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Impact of COVID-19 pandemic on the physical, mental and social health of the suburban and rural adult population in Bangladesh

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Abstract

***Background and objectives*:** The COVID-19 pandemic caused a significant impact on health worldwide. Adverse effect of COVID-19 on health-related quality of life is significant. This study aimed to find out the impact of COVID-19 on the physical, mental and social health of suburban and rural adult population in Bangladesh.

***Methods*:** A suburban and a rural community were purposively selected. The suburban and rural areas were located about 40 km and 130 km north and north-east of Dhaka city respectively. People aged ≥20 years in the selected communities were enrolled in the study. The investigation procedure included socio-demographic and clinical history, anthropometry, and clinical examination and laboratory investigations. Depression, Anxiety and Stress Scale-21 (DASS-21) and 36-Item Short Form Health Survey (*SF-36)* questionnaires were used for assessing mental and social health respectively. Knowledge, attitude and practice (KAP) regarding the prevention and transmission of COVID-19 was assessed by a validated questionnaire and interview.

***Results*:** Total 385 individuals (suburban=201, rural=184) were enrolled in the study. Out of 385, 116 and 269 were male and female, respectively. Out of total 385 participants, depression, anxiety and stress were present in 113 (29.4%), 144 (37.4%) and 70 (18.2%) respectively, while 210 (54.5%) were normal. Extremely severe depression, anxiety and stress were present in 3.6%, 6% and 0.5%, respectively. Depression and anxiety did not differ between suburban and rural populations, though stress was significantly higher among the suburban ($p<0.05$) population. Social functioning was limited in more than 50% as opposed to excellent (5.5%) or good (39.8%). Almost 60% of the participants had to cut-down schedule of heavy work. Moderate to minimal physical activities were less affected, though weakness and nervousness predominantly hindered socialization. About the prevention and transmission of COVID-19, awareness and attitude were found satisfactory (≥45%), though practice was neglected (<30%).

***Conclusions*:** This is the first study in Bangladesh to report the impact of the COVID-19 pandemic on the physical, mental, and social health of adult suburban and rural populations. Physical and mental disabilities were evident among the studied people. Social functioning was affected by COVID-19 equally in suburban and rural participants. A well-designed cohort study is needed to obtain a real picture of the impact of COVID-19 pandemic on human health and society.

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Introduction

A local outbreak of pneumonia of initially unknown cause was detected in Wuhan (Hubei, China) and first reported in December, 2019 [1]. The causative agent was quickly identified as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and became the cause of the pandemic of acute respiratory disease, called 'coronavirus disease 2019' (COVID-19).The outbreak rapidly engulfed many other countries and regions, affecting 70000 confirmed cases by February, 2020 [1-3]. This virus invades almost all organs of the body and upsets physical and mental health, affecting psychosocial behavior. The reported morbidity and mortality were enormous. In short, this pathogen had disastrous effects on mankind by making a pandemic health hazard. The fatality rate reached 14.1% in New York and also in some other countries [4].World-wide, regularly published reports on COVID-19 have been keeping us informed about the magnitude of the infection and fatality [1-5].Mental, physical and behavioral disorders are reported in both COVID-19 sufferers and general people during this pandemic in different countries, including Bangladesh [6-8].

There has been no comprehensive study on the effect of the COVID-19 pandemic on mental, physical and social functioning of the general Bangladeshi population. This study compared the impact of the COVID-19 pandemic on mental and physical health as well as the social functioning of rural and suburban people. The study also assessed the knowledge, attitude and practice (KAP) of those populations regarding the prevention and transmission of SARS-CoV-2.

Materials and methods

The study was conducted in suburban and rural communities from November, 2022 to December, 2022 and in August, 2023 respectively. The protocol was duly approved by the Institutional Review Board. Informed consent was obtained from each participant prior to enrollment in the study.

***Study population and methods*:** The suburban community was selected from Savar Upazila (sub-district) under Dhaka district, about 40km north of Dhaka City. The rural villages were selected from Nandail Upazila (sub-district) under Mymensingh district, about 130 km north-east of Dhaka city. The sample size was arbitrarily estimated at 200 from suburban and 200 from rural sites. All people aged 20 years and above in the selected communities were invited to take part in the study. The local social, political and religious leaders were briefed about the objectives and procedural details of the study. The local school teachers and students were requested to volunteer and cooperate in the implementation of the study. The investigation team consisted of physicians, nurses and laboratory technicians.

The participants (age ≥20y) were enlisted serially, and a designated physician recorded socio-demographic data and clinical history in a structured questionnaire. After obtaining the detailed history, each participant underwent anthropometry (height, weight, waist- and hip-girth → BMI, WHR). Then general examination was done (look/appearance, anemia, cyanosis, jaundice, edema, etc). Every participant was checked for obesity (BMI, WHR), hypertension (blood pressure), diabetes (blood glucose) and post-COVID sequels.

The DASS-21 questionnaire was used to assess the state of depression, anxiety and stress due to COVID-19 pandemic situation [9].TheDASS-21 scoring system was applied to grade the depression, anxiety and stress states into normal, mild, moderate, severe and extremely severe degrees, as per Table-1.

Table-1: *DASS-21 scoring system for categorization of depression, anxiety and stress into different grades*

Grade	Score for		
	Depression	**Anxiety**	**Stress**
Normal	0-4	0-3	0-7
Mild	5-6	4-5	8-9
Moderate	7-10	6-7	10-12
Severe	11-13	8-9	13-16
Extremely Severe	14+	10+	17+

For assessment of social health and function the "36 SF Questionnaire**"** was used. This questionnaire contained 36 questions on general health,

limitations of activities, physical health problems, emotional health problems, social activities, energy and emotions. Using a validated questionnaire, each participant was also interviewed in depth on his/her knowledge, attitude and practice (KAP) regarding the prevention and transmission of the virus causing COVID-19.

Minor illnesses were treated and if any additional systemic diseases were found, the participant was referred to referral hospitals. About 5 ml blood was collected aseptically from each participant and random blood glucose (RBG), lipids, creatinine and SGPT were estimated according to the standard methods.

***Statistical analysis*:** The post-COVID effect was described mainly with descriptive statistics. Knowledge, attitude and practice (KAP) were tabulated. The data were presented in percentages according to every component of KAP. Likewise, each component of depression, anxiety and stress score (DASS) was presented in percentage. Chi-sq test was done for determining the association between DASS and geographical sites and other variables (rural and suburban). SPSS version 20 was employed. For the inferential statistics, significance level was accepted at $p<0.05$.

Results

A total of 385 individuals volunteered the study. Of them, 201 were from suburban and 184 from rural communities. Out of 385, 116 and 269 were male and female respectively. No significant difference was observed between male and female participants residing in suburban and rural areas (Table-2).

Table-2: *Gender distribution of the study population*

Gender	Suburban n(%)	Rural n(%)	Total n(%)
Male	54 (46.6)	62 (53.4)	116 (30.1)
Female	147 (54.6)	122 (45.4)	269 (69.9)
Total	201 (52.2)	184 (47.8)	385

Note: Chi-sq: p=0.15

Table-3a: *Biophysical parameters of all participants*

Parameters	n	Minimum	Maximum	Mean ± SD
Age (y)	385	21	95	48.20 ± 13.7
Height (cm)	385	132	175	152.7 ± 8.1
Weight (kg)	385	26.0	94.0	54.2 ± 10.3
Waist (cm)	385	36	115	85.7 ± 11.1
Hip (cm)	385	34	122	89.8 ± 11.7
BMI	385	13.27	33.33	23.1 ± 3.78
WHR	385	0.59	1.40	0.96 ± 0.12
WHtR	385	0.23	0.75	0.56 ± 0.07
SBP (mmHg)	385	70	190	120.5 ± 18.3
DBP (mmHg)	385	50	130	78.2 ± 12.3
RBG (mmol/L)	385	3.5	18.4	6.4 ± 2.1
TG (mg/dl)*	184	44	561	178.1 ± 96.3
CHOL (mg/dl)*	184	90	344	151.2 ± 44.2
HDL (mg/dl)*	184	21	64	37.5 ± 8.0
LDL (mg/dl)*	184	41	224	84.5 ± 33.8
SGPT (mg/dl)	385	10.0	111.0	25.9 ± 13.1
Creatinine (mg/dl)	385	0.3	5.2	0.95 ± 0.32

**Only rural samples, BMI – body mass index, SBP, DBP – systolic, diastolic blood pressure, chol – total cholesterol, HDL – high-density lipoproteins, LDL – low-density lipoproteins, RBG – blood glucose random, SD – standard deviation, SGPT - serum glutamate pyruvate transaminase, TG – triglycerides, WHR – waist-to-hip ratio, WHtR – waist-to-height ratio.*

The biophysical characteristics of all participants are shown in Table-3a. Table-3b displays the differences in characteristics between male and female participants. Significant differences were observed, as usual, in anthropometric measures. Likewise, some differences were found to be significant in comparisons between suburban and rural participants (Table-3c).

Table-3b: *Comparisons of biophysical parameters of male and female participants*

Parameters	Male (n=116)	Female (n=269)	p
	Mean ± SD	Mean ± SD	
Age (y)	53.4 ±13.2	45.9 ± 13.3	0.000
Height (cm)	160.1 ±7.0	149.5 ±6.3	0.000
Weight (kg)	58.2 ± 10.8	52.4 ±9.6	0.000
Waist (cm)	83.5 ± 11.9	86.6 ±10.6	.013
Hip (cm)	88.1 ± 10.1	90.5 ±12.3	0.066
BMI	22.6 ± 3.8	23.4 ±3.7	0.085
WHR	0.94 ± 0.08	0.96 ±0.13	0.16
WHtR	0.52 ± 0.07	0.57 ±0.06	0.000
SBP (mmHg)	120.9 ± 17.7	120.4 ±18.5	0.799
DBP (mmHg)	79.1 ± 12.3	77.8 ±12.3	0.345
RBG (mmol/L)	6.8 ± 2.3	6.3 ± 2.08	0.042
TG (mg/dl)*	184.8 ± 109.3	174.6 ±89.2	0.498
Chol (mg/dl)*	148.9 ± 47.9	152.4 ±42.3	0.617
HDL (mg/dl)*	36.6 ± 9.0	38.0 ±7.4	0.293
LDL (mg/dl)*	84.7 ± 34.3	84.4 ±33.6	0.955
SGPT (mg/dl)	28.3 ± 14.7	24.8 ±12.1	0.022
Creatinine (mg/dl)	1.01 ± 0.28	0.935 ±0.34	0.037

*Note: *Only rural samples, BMI – body mass index, WHR – waist-to-hip ratio, WHtR – waist-to-height ratio,SBP, DBP – systolic, diastolic blood pressure, RBG – blood glucose random, TG – triglycerides, chol – total cholesterol, HDL – high-density lipoproteins, LDL – low-density lipoproteins, SGPT - serum glutamate pyruvate transaminase, , SD – standard deviation.*

Table-3c: *Comparisons of biophysical parameters of suburban and rural study population*

Parameters	Suburban (n=201)	Rural (n=184)	p
	Mean ± SD	Mean ± SD	
Age (y)	48.1 ± 14.1	48.2 ± 13.3	0.915
Height (cm)	150.7 ± 8.0	154.9 ± 7.7	0.000
Weight (kg)	55.6 ± 10.9	52.6 ± 9.5	0.004
Waist (cm)	86.0 ± 10.7	85.3 ± 11.5	0.566
Hip (cm)	89.2 ± 12.4	90.4 ± 11.0	0.314
BMI	24.3 ± 3.6	21.8 ± 3.5	0.000
WHR	0.97 ± 0.15	0.94 ± 0.06	0.007
WHtR	0.57 ± 0.06	0.5 ± 0.08	0.016
SBP (mmHg)	123.8 ± 16.5	117.0 ± 19.5	0.000
DBP (mmHg)	81.9 ± 12.0	74.0 ± 11.3	0.000
RBG (mmol/L)	6.5 ± 1.7	6.4 ± 2.3	0.703
SGPT (mg/dl)	22.2 ± 14.0	28.8 ± 11.5	0.000
Creatinine (mg/dl)	0.90 ± 0.40	1.01 ± 0.2017	0.002

BMI- body mass index, SBP, DBP – systolic, diastolic blood pressure, RBG – random blood glucose, SGPT - serum glutamate pyruvate transaminase, WHR – waist-to-hip ratio, WHtR – waist-to-height ratio, SD – standard deviation.

It may be noted that lipids (chol, TG, HDL, LDL) could not be compared as the suburban group had no data.

Based on the DASS-21 scoring system, Table-4a shows the prevalence of depression, anxiety and stress among the suburban and rural population. Out of the total 385 enrolled participants, 210 (54.5%) had no depression, anxiety or stress, while 29.4%, 37.4% and 18.2% had depression, anxiety and stress respectively. Of 385, 51 (13.2%) had all three conditions. There was no significant difference for depression and anxiety (p>0.5) between the suburban and rural people, though 'stress' was significantly (p = 0.023) higher in the suburban (22.4%) than their rural counterparts (13.6%). The prevalence of total and different grades of depression, anxiety and stress according to the gender of the study population are shown in Table-4b. No significant differences were observed between the male and female participants regarding the different grades of depression, anxiety and stress. Of the total 385, "extremely severe" depression, anxiety and stress were present in 3.6%, 6% and 0.5%, respectively.

The prevalence of different grades of depression, anxiety and stress of suburban and rural population are shown in Table-4c. No significant (p > 0.05) difference was present in the occurrences of different grades of the above mental conditions between the suburban and rural people.

Table-4a: *Prevalence of depression, anxiety and stress among the suburban and rural population (n=385)*

Study site	Total Number	Depression n (%)	Anxiety n (%)	Stress n (%)
Suburban	201	63 (31.3)	77 (38.3)	45 (22.4)*
Rural	184	50 (27.2)	67 (36.4)	25 (13.6)*
Total	**385**	**113 (29.4)**	**144 (37.4)**	**70 (18.2)**

*Note: *p = 0.023 between suburban vs. rural; for depression and anxiety between suburban vs. rural: p > 0.05.Calculated by Chi-sq test.*

Table-4b: *Prevalence of graded depression, anxiety and stress according to gender (male=116, female=269) of the study population (n=385)*

Variables	Total case Number (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Extremely Severe n (%)	p-value
Depression						
Male	31 (26.7)	12 (10.3)	15 (12.9)	2 (1.7)	2 (1.7)	
Female	82 (30.5)	30 (11.2)	33 (12.3)	7 (2.6)	12 (4.5)	0.715
Total	**113 (29.4)**	**42 (10.9)**	**48 (12.5)**	**9 (2.3)**	**14 (3.6)**	
Anxiety						
Male	37 (31.9)	17 (14.7)	8 (6.9)	7 (6)	6 (5.2)	
Female	107 (39.8)	45 (16.7)	23 (8.6)	21 (7.8)	17 (6.3)	0.644
Total	**144 (37.4)**	**62 (16.1)**	**31 (8.1)**	**28(7.3)**	**23 (6.0)**	
Stress						
Male	20 (17.2)	8 (7.0)	9 (7.8)	3 (2.6)	0	
Female	50 (18.6)	17 (6.3)	16 (5.9)	15 (5.6)	2 (0.7)	0.582
Total	**70 (18.2)**	**25 (6.5)**	**25 (6.5)**	**18 (4.7)**	**2 (0.5)**	

Note: p value - calculated by Chi-sq test.

Table-4c: Prevalence of severity of depression, anxiety and stress among the study population living in suburban and rural areas as assessed by DASS-21 (Suburban = 201, Rural =184)

Grades	Depression			Anxiety			Stress		
	Suburban n (%)	**Rural n (%)**	**Total n (%)**	**Suburban n (%)**	**Rural n (%)**	**Total n (%)**	**Suburban n (%)**	**Rural n (%)**	**Total n (%)**
Mild	20 (10.0)	22 (12.0)	42 (11)	35 (17.4)	27 (14.7)	62 (16.1)	15 (7.5)	10 (5.4)	25 (6.5)
Moderate	29 (14.4)	19 (10.3)	48 (12.5)	14 (7.0)	17 (9.2)	31 (8.1)	20 (10.0)	5 (2.7)	25 (6.5)
Severe	6 (3.0)	3 (1.6)	9 (2.3)	17 (8.5)	11 (6)	28 (7.3)	8 (4.0)	10 (5.4)	18 (4.7)
Extremely Severe	8 (4.0)	6 (3.3)	14 (3.6)	11 (5.5)	12 (6.5)	23 (6.0)	2 (1.0)	0 -	2 (0.5)
Total	**63 (31.3)**	**50 (27.2)**	**113 (29.4)**	**77 (38.3)**	**67 (36.4)**	**144 (37.4)**	**45 (22.4)**	**25 (13.6)**	**70 (18.2)**

Note: p > 0.05 for different grades of depression, anxiety and stress between suburban and rural people; calculated by Chi-sq test.

Assessment of the social functioning of the study population revealed that maintenance of general health was affected in more than 50% (not so good, fair, poor) as against excellent (5.5%) or good (39.8%) [Table-5a]. In comparison to a year ago, when the intensity of the pandemic was more pronounced than during our investigation period,

Table-5a: *Assessment of social functioning of the study population (n=385)*

Variables	Number (%)
General health	
Excellent	21 (5.5)
Good	154 (40.0)
Not so good	152 (39.5)
Fair	49 (12.7)
Poor	9 (2.3)
Compared to one year back how would you rate your health now?	
Much better	38 (9.9)
Somewhat better	72 (18.7)
No change	164 (42.6)
Worse	106 (27.5)
Much worse	5 (1.3)

42.3% rated no change in their health status, while less than 30% reported being better or somewhat better.

Regarding the limitation of regular activities, over 60% of the participants experienced an impact on vigorous or strenuous work, while the influence on moderate to minimal physical activities was less, ranging from 40% to 70% (Table-5b).

The components of physical, emotional and social health were shown in Table-5c through Table-5f. Almost >50% reported that they had to cut-down on their regular work (Table-5c). Similarly, more than half of the respondents had emotional health problems and 42.6% had to avoid social responsibilities (Table-5d, 5e].The vitality and energetic effort were also affected but not very discernible. Nervousness and unhappiness were reported in less than 30% of people (Table-5f).

Knowledge, attitude and practice (KAP) regarding the prevention and transmission of COVID-19 are shown in Table-6a and 6b. Overall, there was fairly adequate awareness about COVID-19, ranging from 47% to 88% (Table-6a). For attitude, 65% agreed to abide by the advices of health personnel while fewer than 35% adhered to recommended practices (Table-6b).

Table-5b: *Limitations of activities during COVID-19 period (n=385)*

Does your health now limit you in following activities? If so, how much?	Limited a lot n (%)	Limited a little n (%)	Not limited n (%)
Vigorous / strenuous activities (running, ploughing, rowing, rickshaw-pulling)	116 (30.1)	148 (38.4)	119 (30.9)
Moderate activities (moving a table, carrying a bag, cycling)	75 (19.5)	154 (40.0)	155 (40.3)
Climbing several stairs	89 (23.1)	138 (35.8)	157 (40.8)
Walking more than a mile	77 (20.0)	133 (34.5)	173 (44.9)
Bathing or dressing yourself	37 (9.6)	87 (22.6)	259 (67.3)

Table-5c: *Physical health problems during COVID-19 period (n=385)*

During the last month have you had the following experiences daily?	Yes n (%)	No n (%)
Cut down the amount of time you spent on work or other activities?	214 (55.6)	171 (44.4)
Accomplished less than you would like?	175 (45.5)	210 (54.5)
Were limited in the kind of work or other activities?	221 (57.4)	164(42.6)

Table-5d: *Emotional health problems during COVID-19 period (n=385)*

During the last month, have you had any emotional problems (such as feeling depressed or anxious) which affected the following?	Yes n (%)	No n (%)
Cut down the amount of time you spent on work or other activities	198 (51.4)	187 (48.6)
Accomplished less than you would like	191 (49.4)	194 (50.4)
Didn't do work or other activities as carefully as usual	167 (43.4)	218 (56.6)

Table-5e: *Emotional problem affecting social activities during COVID-19 period (n=385)*

Emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?	Not at all n (%)	Slightly n (%)	Moderately n (%)	Severely n (%)
	224 (58.2)	117 (30.4)	36 (9.4)	8 (2.1)

Table-5f: *Assessment of energy and emotions (n=385)*

Following questions were about how you felt and how things were with you during the last 4 weeks	All of the time n (%)	Most of the time n (%)	Sometime n (%)	Never n (%)
How much did you feel very nervous?	14 (3.6)	32 (8.3)	97 (25.2)	242 (62.9)
How much did you feel calm and peaceful?	62 (16.1)	116 (30.1)	85 (22.1)	122 (31.7)
Have you ever felt downhearted?	6 (1.6)	54 (14.0)	232 (60.2)	93 (24.2)
Have you ever been a happy person?	69 (18.0)	112 (29.1)	151 (39.2)	53 (13.8)
Did you ever feel tired?	32 (8.3)	67 (17.4)	228 (59.2)	58 (15.1)

Table-6a: *Assessment of knowledge on the COVID-19 pandemic (n=385)*

Questions asked to the participants about COVID-19	True		False		Don't know	
	N	%	n	%	n	%
Does one suffer from fever, easy fatigue, cough, body ache?	204	53.0	166	43.1	15	3.9
Does one suffer from common cold like symptoms?	184	47.8	185	48.1	16	4.2
No effective treatment; supportive treatment helps recovery?	244	63.4	59	15.3	82	21.3
Only elderly, obese, with chronic illnesses are severe cases?	276	71.7	45	11.7	64	16.6
One can infect the virus even when a fever is not present?	261	67.8	62	16.1	62	16.1
The spread is via respiratory droplets from infected person?	314	81.6	24	6.2	47	12.2
Wearing masks can prevent transmission?	335	87.0	23	6.0	27	7.0
The children rarely get infection?	262	68.1	59	15.3	64	16.6
To prevent infection one should avoid crowded places?	340	88.3	13	3.4	32	8.3
Isolation and treatment of infected person reduce spread?	335	87.0	13	3.4	37	9.6
The isolation and observation period is 14days?	316	82.1	22	5.7	47	12.2

Table-6b: *Assessment of attitude and practice regarding control and preventive measures for the COVID-19 pandemic (n=385)*

Questions regarding:	Agree n (%)	Disagree n (%)	Can't say n (%)
Attitude			
Do you agree that COVID-19 will be successfully controlled?	250 (64.9)	34 (8.8)	101 (26.2)
Do you believe we can win the battle against the COVID-19?	176 (45.7)	79 (20.5)	130 (33.8)
Practice	**Yes n (%)**	**No n (%)**	**Sometimes n (%)**
In recent days- did you maintain restricted visit to crowded place?	129 (33.5)	238 (61.8)	18 (4.7)
In recent days - did you use regular mask outside home?	125 (32.5)	228 (59.2)	32 (8.3)

Discussions

Different public health measures have been adopted for the mitigation of transmission and to reduce the detrimental effects of the COVID-19. Though such measures have many potential benefits, they also have negative short- and long-term consequences for mental health. Long-term quarantine may pose financial loss and socioeconomic distress and, consequently, be responsible for the emergence of psychological disorders. The existing prevalence of mental disorders is very high in Bangladesh [10]. According to the nationwide survey on mental health conducted in 2019 (pre-COVID-19 period), the prevalence of all mental disorders among the adult population is 18.7% and among the child population, it is 12.6% [11]. A study conducted in the early period of the COVID-19 pandemic revealed that 30.1% of adolescents were suffering from moderate to severe depressive symptoms, and females suffered more than males [12].

The current study was conducted when the dreadfulness of COVID-19 was declining, at least to some extent. It was observed that nearly one-third of study participants had both depression and anxiety. Moreover, stress was reported by almost one-fifth of the participants. In this study, the prevalence of anxiety was somewhat similar to a study conducted during the very first enactment of lockdown by Banna et al [13]. But compared to that study, the prevalence of depression and stress in our study was nearly half and one-third respectively. According to Banna et al, the prevalence of depression, anxiety and stress was

57.9%, 33.7%, and 59.7%, respectively. In a study conducted in China, the prevalence of depressive symptoms was 16.5% in the general population [14] and Ueda et al. [15] from Japan also reported a much lower prevalence of depression (11.4%) during the early part of the COVID-19 pandemic. Socio-economic conditions and poor healthcare systems may contribute to the disparities in these findings in our country. A few earlier studies have reported that low- and middle-income countries have a higher burden of mental disorders than economically developed countries [16,17]. The rise in the confidence levels of doctors, improved public satisfaction with health information, increased adherence to personal protective measures, reduced fatalities from subsequent SARS-CoV-2 strains, and most importantly, a higher perception of survival chances among the general population may have contributed to this phenomenon.

In DASS comparisons, it was noted that a higher percentage of females suffered from depression and anxiety compared to males, though this finding was not statistically significant. The observation aligns with the results reported by Wang et al [14] from China. The lockdown situation might have led to an upsurge in domestic violence against women, and the unrest stemming from financial insecurity could be a contributing factor to these outcomes. Depression and anxiety were almost same in both our communities, though stress was significantly higher among suburban people. This is possibly due to more morbidity and mortality in urban communities. This is consistent with an interesting finding in China [7]. The finding was that nurses exposed to COVID-19 from Hubei, China had stress disorders despite their job satisfaction.

The present study is unique as it encompassed two geographical sites. This gave the opportunity to compare the differences in perception of COVID-19 and related health issues between suburban and rural people. Comparisons of KAP showed no significant difference between the two communities (data not shown). Possibly, this happened due to the nationwide dissemination of health-related education with an emphasis on COVID-19 transmission. Mass media is available even in the remotest village communities in Bangladesh. Hence, there was no notable difference in both awareness and attitude components. The lower adherence to practices in villages was attributed to the paucity of detected infections among residents.

The social functioning of the participants was found to be limited in the study, which is consistent with other investigations. In Kerala, around one-third of the patients (36.4%) had dyspnea on exertion, and 11.8% had dyspnea at rest [8]. Another study conducted among the Japanese and Swedish observed that of the 135 COVID-19 survivors among the 763 total participants, 37% (*n* = 50/135) had post-COVID stress [18].

This study found that more than 50% of participants had to cut down on their regular activities, which had also been reported in the Irish Cohort [19]. Again, others reported that patients with Long COVID sufferings had multisystem involvement and significant disability. Their seven months follow-up showed many patients did not recover (mainly from systemic and neurological / cognitive symptoms) and had not returned to previous levels of work and continued to experience significant symptom burden [20]. The disabilities of post-COVID systemic and neurologic manifestations were reported by many other studies [21-23].

Some limitations of our study may be noteworthy. All the suspected COVID-19 patients in rural communities were not diagnosed serologically. History taken by the interviewer was not consistent. There might have been some error in recollecting and comparing the pre- and post-COVID statements.

Conclusions

The study is the first of its kind to report on the impact of COVID-19 by comparing the biophysical characteristics, KAP, DASS and social functioning of rural vs. urban population. Long-lasting disabilities in physical and mental health were evident and consistent with other studies. Social health and functioning were affected by COVID-19, both in suburban and rural participants. More studies, specifically cohort studies, are needed to get a real picture of the COVID-19 impact on the general

population with different socio-economic and health statuses.

Authors' contribution

NT: data collection, data analysis and draft manuscript writing; MMT, SA, NA: data collection; RM: tool development and data collection; MM: planning, data collection and manuscript writing; MAS: protocol design, data analysis and manuscript writing; RM: idea and concept.

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