country were confirmed on 8 March 2020 and as of 22 May 2020, a total of 28,511 cases have been confirmed with a case fatality rate of 1.46%[7]. While a mathematical model predicted that the outbreak can be controlled if the viral dissemination can be stopped within 12 weeks, while Bangladesh has already passed 10 weeks with an increasing number of confirmed cases[8]. So, this is high time to follow the NPI measures more strictly not to become the next worst-hit country of the synchronous global pandemic. Even the experiences from the Influenza pandemic showed the significance of NPIs especially for underdeveloped countries with limited capacity to intervene the viral transmission[9]. The Centre for Disease Control and Prevention (CDC) suggested NPIs such as coughing etiquette, washing hands, home quarantine at personal level and social distancing, closure of educational institutions, travel restrictions and banning public events etc. at the community level to prevent pandemic flu/flu-like COVID-19[10]. But the recent study in China showed that correct knowledge and attitude are inevitable to ensure the success of this NPI based containment strategy[11]. While the government has taken measures to ensure social distancing by enforcing nationwide lockdown with the deployment of the Bangladesh Army, breach of COVID-19 restrictions is common due to the general lack of awareness among people. Even WHO is repeatedly warning Bangladesh about the probable catastrophic outcome of COVID-19 due to the unawareness among general people[12]. Besides, experiences from the SARS outbreak in 2002 suggest that the panic emotion oozing from lack of awareness might complicate or fail the containment attempts[13]. Even the knowledge gap will create the fear of being socially stigmatized and marginalized, which may cause the denial of early symptoms and ultimately, delaying the decision of seeking medical care[14]. This tendency was specifically evident among the Asian community during the last SARS pandemic[13]. More importantly, the lesson learnt from China indicated that the severity could have been lowered by 66%, 86%, and even 95%, if the measures had been taken one, two or three weeks earlier respectively[3]. But implementing the draconian lockdown is dilemmatic considering the people with unprivileged economic conditions who are forced to go out for a living. So, the proper planning and policies need to be devised to ensure the successful implementation of NPIs which urges the proper knowledge and attitude among the general population, especially the millennials. Because millennials are being considered most susceptible to COVID-19 due to their false sense of security regarding being infected[15]. So, this study evaluated the knowledge, attitude and practices regarding COVID-19 among the university students across the country so that the loopholes in knowledge and attitude risking the containment strategy can be identified and mitigated to utilize them in raising public awareness.

MATERIALS AND METHODS

Study population

The cross-sectional survey was conducted using a self-administered questionnaire (Supportive information) following the convenient sampling technique among the students of different universities of Bangladesh from 16th to 23rd March, 2020. Initially, the survey was carried out using hardcopies through personal communication, but from 17th March and onward, the rest of the data were collected via Microsoft-forms through social media due to the sudden closure of educational institutions by the government.

Study design

The questionnaire consisted of 3 sections: 1) demographics, 2) knowledge, attitude, practice and 3) Co-produced perception on specific aspects of COVID-19. It was designed to investigate the preparedness of the university students to combat COVID-19 in Bangladesh based on their current knowledge and attitude towards the outbreak and to explore their practices for potential risk assessment. The Cronbach Alpha value of the questionnaires was 0.8 demonstrating an adequate level of internal consistency.

Participants' knowledge was assessed based on 3 open-ended questions (K1-K3) regarding the incubation period, stability of the virus and the recommended hand-sanitizer, 7 close-ended questions regarding the symptoms of COVID-19 (K4-K10) and 6 close-ended questions (K11-K16) regarding viral transmission. Each correct response was assigned a value of 1, while incorrect/ don't know response had a value of 0. So,

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the aggregate score for all questions would range from 0 to 16. According to modified Bloom's cut-off point, the overall knowledge was categorized as good for the score between 80-100% (13-16points), moderate for the score between 50-79% (8-12 points) and poor for the score less than 50% (<8 points). Similarly, attitude was assessed using 14 close-ended questions (A1-A14) and the responses were scored as previously described.

For designing the third section of the questionnaire, an expert panel of different educational backgrounds was contacted via a social media platform. They were asked about their common confusion and the contradictory information they had regarding COVID-19. All the de-identified responses were then refined to co-produce this perception section regarding the scientific name and the fecal-oral transmission of the virus, the effect of temperature on transmission, the effectivity of vitamin C in treatment, gender bias on infection rate.

Statistical Analysis

Data were entered manually and analyzed in SPSS Software Version 20[16]. The descriptive statistics were used to obtain frequencies and percentages for categorical variables and to measure central tendency and dispersion (mean, median and range).

For testing association between categorical variables, cross-tabulation with Pearson's chi-square test was performed. The variation in knowledge and attitude was tested with Mann Whitney U test due to non-normal distribution of the scores. Binary logistic regression was used and an odds ratio (OR) was calculated at 95% confidence intervals(CI) as appropriate. A p-value of <0.05 was considered statistically significant.

Ethics

The participants confirmed their consent to participate voluntarily by signing in the authorization of participation section. No identifying demographic data of the participants were collected. The protocol followed the 1964 Helsinki declaration and its later amendments along with the Checklist for Reporting Results of Internet E-Surveys guidelines[17]. However, the study was approved by the head of the department before the formal survey.

RESULTS

Participants

A total of 1393 university students across the country participated in the survey and were mostly males (869, 62.4%). About four-fifths (1111, 79.8%) of the participants were from the science background, while the rest (282, 20.2%) was from the non-science background.

Knowledge and Attitude towards COVID-19

Only 6.9% of the participants had good knowledge (k) score (13.4+-0.7), while the majority (69.8%) had moderate k score of 9.8+-1.3 on a scale of 0-16 (Table 1). While the respondents were least aware of the duration of viral stability in the environment (20.3%) and the recommended hand sanitizer composition (22.3%), 76.3% of the participants correctly answered about the incubation period of COVID-19 and more than half of them (547, 53.26%) were aware of the transmission from asymptomatic persons ($\chi^2(6,1342)=51.23$, $P<.001$).

In case of attitudes, about 30% of the participants had positive attitudes (Table 2). The students with good knowledge tended to have a positive attitude (OR=3.7, 95% CI=2.4-5.7), while non-parametric Spearman Rank Correlation between knowledge and attitude score showed low degree of correlation ($r_s=0.4$, $P<0.05$). The respondents with poor and moderate k scores predominantly subscribed to a neutral attitude (Figure 1). However, the median knowledge score for the students of the science group (9.2 ± 2.4) was higher than that of non-science backgrounds (8.7 ± 2.4, $p<0.05$). But no such association was found in case of attitude score, although compared to males, a higher percentage of females showed positive attitudes regarding the effectivity of home quarantine (76.3% vs 68.2%, p=.001), drinking water to prevent infection (78.8% vs 74.7%, p<.001) and the increased COVID-19 risk due to smoking (5.3% vs 2.7%, p<.001). The positive attitude towards the risk due to smoking was also found prevalent among the students of the science group, rather than the students of non-science background (76.9% vs 73.5%, p<.001).

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Practices and influencing factors behind practices

More than 70% of the participants regularly practiced most of the preventive measures (Table 3) Washing hands with soap was the most practiced NPI (85.4%), while the least practiced one was disinfecting the frequently touched objects(43.5%) followed by wearing masks(69.1%) and were significantly influenced by the positive attitude (Table 5). In general, the majority of the participants with good k scores was observed to maintain good NPIs compared to the participants with moderate or poor k scores (Table 4). Likewise, participants with a positive attitude showed adherence to good practices (Table 5). However, the students from science background were more likely to wash hands frequently with soap (OR=1.26, 95% CI=0.9-1.8) compared to the students from other disciplines. Further, a large number of the participants were found to sanitize hands after using lifts, although only 11.9% of the participants reported using lifts (Table 3). Alarmingly, 72.5% and 58.1% of the participants or their family members continued going to public places like bazaars and mosques respectively (Table 3).

Participants were found to be more concerned with taking preventive measures than stocking foods, hand sanitizers, etc. Besides, only half (50.1%) of the respondents who thought home quarantine was effective in controlling COVID-19 was found to stock the consumer products ($\chi^2(2,1393)=16.86$, $P< .001$).

Co-produced perception section regarding COVID-19

Only 3.4% of the participants correctly answered the scientific name of the virus (SARS-CoV-2) causing COVID-19, while this open-ended question showed that the majority of the participants incorrectly answered COVID-19 as the scientific name (Fig 2(A)). The participants mostly denied the gender-dependent differential effect on COVID-19 (55.2%) (Fig 2(B)), but were mostly affirmative in recommending masks for healthy individuals (64.6%) followed by viral transmission through contaminated foods (59.7%) (Fig 2(B)). Uncertainty about the effectivity of vitamin C in treating COVID-19 patients was the highest.

Sources of information and its impact

Facebook was the prevalent source of information regarding COVID-19 among the students irrespective of their academic disciplines (Table 6), while other social sites than Facebook was least accessed (Fig 3). Even a higher percentage of the students with good k scores collected information from Facebook compared to those with moderate or poor k scores. Similarly, more students from the science background relied upon Facebook than the students from other academic disciplines. But the scenario was exactly the opposite for other sources of information (Table 6). Besides, among the participants believing that Bangladesh is not at risk of COVID-19, the higher percentage of them were relying on social sites excluding Facebook (8.9% vs 4.7%) or people around (8.7% vs 4.5%) compared to the students not relying on those sources (χ^2 (1,1375) =4.6 and χ^2 (1,1375)$_=$7.2, $p<.05$ respectively). Even using social sites excluding Facebook was mostly noticed among the respondents with neutral attitude compared to the respondents with positive attitude, while the opposite was noticed in case of Facebook, TV/Radio/Newspaper and Online News Portals (Table 6). However, more than half of the participants (52.4%) thinking positively about home quarantine was found not to collect information from TV/ Radio/ Newspaper (χ^2 (1,1375)=5.3, p=0.02).

DISCUSSION

This was the first study to investigate knowledge, attitude and practices (KAP) regarding COVID-19 among university students at the national level. Practicing NPIs was found significantly associated with both good knowledge and positive attitude, which was consistent with the KAP based study in China[11]. But unfortunately, the least prevalence of good knowledge (6.9%) and positive attitude (29.6%) among the educated millennials undoubtedly supports the stark warning of WHO regarding unawareness among the general people in Bangladesh[12]. Adopting a neutral attitude predominately by both moderate and poor k scorers was even more worrying. Besides, despite the male to female ratio in this country being 100.2:100[18] and the participants being mostly males, four-fifth of the participants were unaware of male predisposition to COVID-19[19]. While gender bias was allegedly due to the higher prevalence of smokers among males[19], the males were less concerned about smoking than females($p<.001$). So, the differential impact of gender

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and academic discipline as well on knowledge/attitude proves the need for an immediate and customized program to raise awareness.

To contain COVID-19, the knowledge of transmission routes of SARS-CoV-2 is inevitable. But despite the satisfactory responses about transmission through droplet (sneezing) or body contact (hugging, kissing, handshaking), the risk of getting infected might be higher for the individuals (40.3%) unaware of viral transmission through the conjunctiva. Besides, not disinfecting the frequently touched objects (FTOs) like mobile phone, doorknobs etc. may contribute to the risk which was mostly evident among the participants, while SARS-CoV-2 has been assumed to be viable for approximately 5.6 and 6.8 on stainless steel and plastic respectively and can survive in environment up to 9 days[20]. Improving knowledge about viral stability in the environment may improve the practice. Besides, popularizing the use of bleach, the WHO recommended household disinfectant should be considered[21], as the effectivity of bleach was largely unknown among the students.

The ignorance of covert transmission from asymptomatic cases may discourage the NPIs, while the rate of asymptomatic infection can be 30.8% or even higher, especially among children[22]with the possible disease transmission rate being as high as 31%[23] or even 59%[24]. Besides, the rise in the rate of morbidity and mortality among the young and the mid-aged notified by WHO[25] needs consideration, while the attitude of completely ignoring the risk of COVID-19 for the individuals aged under 50 years was also evident in this study. Besides, this attitude might have contributed partly to the initiation of the outbreak in the country by breaching the self-quarantine restriction of the migrants and return-migrants from COVID-19 hit countries. But believing in absolute effectivity of airport thermal scanner in screening infected cases might be even more responsible for being lackadaisical to maintain the quarantine, while the scanners fail to detect 64% of the presymptomatic passengers[26]. Hence, knowing about the incubation period and recognizing the symptoms correctly, especially the rare ones are crucial for intercepting viral transmission from both symptomatic and asymptomatic cases. Also, considering sneezing or rhinorrhea thus benign common cold or influenza as COVID-19, which are typically not symptoms[27], may create fear and social stigmatization. Besides, overlapping clinical symptoms and laboratory features of COVID-19 and endemic dengue disease in Bangladesh[28] needs to be considered to ensure the successful containment, as 80% of the symptomatic patients need to be traced at least to yield a probability of 80% or more success of COVID-19 control strategies[8].

However, thinking affirmatively about viral transmission through contaminated foods (59.7%) or feces (28.6%) might enforce the NPI measures without causing serious harm, while the fecal-oral transmission has only been suggested in studies[29]. But the prevalent perception of viral transmission through pets needs attention to avoid jeopardizing animal welfare and stigmatization of the pet owners, as no domestic animals have yet been reported to transmit the virus despite the report of dog being infected[30].

The control and mitigation measures were followed satisfactorily by the majority of the participants, especially frequent handwashing, using sanitizers, avoiding public transport, etc. But the prevalent misconception like drinking water frequently to prevent COVID-19 may lead to a false sense of security. Moreover, being optimistic about vitamin C in treating COVID-19 or the temperature of the country reducing viral transmission may also weaken the containment strategy adopted, as despite some promising results, effect of any of these are still not confirmed[31,32]. However, steps should be taken to encourage mass masking, which was less commonly practiced but positively correlated with positive attitude. Although WHO is still not recommending masks for healthy individuals, that is probably to stop the panic buying of masks worldwide to ensure the supply for healthcare professionals. But studies confirmed that mass masking can effectively reduce the infection rate primarily by blocking viral transmission from asymptomatic infectious individuals[33]. Panic buying of hand-sanitizers was also noticed worldwide including 470% increase in sales in USA[34]. The hype of thinking hand-sanitizer superior to soap against SARS-CoV-2 was also evident in this study. But washing hands with soap was more practiced than using sanitizer, while both practices were associated with good knowledge and positive attitude. But alarmingly, less than one-third of the hand sanitizer users knew the recommendation of using >60% alcohol based sanitizers indicating the futility of using sanitizers. Besides,

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more than one-tenth of the students reporting frequent handwashing did not follow the WHO recommended procedure of washing for at least 20s, while more than 5% of the participants even did not know about this recommendation of hand hygiene. However, a study in Nigeria reported a significant influence of health educational messages circulated through social media, newspapers, radio on good handwashing practices during Ebola outbreak to prevent Ebola virus disease[35]. Likewise, using Facebook for COVID-19 related issues among the students including good k scorers indicates the impact of these media in raising awareness, concomitantly that surely reminds the negative impact of social media infodemics. A significant percentage of misinforming COVID-19 tweets have already been reported to be circulating on twitter[36]. Even the typical reluctance of using scientific jargon like SARS-CoV-2 in these media might be a reason behind not knowing the name SARS-CoV-2 and mistaking the disease name, COVID-19 as the virus name. However, the influence of people around in the participants' zero risk attitude about COVID-19 in Bangladesh clearly showed the importance of having correct information. But irrespective of the level of knowledge, practicing NPIs can be challenging due to the unprivileged economic condition of the individuals. Because almost two-thirds of the individuals holding positive attitude towards home quarantine were found reluctant to stock consumer products and even continued going to bazaars daily. But determining the economic influence was beyond the scope of this study.

However, it is no doubt that adapting public attitude towards NPIs is difficult for developing countries. But educating and inspiring millennials to raise awareness might be effective, especially when the NPI practices at the personal level were found in strong association with good knowledge and positive attitude. However, the study is not denying its limitations. As the data were collected from a self-administered questionnaire, the authenticity of the responses could not be cross-checked. Furthermore, the majority of the data were collected through online forms, so the students having no access to the internet might not be able to participate in the study. But despite those limitations, the NPIs, including the personal hygiene-related awareness and its impact on controlling the COVID-19 are worth promoting, especially through social media and other platforms.

CONCLUSION

Non-pharmaceuticals interventions need to be implemented to contain COVID-19, while correct knowledge is unavoidable to ensure the success of this strategy. So, effective strategies need to be devised to raise awareness regarding preventive measures.

REFERENCES

1. Worldometers.info. Worldometer COVID-19 Data. 2020.

2. Livingston E, Bucher K. Coronavirus Disease 2019 (COVID-19) in Italy. JAMA 2020.

3. Ferguson NM, Laydon D, Nedjati-Gilani G, et al. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. imperial.ac.uk 2020.

4. Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. Lancet Infect Dis 2020.

5. Baud D, Qi X, Nielsen-Saines K, Musso D, Pomar L, Favre G. Real estimates of mortality following COVID-19 infection. Lancet Infect Dis 2020.

6. Gautret P, Lagier J-C, Parola P, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. Int J Antimicrob Agents 2020.

7. World Health Organization. Coronavirus disease (COVID-2019) Bangladesh situation report-12. World Heal Organ.

8. Hellewell J, Abbott S, Gimma A, et al. Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. Lancet Glob Heal 2020.

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9. Martinez DL, Das TK. Design of non-pharmaceutical intervention strategies for pandemic influenza outbreaks. BMC Public Health 2014.

10. The Centers for Disease Control and Prevention (CDC 2020). Pandemic preparedness resources. https://www.cdc.gov/coronavirus/2019-ncov/php/pandemic-preparedness-resources.html [Accessed April 18, 2020]. 2020.

11. Zhong BL, Luo W, Li HM, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci 2020.

12. News baaNlaadesher maanuss ascetn, mhaabipd hte paareH jaatisNgh (Un-awareness among general population may bring catastrophe in Bangladesh: WHO) http://amaderdesh24.com/?p=4971&fbclid=IwAR0Vc5SW6tX2AznuzMz1y26pkidkOXpsg4ZpFXhBweb0_-_E0DLSXzQaW3Tw. 2020. [In Bengali]

13. Person B, Sy F, Holton K, et al. Fear and Stigma: The Epidemic within the SARS Outbreak. Emerg Infect Dis 2004.

14. Das V. Stigma, Contagion, Defect: Issues in the Anthropology of Public Health. NIH Conf Stigma Glob Heal Dev a Res Agenda 2001.

15. GUNIA A. News. 'Millennials Aren't Taking Coronavirus Seriously, a Top WHO Official Warns'. Time 2020.

16. SPSS I. SPSS for windows (version 20). Chicago, Ill, USA 2010.

17. Eysenbach G. Correction: improving the Quality of web surveys: the Checklist for Reporting results of internet E-Surveys (CHERRIES). J Med Internet Res 2012;14:e8.

18. Ministry of Health and Family Welfare G of B. National Preparedness and Response Plan for COVID-19, Bangladesh. 2020.

19. Cai H. Sex difference and smoking predisposition in patients with COVID-19. Lancet Respir Med 2020.

20. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. N Engl J Med 2020.

21. WHO. Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19). Who 2020.

22. Mizumoto K, Chowell G. Transmission potential of the novel coronavirus (COVID-19) onboard the diamond Princess Cruises Ship, 2020. Infect Dis Model 2020.

23. Arakawa Y, Shibata N, Shibayama K, et al. Convenient test for screening metallo-β-lactamase-producing gram- negative bacteria by using thiol compounds. J Clin Microbiol 2000.

24. Dong Y, Mo X, Hu Y, et al. Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. Pediatrics March 2020:e20200702.

25. Feuer W. WHO says 'more and more' young people are dying from the coronavirus. CNBC 2020.

26. Chinazzi M, Davis JT, Ajelli M, et al. The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. Science 2020.

27. Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet 2020.

28. Yan G, Lee CK, Lam LTM, et al. Covert COVID-19 and false-positive dengue serology in Singapore. Lancet Infect Dis 2020.

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29. Jiang F, Deng L, Zhang L, Cai Y, Cheung CW, Xia Z. Review of the Clinical Characteristics of Coronavirus Disease 2019 (COVID-19). J Gen Intern Med 2020.

30. Goumenou M, Spandidos D, Tsatsakis A. [Editorial] Possibility of transmission through dogs being a contributing factor to the extreme Covid-19 outbreak in North Italy. Mol Med Rep 2020.

31. Araujo MB, Naimi B. Spread of SARS-CoV-2 Coronavirus likely to be constrained by climate. medRxiv 2020.

32. Majid Rezaei Basiri. Theory about Treatments and Morbidity Prevention of Corona Virus Disease (Covid-19). J Pharm Pharmacol 2020.

33. Leung CC, Lam TH, Cheng KK. Mass masking in the COVID-19 epidemic: people need guidance. Lancet 2020.

34. SERVICE CCW. The item that shoppers are panic-buying in week 5 of coronavirus shutdown. Mercur News 2020.

35. Ilesanmi OS, Alele FO. The effect of Ebola Virus Disease outbreak on hand washing among secondary school students in Ondo State Nigeria, October, 2014. Pan Afr Med J 2015.

36. Kouzy R, Abi Jaoude J, Kraitem A, et al. Coronavirus Goes Viral: Quantifying the COVID-19 Misinformation Epidemic on Twitter. Cureus 2020.

Table 1. Knowledge scores of the participants regarding COVID-19 and SARS-CoV-2

		Correct	Incorrect
Incubation period (2-14days)	Incubation period (2-14days)	1063(76.3%)	320(23.7%)
Coronaviruses survive in environment (upto 9days)	Coronaviruses survive in environment (upto 9days)	283 (20.3%)	1110(79.7%)
Symptoms of COVID-19	Symptoms of COVID-19		
Fever (Common)	Fever (Common)	1249(90.8%)	144(10.3%)
Cough (Common)	Cough (Common)	1221(90.4%)	172(12.3%)
Sneezing (Rare)	Sneezing (Rare)	221(15.9%)	1172(84.1%)
Runny nose (Rare)	Runny nose (Rare)	388(27.9%)	1005(72.1%)
Fatigue (Common)	Fatigue (Common)	771(58.1%)	622(44.7%)
Diarrhea (Rare)	Diarrhea (Rare)	428(32.2%)	965(69.3%)
Pain (Common)	Pain (Common)	987(73.8%)	406(29.1%)
Viral transmission	Viral transmission		
Sneezing (Yes)	Sneezing (Yes)	1334(96.9%)	59(4.2%)
Pets (No)	Pets (No)	374(26.9%)	1019(73.1%)
Hand shaking (Yes)	Hand shaking (Yes)	1290(95.0%)	103(7.4%)
Touching eye (Yes)	Touching eye (Yes)	832(61.5%)	561(40.27%)
Hugging/kissing (Yes)	Hugging/kissing (Yes)	1224(90.6%)	169(12.1%)
Asymptomatic (Yes)	Asymptomatic (Yes)	685(49.2%)	708(50.8%)
Any hand sanitizer will be effective (>60% alcohol based)	Any hand sanitizer will be effective (>60% alcohol based)	310 (22.3%)	1083(77.7%)
Level of knowledge (Mean±SD)	Frequency (%)	Frequency (%)	Frequency (%)
Good (13.4±0.7)	96(6.9%)	96(6.9%)	96(6.9%)
Moderate (9.8±1.3)	972(69.8%)	972(69.8%)	972(69.8%)

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		Correct	Incorrect
Poor (5.8±1.5)	325(23.3%)	325(23.3%)	325(23.3%)

Table 2: Attitude of the participants towards COVID-19 issues

	Positive	Negative	Neutral
Smoking increases the risk (agreed)	1060(76.7%)	112(8.1%)	210(15.2%)
Frequent water uptake prevents COVID-19 (disagreed)	330(23.7%)	757(54.3%)	306(22%)
Thermal scanner is 100% effective in detecting infected persons (disagreed)	530(38.1%)	489(35.1%)	374(26.8%)
Bangladesh is at high risk (agreed)	1302(94.7%)	73(5.3%)	18 (1.3%)
Home quarantine can prevent COVID-19(agreed)	990(71.9%)	386(28.1%)	17(1.3%)
Closing the educational institute is effective (agreed)	1287(93.5%)	59(4.3%)	30(2.2%)
..... is effective against SARS-CoV-2			
Soap (yes)	854(62.7%)	276(20.3%)	231(17%)
Sanitizer (yes)	1115(82.2%)	104(7.7%)	138(10.2%)
Bleach (yes)	535(39.9%)	198(14.8%)	607(45.3%)
Disinfectants (yes)	912(67.8%)	117(8.7%)	317(23.6%)
..... age group is in risk.			
0-10years (risk)	986(70.8%)	211(15.4%)	173(12.6%)
10-30years (risk)	1130(81.12%)	111(8.2%)	109(8.1%)
30-50years (risk)	1199(86.1%)	30(2.2%)	118(8.8%)
More than 50 (risk)	1288(92.46%)	8(0.6%)	63(4.6%)
Level of attitude (Mean±SD)	Frequency(%)	Frequency(%)	Frequency(%
Positive(12.5±0.7)	412(29.6%)	412(29.6%)	412(29.6%)
Neutral(9.9±1.1)	808(58%)	808(58%)	808(58%)
Negative(5.6±2)	173(12.4%)	173(12.4%)	173(12.4%)

Table 3. Practices for preventing COVID-19

	Yes	No	No need[a]/don't know[b]/not valid[c]
Following Sneezing/coughing etiquette	1088(79.3%)	194(14.1%)	90(6.6%)[a]
Limited body contact	1021(75%)	265(19.5%)	75(5.5%)[a]
Using mask	940(69.1%)	350(25.7%)	71(5.2%)[a]
Using hand sanitizer	1046(77.4%)	255(18.9%)	51(3.8%)[a]
Washing hands with soap	1160(85.4%)	161(11.8%)	38(2.8%)[a]
Limited public transport	957(70.6%)	321(23.7%)	78(5.8%)[a]
Avoid touching frequently touched objects(FTOs)	973(71.7%)	318(23.4%)	66(4.9%)[a]
Cleaning FTOs regularly	588(43.5%)	689(50.9%)	76(5.6%)[a]
Washing hands for 20s	1046(75.7%)	265(19.2%)	71(5.1%)[b]

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	Yes	No	No need[a]/don't know[b]/not valid[c]
stocking sanitizer/consumer products	649(46.6%)	762(52.8%)	-
Sanitizing hands after using lift	95(6.9%)	68(4.9%)	1212(88.1%)[c]
Going to public places			
Mosque	810(58.1%)	453(32.5%)	130(9.3%)[c]
Gym	89(6.4%)	1116(80.1%)	188(13.5%)[c]
Bazaar	979(72.5%)	298(22.1%)	188(13.5%)[c]
Others	586(44.1%)	410(30.8%)	334(25.1%)[c]

Table 4: Comparison of the COVID-19 preventive practices with good knowledge and positive attitude

	Good knowledge (n=96)	Moderate knowledge (n=972)	Poor knowledge (n=325)	χ^2 value	P value
	n(%)	n(%)	n(%)		
Sneezing/ Coughing Etiquette	90 (93.8)	784 (80.7)	214 (65.9)	46.0	<.001
Limited body contact	90 (93.8)	753 (77.5)	178 (54.8)	86.2	<.001
Using masks	63 (65.6)	675 (69.4)	202 (62.2)	6.1	0.05
Using hand sanitizers	79 (82.3)	761 (78.3)	206 (63.4)	31.8	<.001
Hand washing with soap	91 (94.8)	845 (87)	224 (68.9)	66.5	<.001
Avoiding public transport	86 (89.6)	694 (71.3)	177 (54.5)	53.4	<.001
Avoiding FTOs	86 (89.6)	711 (73.1)	176 (54.2)	60.8	<.001
Disinfecting FTOs regularly	43 (44.8)	433 (44.5)	112 (34.5)	10.4	.005

Table 5: The odds ratio between different practices and good knowledge and positive attitude

Variables	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95%
	Good Knowledge	P value	Positive Attitude	P value
Sneezing/Coughing Etiquette	3.9 (1.7 - 9.1)	.001	1.6 (1.2-2.2)	.003
Limited body contact	4.5 (1.6-10.6)	<.001	2.93 (2.13 -4.03)	<0.001
Using masks	0.8 (0.5- 1.3)	.43	1.3 (1.1 – 1.7)	.02
Using hand-sanitizers	1.4 (0.8- 2.4)	.25	1.6 (1.2- 2.2)	.001
Hand washing with soap	3.1 (1.2 -7.7)	.01	2.5 (1.7-3.6)	<.001
Avoiding public transport	3.4 (1.7- 6.4)	<.001	2.4 (1.8- 3.3)	<.001

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Variables	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95%
Avoiding touching FTOs	3.3 (1.7- 6.4)	.001	2.1 (1.6- 2.8)	<.001
Disinfecting FTOs	0.9 (0.6-1.5)	0.8	1.7 (1.3-2.1)	<.001

Table 6: Categorization of information sources regarding COVID-19 according to Gender, Academic disciplines, Attitude/Knowledge score and their association by chi-square analysis

	Gender	**Gender**		**Academic Disciplines**	**Academic Disciplines**	
	Male	**Female**	**P**	**Science**	**Non-science**	**P**
F	555(63.9)	354(68.3)	.1	733(66.0)	154(54.6)	.005
SS	157(18.1)	77(14.9)	.1	160(14.4)	71(25.2)	.001
PPL	172(19.8)	83(16.0)	.08	189(17.0)	61(21.6)	.03
TRN	421(48.4)	214(41.3)	.01	479(43.1)	140(49.6)	.009
ON	485(55.8)	231(44.6)	.01	578(52.0)	131(46.5)	.3
G	184(21.2)	73(14.1)	0.001	170(15.3)	83(29.4)	<0.001

	Attitude Score	**Attitude Score**	**Attitude Score**	**P**	**Knowledge Score**	**Knowledge Score**	**Kno**
	Positive	**Neutral**	**Negative**		**Good**	**Moderate**	**Poo**
F	297(72.1)	502(62.1)	111(64.2)	.003	73(76.0)	653(67.2)	184(
SS	53(12.9)	156(19.3)	25(14.5)	.01	11(11.5)	157(16.2)	66(2
PPL	69(16.7)	150(18.6)	36(20.8)	.5	12(12.5)	180(18.5)	63(1
TRN	215(52.2)	348(43.1)	72(41.6)	.006	46(47.9)	442(45.5)	147(
ON	218(52.9)	433(53.6)	68(39.3)	.002	54(56.3)	516(53.1)	149(
G	80(19.4)	149(18.4)	29(16.8)	.7	18(18.8)	189(19.4)	51(1

(F=Facebook, SS=Social Sites other than Facebook, PPL=People around, TRN=TV/Newspaper/Radio, ON=Online News Portals, G=Govt. notices/texts sent by Govt. authorities)

Figure 1: Chi-square test showed the association between knowledge and attitude score [$\chi^2(4, 1393)=199.2$, $p<.001$]. Positive attitude was prevalent among good knowledge scorers, while neutral attitude was common among medium or poor knowledge scorers.

Figure 2: (A) Students' perception of the scientific name of the virus causing COVID-19. 3.4% of the participants correctly knew the scientific name (SARS-CoV-2), while the majority mistook COVID-19 as the virus name.

Figure 2: (B) Co-produced perception section regarding the common confusing aspects of COVID-19 . The participants were mainly affirmative about wearing maks and viral transmission through contaminated foods, while they answered in negative prevalently regarding gender bias, effect of temperature on the viral transmission and viral transmission through feces.

Figure 3: Sources of information regarding COVID-19. The participants accessed Facebook followed by online news portals and TV/Radio/Newspapers respectively. Among the other sources, the prevalence of individuals relying on Govt. notices/texts sent by governmental authorities and people around were almost equal, while the least accessed one was other social sites than Facebook.

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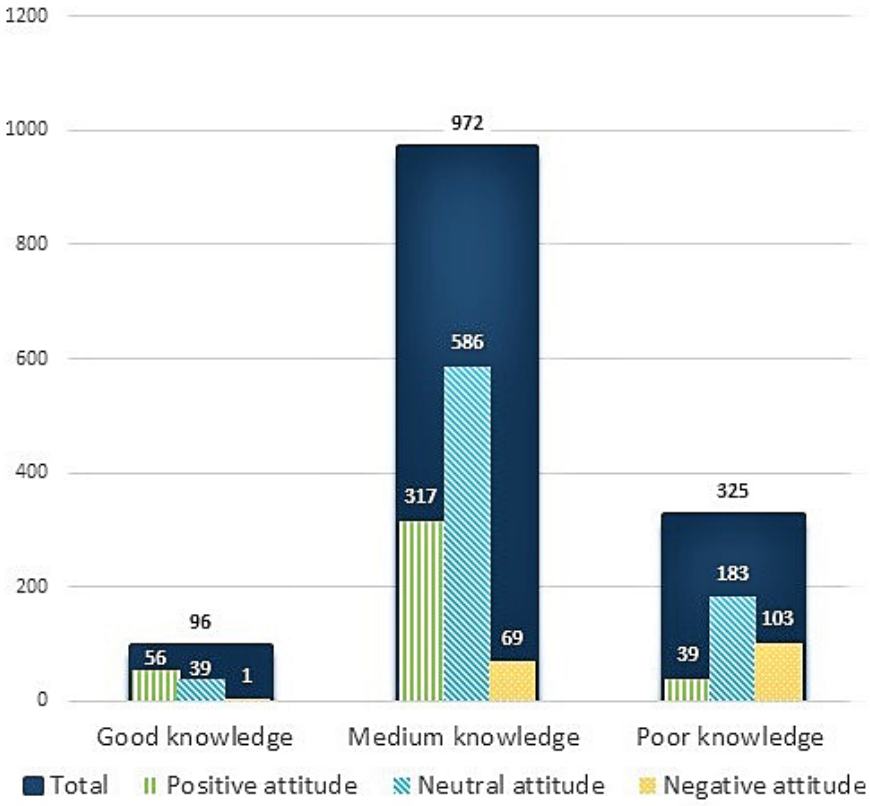

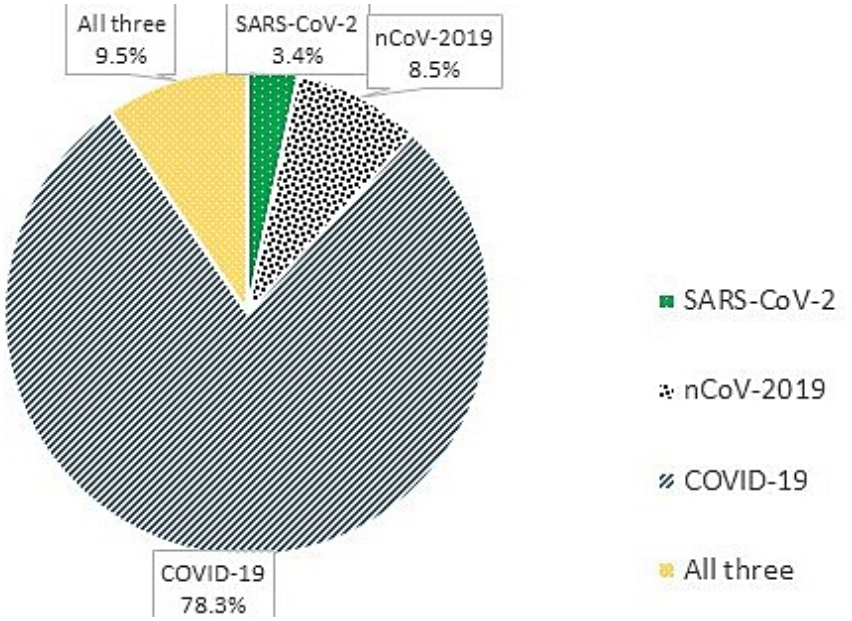

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