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Review Article

Knowledge and Perception of COVID-19 Related Social Distancing Regulations: A Cross-Sectional Study of Bangladeshis Living in Bangladesh and the United States

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Abstract

This study compared the Perception of Social Distancing Regulations (PSDR) among Bangladeshis living in Bangladesh (BD) and the United States (US).

Methods: Data were collected through a cross-sectional survey (n = 2338; BD=1879, US=459) using social media platforms during June and July 2020. Based on the responses, 'Perception Scores' with values ranging from 0-9 were assigned. Using SAS 9.4, bivariate analyses and ordinal logistic regression were conducted to investigate the relationship between PSDR and Sociodemographic Characteristics (SDCs).

Results: Bivariate analyses showed PSDR is significantly related with highest level of education among participants from the U.S. (p=0.002) and BD (p<0.0001); household income (p=0.001) and area of residence (p=0.002) among the participants of BD. Ordinal logistic regression revealed significant effect of education but no effect of household income in predicting higher PSDR score.

Conclusion: In a population of the same ethnic origin, the role of SDCs varies in predicting the COVID-19 related PSDR score based on their current primary country of residence.

Introduction

COVID-19 is a respiratory viral contagious disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1,2]. Since its first identification in Wuhan, China in December 2019 [3], more than 177 million cases have been confirmed with 3.8 million confirmed deaths [4], making COVID-19 one of the deadliest pandemics in history. The disease was declared a global pandemic by the World Health Organization on 11 March 2020.

In public health, social distancing generally refers to a set of non-pharmaceutical measures that are intended to halt the spread of a contagious disease by imposing physical distancing among a population group (the physical distance may vary from one country to another and may change with time) and reducing the frequency of interaction/contact among the population [5,6]. In an attempt to 'flatten the curve' [7], during the early stages of the pandemic, social distancing guidelines such as self-isolation, quarantine were enforced as preventive measures. Prior to the development of an effective vaccine, such preventive measures played a pivotal role in checking the rapid spreading of the disease and reducing the infection rate [8,9]. However, social distancing guidelines have also paved the way to adverse effects on the mental status and lifestyle of people belonging to different age [10,11], gender [12-14], profession [15,16], socio-economic background [17,18], race and ethnicity [19,20]. Generally characterized as a developing nation, Bangladesh has emerged as one of the fastest growing economies in the last decade which is largely attributed to its demographic dividend, stable macroeconomic conditions, and exports in the garments sector [21]. Being one of the world's densest populations, the government of Bangladesh has faced significant challenges in imposing social distancing measures [22,23]. Alongside socio-economic hurdles of social distancing guidelines associated to the COVID-19 pandemic, several studies have reported severe adverse impact on the



mental health and psychological status [24-28] of Bangladeshi people.

In this study, we aim to elucidate the perception of social distancing guidelines among Bangladeshis living in two geographic regions – Bangladesh and The United States of America.

Methods

Study Design and Participants

A web-based cross-sectional study was conducted among people of Bangladeshi origin living in their home country and abroad. Participants were divided into two groups -- primarily residing in their native country and currently living in the United States either due to permanent migration, or job, or higher education. Participants living outside of these two countries were not included in this study due to relatively smaller sample size and demographic heterogeneity.

Data Collection

The data for this study was collected in the period between June 1st and July 31st, 2020. A structured questionnaire was developed and distributed through social media platforms. In the first page of the data collection instrument, the purpose of the study was stated and written informed consent was sought from the participants. Participation was voluntary and anonymity was preserved. The entire questionnaire including the cover page was developed in English with Bengali translation provided within parenthesis. The questionnaire was developed focusing on collecting information in three major sections. The first section included questions about sociodemographic characteristics i.e., age, gender, country of primary residence, length of residence, area of residence, educational status, income, and marital status. In the second section, participants were asked several questions about their knowledge and perception of social distancing regulations during the COVID-19 pandemic. In the third section of the questionnaires, participants were asked to choose reasons they believe are keeping them from complying with the regulations of social distancing e.g., employment issues such as inability to work from home, overcrowded living space, excessive boredom from staying at home, lack of proper information regarding the social distancing regulations, etc.

Measures

The main outcome of interest in this study was the knowledge and perception of the participants about the COVID-19 related social distancing regulations which was measured by a scoring system with the range of possible scores from 0 to 9. Participants were asked what they understand by social distancing and to choose as many responses as they think are correct from a list of options e.g., staying at least 3-6 feet from other people when going outside, using facemask when going out, avoiding unnecessary travels outside the city or country, etc. One point was assigned for choosing each of the seven correct responses. They were also asked if they think during the COVID-19 pandemic it is okay to “go out and socialize if someone is healthy” and “continue normal socializing wearing a face mask”. One point was assigned for answering no to each of the questions. Finally, the Perception of Social Distancing Regulation (PSDR) score was calculated by summing up all the assigned points.

Data Cleaning

The total number of respondents were 3008. We excluded 45 participants who did not primarily reside in the US or Bangladesh and 240 participants who reported primarily residing in both countries. We also excluded 54 participants who were below 18 years old, 319 participants who looked up answers during the survey, and 12 participants for contradictory answers to some questions. The final number of total respondents after cleaning the data was 2338.

Handling of Missing Data

Around 38% of the participants declined to report their income in the survey response. A univariate t-test comparing the mean PSDR score between the missing and non-missing income categories confirmed a Missing Completely at Random (MCAR) mechanism. We used Multiple Imputation (MI) process to impute the income information for these participants. MI is a state-of-the-art technique to handle missingness of the data that generates several copies of the dataset and fills in each copy with different estimates of the missing values. Finally, it pools all the imputed datasets to combine the parameter estimates and standard errors into a single set of results.

Statistical Analysis

Descriptive statistics of the sample demographic characteristics were calculated separately for participants residing in the United States and Bangladesh. Additionally, the frequency and percentage of responses to the social distancing regulation questions were calculated and reported by the country of primary residence of the participants. Bivariate analysis was performed to assess the association between the 3 categories of PSDR score (0-3, 4-6, and 7-9) and sociodemographic characteristics of the participants according to their primary country of residence. Finally, the imputed dataset was used to conduct multiple logistic regression analyses to investigate the predictability of PSDR score by the sociodemographic characteristics of participants from each country. All analyses were performed by SAS 9.4.

Results

A total of 2338 participants were selected for this study with around 80% (n = 1879) primarily residing in Bangladesh and 19% (n = 459) living in the United States. For participants living in Bangladesh most were 18-34 years old (n=1475; 78%); female (n=964; 51%); living in urban area (n=1326; 70%) with a graduate or professional degree (n=1448; 77%). Similarly, for participants living in the United States most were 18-34 years old (n=304; 66%); female (n=248; 54%); living in urban area (n=291; 63%) with a graduate or professional degree either from Bangladesh (n=190; 41%) or the United States (n=209; 45%). Majority of the participants from Bangladesh has a high annual household income of 84,000 BDT or more (n=607; 53%). On the other hand, majority of the participants from the United States has a low annual household income of \$31,000 or less (n=123; 39%) (**Table 1**). Mean PSDR score is slightly higher among the U.S. participants (7.58, ± 1.90) than the participants from Bangladesh (6.27, ± 2.48). Most of the participants from the United States correctly identified the 9 survey responses that were used to create the PSDR score. On the other hand, only 55% (n=1043) participants from Bangladesh identified food and grocery deliveries as a part of the social distancing. Overall, 46% (n=1,116) participants think it is okay to continue normal socializing while wearing a face mask during the COVID-19 pandemic (**Table 2**). Bivariate analysis showed significant association of the 3 PSDR score categories with gender (p-value = 0.01) and highest level of education (p-value = 0.002) for the participants primarily living in the United States. For participants living in Bangladesh, PSDR score was significantly associated with age (p-value = 0.002), highest level of education (p-value <0.001), household income (p-value = 0.001), and area of residence (p-value = 0.002) **Table 3** and **Table 4** shows the results of multiple imputation with 50 iterations for the annual household income of participants. Fraction of Missing Information (FMI) varies around 30% for all categories of income from either country. For participants from both countries relative frequencies are high around 99% and 98%, respectively for the U.S. and Bangladesh. Multiple ordinal logistic regression analysis revealed that, having at least an undergraduate education positively contribute to higher PSDR score for participants from both countries with high statistical significance. Being a female (p-value = 0.002) positively contributes to higher PSDR for participants from the United States. For participants from Bangladesh living in the suburban (p-value= 0.01) or urban (p-value = 0.001) also positively contributes to higher PSDR scores compared to being a resident in the rural area (**Table 5**).

**Table 1:** Demographic characteristics of participants by their primary country of residence

	Participants primarily residing in the U.S., n (%)	Participants primarily residing in Bangladesh, n (%)	Total, n (%)
Total no. of participants	459 (19.63)	1879 (80.37)	2338 (100)
Age group			
18-34 years	304 (66.23)	1475 (78.50)	1779 (76.09)
35-64 years	121 (26.36)	320 (17.03)	441 (18.86)
65 years or more	34 (7.41)	84 (4.47)	118 (5.05)
Gender			
Male	211 (45.97)	915 (48.70)	1126 (48.16)
Female	248 (54.03)	964 (51.30)	1212 (51.84)
Highest level of education			
5 th grade	3 (0.65)	14 (0.75)	17 (0.73)
8 th grade	4 (0.87)	23 (1.22)	27 (1.15)
10 th grade	11 (2.40)	66 (3.51)	77 (3.29)
12 th grade	42 (9.15)	306 (16.29)	348 (14.88)
Bangladeshi University or professional education	190 (41.39)	1448 (77.06)	1638 (70.06)
U.S. university or professional education	209 (45.53)	7 (0.37)	216 (9.24)
Technical or vocational education	0 (0.00)	15 (0.80)	15 (0.64)
Household income			
Lowest income (<\$31,000 or < 12,000 BDT)	123 (39.42)	117 (10.37)	240 (10.56)
Lower-middle income (\$31,000-- \$42,000 or 12,000 – 35,999 BDT)	47 (15.06)	162 (14.36)	209 (9.02)
Middle income (\$42,000 -- \$126,000 Or 36,000 – 59,999 BDT)	97 (31.09)	136 (12.06)	233 (10.09)
Upper-middle income (\$126,000--\$188,000 Or 60,000—83,999 BDT)	26 (8.33)	106 (9.40)	132 (5.73)
Higher income (≥\$188,000 or ≥84,000 BDT)	19 (6.09)	607 (53.81)	626 (26.90)
Declined to answer	147(32.03)	751 (39.97)	898 (37.68)
Area of residence			
Urban	291 (63.40)	1326 (70.57)	1617 (69.16)
Suburban	155 (33.77)	386 (20.54)	541 (23.14)
Rural	13 (2.83)	167 (8.89)	180 (7.70)

Table 2: Comparison of knowledge and perception of social distancing among the participants by their primary country of residence

	Participants primarily residing in the U.S., n (%)	Participants primarily residing in Bangladesh, n (%)	Total, n (%)
PSDR score (mean, ± SD)	7.58 (±1.90)	6.27 (±2.48)	6.53 (±2.43)
What do you understand by social distancing?			
Staying at least 3-6 feet from other people when going outside for essential reasons	455 (99.13)	1791 (95.32)	2246 (96.07)
Avoiding gathering with friends and family at home	395 (86.06)	1165 (62)	1560 (66.72)
Staying out of crowded places and avoiding mass gatherings	407 (88.67)	1317 (70.09)	1724 (73.74)
Avoiding unnecessary travels outside the city or country you live in	387 (84.31)	1267 (67.43)	1654 (70.74)
Working/ studying from home	353 (76.91)	1053 (56.04)	1406 (60.14)
Using delivery services for food, groceries, medications, etc.	354 (77.12)	1043 (55.51)	1397 (59.75)
Using facemask when going out for essential reasons	405 (88.24)	1384 (73.66)	1789 (76.52)
It is not okay to continue normal socializing even if wearing face masks properly during the COVID-19 pandemic	286 (62.31)	986 (52.47)	1272 (54.41)
It is not okay to go out and socialize during the pandemic even if someone is healthy	438 (95.42)	1775 (94.47)	2213 (94.65)

**Table 3:** Bivariate analysis: association between PSDR score categories and sociodemographic factors by the country of primary residence of the participants

Perception score categories	Participants primarily residing in the U.S., n (%)			p-value	Participants primarily residing in Bangladesh, n (%)			p-value
	0-3	4-6	7-9		0-3	4-6	7-9	
Age group				0.89 ^a				0.002 ^a
18-34 years	19 (6.25)	46 (15.13)	239 (78.62)		334 (22.64)	305 (20.68)	836 (56.68)	
35-64 years	9 (7.44)	21 (17.36)	91 (75.21)		59 (18.44)	88 (27.50)	173 (54.06)	
65 years or more	2 (5.88)	7 (20.59)	25 (73.53)		8 (9.52)	26 (30.95)	50 (59.52)	
Gender				0.01 ^a				0.98 ^a
Male	18 (8.53)	43 (20.38)	150 (71.09)		194 (21.20)	204 (22.30)	517 (56.50)	
Female	12 (4.84)	31 (12.50)	205 (82.66)		207 (21.47)	215 (22.30)	542 (56.22)	
Highest level of education				0.002 ^b				<0.001 ^b
5 th grade	1 (33.33)	1 (33.33)	1 (33.33)		4 (28.57)	5 (35.71)	5 (35.71)	
8 th grade	1 (25.00)	2 (50.00)	1 (25.00)		5 (21.74)	13 (56.52)	5 (21.74)	
10 th grade	1 (9.09)	0 (0.00)	10 (90.91)		17 (25.76)	22 (33.33)	27 (40.91)	
12 th grade	7 (16.67)	11 (26.19)	24 (57.14)		78 (25.49)	78 (25.49)	150 (49.02)	
Bangladeshi University	10 (5.26)	28 (14.74)	152 (80.00)		290 (20.03)	297 (20.51)	861 (59.46)	
U.S. university	10 (4.78)	32 (15.31)	167 (79.90)		4 (57.14)	0 (0.00)	3 (42.86)	
Vocational education	0	0	0		3 (20.00)	4 (26.67)	8 (53.33)	
Household income				0.06 ^b				0.001 ^a
Lowest income (<\$31,000 or < 12,000 BDT)	9 (7.14)	26 (20.63)	91 (72.22)		20 (16.53)	37 (30.58)	64 (52.89)	
Lower-middle income (\$31,000-- \$42,000 or 12,000 - 35,999 BDT)	4 (8.51)	12 (25.53)	31 (65.96)		48 (29.27)	30 (18.29)	86 (52.44)	
Middle income (\$42,000 -- \$126,000 or 36,000 - 59,999 BDT)	4 (4.00)	9 (9.00)	87 (87.00)		25 (18.38)	30 (22.06)	81 (59.56)	
Upper-middle income (\$126,000--\$188,000 or 60,000--83,999 BDT)	2 (7.41)	3 (11.11)	22 (81.48)		25 (23.36)	35 (32.71)	47 (43.93)	
Higher income (≥\$188,000 or ≥84,000 BDT)	2 (10.00)	3 (15.00)	15 (75.00)		114 (18.72)	134 (22.00)	361 (59.28)	
Declined to answer	9 (6.47)	21 (15.11)	109 (78.42)		169 (22.78)	153 (20.62)	420 (56.60)	
Area of residence				0.16 ^b				0.002 ^a
Urban	25 (8.59)	48 (16.49)	218 (74.91)		262 (19.76)	298 (22.47)	766 (57.77)	
Suburban	5 (3.23)	23 (14.84)	127 (81.94)		86 (22.28)	79 (20.47)	221 (57.25)	
Rural	0 (0.00)	3 (23.08)	10 (76.92)		53 (31.74)	42 (25.15)	72 (43.11)	

^aChi-square test^bFisher's Exact test**Table 4:** Results of multiple imputation with 50 iterations for the annual household income variable

Annual Household Income	Participants primarily residing in the U.S.				Participants primarily residing in Bangladesh			
	Before imputation, n (%)	After Imputation, n (%)	Fraction Missing Information (FMI)	Relative Efficiency	Before imputation, n (%)	After Imputation, n (%)	Fraction Missing Information (FMI)	Relative Efficiency
Lowest income (<\$31,000 or < 12,000 BDT)	123 (39.42)	9284 (40.45)	Ref	Ref	117 (10.37)	3899 (10.38)	Ref	Ref
Lower-middle income (\$31,000-- \$42,000 or 12,000 - 35,999 BDT)	47 (15.06)	4013 (17.49)	0.2195	0.9956	162 (14.36)	5710 (15.19)	0.3882	0.9810
Middle income (\$42,000 -- \$126,000 or 36,000 - 59,999 BDT)	97 (31.09)	6597 (28.75)	0.3378	0.9933	136 (12.06)	4482 (11.93)	0.3215	0.9842
Upper-middle income (\$126,000--\$188,000 or 60,000--83,999 BDT)	26 (8.33)	1761 (7.67)	0.3274	0.9935	106 (9.40)	3434 (9.14)	0.2728	0.9865
Higher income (≥\$188,000 or ≥84,000 BDT)	19 (6.09)	1295 (5.54)	0.2698	0.9946	607 (53.81)	20055 (53.37)	0.2890	0.9858

**Table 5:** Logistic regression analysis: association between PSDR score and sociodemographic characteristics by country of primary residence

Sociodemographic characteristics	Participants primarily residing in the U.S.		Participants primarily residing in Bangladesh	
	β (95% CI)	p-value	β (95% CI)	p-value
Age group				
18-34 years	Ref	Ref	Ref	Ref
35-64 years	-0.02 (-0.44 - 0.40)	0.93	0.13 (-0.18 - 0.43)	0.42
65 years or more	0.42 (-0.26 - 1.10)	0.22	0.99 (-0.43-1.56)	0.06
Gender				
Male	Ref	Ref	Ref	Ref
Female	0.55 (0.21- 0.90)	0.002	0.11 (-0.12, 0.33)	0.34
Highest level of education				
5 th grade	Ref	Ref	Ref	Ref
8 th grade	1.29 (-1.45 - 4.03)	0.36	-0.03 (-1.66 - 1.60)	0.97
10 th grade	3.02 (0.64 - 5.40)	0.01	0.73 (-0.71 - 2.17)	0.32
12 th grade	1.59 (-0.59 - 3.77)	0.15	0.87 (-0.48 - 2.21)	0.21
Bangladeshi University or professional education	2.81 (0.69 - 4.93)	0.0094	1.39 (0.06 - 2.72)	0.04
U.S. university or professional education	2.85 (0.74 - 4.98)	0.0082	-0.45 (-2.69 - 1.78)	0.69
Technical or vocational education*	-	-	1.29 (-0.52 - 3.10)	0.16
Household income				
Lowest income (<\$31,000 or < 12,000 BDT)	Ref	Ref	Ref	Ref
Lower-middle income (\$31,000-- \$42,000 or 12,000 - 35,999 BDT)	-0.30 (-0.90 - 0.32)	0.35	-0.64 (-1.21 to -0.06)	0.03
Middle income (\$42,000 -- \$126,000 Or 36,000 - 59,999 BDT)	0.51 (-0.004 - 1.02)	0.052	-0.03 (-0.61 - 0.54)	0.92
Upper-middle income (\$126,000--\$188,000 Or 60,000--83,999 BDT)	0.40 (-0.38 - 1.17)	0.31	-0.57 (-1.17 - 0.03)	0.06
Higher income (≥\$188,000 or ≥84,000 BDT)	-0.37 (-1.37 - 0.62)	0.46	-0.09 (-0.54 - 0.36)	0.70
Area of residence				
Rural	Ref	Ref	Ref	Ref
Suburban	-0.06 (-1.10, 0.97)	0.91	0.57 (0.12 - 1.03)	0.01
Urban	-0.45 (-1.47, 0.56)	0.38	0.68 (0.27 - 1.09)	0.001

No observations

Discussion

Maintaining social distancing has been a fundamental public health measure during the initial fight against the COVID-19 pandemic. The effectiveness of various social distancing measures depends more on the compliance of general population than on central decision making by the government. The aim of this study was to assess the knowledge and perception of social distancing regulations among Bangladeshis and explore if sociodemographic factors predict their level of knowledge. We compared the findings with the knowledge level and the impact of sociodemographic factors on a sample of participants of same ethnic origin but living in a developed country. To date, no research has been conducted to explore this viewpoint. The most notable difference in the sociodemographic factors between these two groups of participants was in the distribution pattern of their household income. Although, in terms of the highest level of education, both groups have similar percentage of participants who completed university education, most of the participants from Bangladesh reported being in the highest category of the household income while the majority of the participants from the U.S. belonged to the lowest income groups. In bivariate analysis, household income was found to be significantly associated with the 3 categories of PSDR score for participants living in Bangladesh, but ordinal logistic regression with imputed dataset did not reveal any significant role of household income in predicting PSDR score for neither of the countries' participants. The overall PSDR score was 6.53 with

a standard deviation of 2.43. U.S. participants, despite having similar education level distribution and comparatively being in the lower income category, have higher mean PSDR score than Bangladeshi participants. Clearly the annual household income did not play much role in predicting the PSDR score in neither group of the participants. Rather, for participants from both countries people who have completed university level education were found to score significantly higher compared to the persons who completed elementary level education only. These findings indicate the possible paucity among the low educated group of people regarding interpreting the directions issued by the government for maintaining social distance during the COVID-19 pandemic.

There are some limitations of our study that impacts the generalizability of the findings. Firstly, the data was collected through a web-based questionnaire circulated in the social media which heavily represent the younger, wealthier, urban population with higher education. Secondly, the instrument used in measuring the PSDR score was not validated previously. However, a high Cronbach's alpha value (0.87) indicates the reliability of the questionnaire.

Conclusion

While governments worldwide had introduced social distancing measures to mitigate the burden of COVID-19 pandemic, the compliance of public heavily



depended on the effective conveying of the message to the diverse group of population. Findings from the study underscores the importance of tailoring the message according to the sociodemographic characteristics of the target population, especially level of education. Future research with higher statistical rigor is needed to further advance the knowledge regarding effective message delivery for taming the pandemic.

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