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An Analysis of the Lifestyle and Mental Health Status of Adult People Living in Dhaka City: A Cross-Sectional Study in Post COVID-19 Era

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Abstract

Introduction: The Novel Coronavirus or COVID-19 affected all the megacities of the world and made the mental health and lifestyle of people paralyzed. According to different studies, such difficulties were different in scale in different cities depending on the demographic attributes of the people. This phenomenon has created the essence of the current study to examine the health conditions in terms of their mental health, lifestyle, and demographic attributes during and immediate past of the COVID-19 era. **Method:** It was a cross-sectional study covering the people of Dhaka City Corporation. For this purpose, a multistage sampling method was applied, under which the respondents were selected randomly and a self-administered structured questionnaire was used to collect data. The questionnaire was developed based on the DASS 21, as it was suitable to measure the components of mental health in the form of depression, anxiety, and stress. Descriptive analysis and cross-tabulation were applied to find out the association between dependent and independent variables, whereas, a chi-square test was performed to examine the hypothesis. Finally, multivariate analysis was done to find out the risk factors. Three logistic regression models were developed for three dependent variables. **Result:** The findings of the analysis revealed that the lifestyle of people had severely influenced the components of their mental health conditions during and immediate past of COVID-19 in the Dhaka City Corporation, which varies to some extent depending on the demographic attributes of those. **Conclusion:** The above findings are statistically significant enough to conclude about the essence of taking preventive measures regarding mental health issues in the future. However, the limitations of this study- keeping it within the urban areas and the educated people, have also

created the venue for future researchers to move with their research endeavors in the rural areas nationwide and thus generalize the results.

Keywords

Lifestyle, Mental Health, Depression, Stress, Anxiety, Dhaka City, DASS 21, COVID-19

1. Introduction

COVID-19 is a highly transmittable viral disease caused by the zoonotic novel coronavirus (SARS-CoV-2) that created a serious threat to human health [1], [2]. Initially, it seemed impossible to fight back and survive from COVID-19 invasion, but finally, it came under control with the combined effort of the global community after losing many lives [1]. The first case of a COVID-19 patient in Bangladesh was detected in March 2020, that gradually broke out into 64 districts of the country and killed 29424 people by November 2022 as recorded by the Institute of Epidemiology, Disease Control and Research (IEDCR) [3] [4]. The City Corporations and metropolitan cities, like Dhaka, Narayanganj, Gazipur, and Chottagram, were the most affected zones despite having different measures, including quarantine and regional lockdown facilities [4] [5].

During COVID-19, people had to go through numerous critical mental health and lifestyle issues that created a long-term effect on their lives. Adults lost their jobs and students lost their academic schedules [6]. Simultaneously, they were captured by many complications, including internet addiction, that negatively impacted their mental health. Studies reveal that 75% of students were suffering from different complications during the immediate past of COVID-19 [6]. In this situation, the current study was initiated to assess the mental health conditions of people of Dhaka City following the immediate past year of the post-COVID-19 era and thus revealed the evidence of risk factors associated with the post-pandemic era aiming to generate protective guidelines for future stable mental health [1] [2]. As a growing country, Bangladesh faced intolerable pain in terms of mental health disturbance and lifestyle disorders because of COVID-19 [2].

The world has already witnessed a few pandemics so far in the twenty-first century associated with novel coronaviruses, which were highly contagious diseases and caused high mortalities [7]. However, COVID-19 which first broke out in late 2019 in Wuhan City, China, was more contagious and deadly and impacted the lives of millions of people [8]. Within a short time, it spread out across the world over time [2] [9]. USA, Brazil, Italy, Spain, and India recorded 7.91%, 23.19%, 3.43%, 5%, and 9.21% of COVID-19 infection [10]. During the COVID-19, rumors grew and close-minded attitudes developed among the people [11]. All these together created a prolonged impact on health conditions, raising more anxiety among people with pre-existing mental health complexities

[12]. The mass quarantine system during COVID-19 escalated the anxiety among the people [13] [14]. People became less active during quarantine as the nonengagement in physical activity develops better outcomes for anxiety [15] [16] [17] [18]. It also created a significant impact on the lifestyle behavior of people during the immediate post-COVID-19. COVID-19 itself, and the measures adopted to combat its effect, also created economic and social impact [19] [20].

According to the World Health Organization (WHO), mental health is a state of well-being of individuals that allows them to realize their abilities, cope with the normal stress of life, work productively, and contribute to their community [21]. Depression is one of the potential components is depression that shows the signs of mental health disorders [22]. Mental health disorders create disturbances in sleeping, appetite, tiredness, and poor concentration at work [22]. Depression has a long-lasting effect on health and it leads to the cause of disability around the world [23]. The second component of mental health illness is anxiety, which comes through feelings of tension, worried thoughts, and physical changes [24]. Stress is the third component of a mental health condition, which brings a change in physical, emotional, or psychological strain. It is the body's response of a person to anything required [25]. The recent invasion of COVID-19 not only impacted mental health issues but also brought significant changes in lifestyle patterns that reduced quality of life [26].

Lifestyle of people is a multidimensional construct that integrates behaviors from nutrition, physical activity, restorative sleep, outdoor activities, substance usage, stress management, and social support [27]. It has a significant relationship with the post-pandemic era as the pandemic hinders the normal order of these factors [27]. The lifestyle variables cause an increased risk for most physical diseases during any pandemic [1], which was experienced around the world during the invasion of COVID-19 [19]. The demographic attributes of an adult person are the personal traits of that person, which have a relation with the components of mental health and lifestyle of people [28] [29].

In line with the above theoretical evidence, the researcher has set the objective of this study to find out the mental health status and lifestyle patterns of the adult people of Dhaka City following the immediate past year of the COVID-19 pandemic there. This broad objective went through three specific objectives; to assess the level of depression, anxiety, and stress of adult people, to identify the lifestyle patterns of adult people, and to see the demographic attributes of the respondents related to their mental health and lifestyle. The lifestyle of people, demographic attributes of people, and COVID-19 invasion were counted as independent variables (IV) in this study, whereas the mental health of people was counted as a dependent variable (DV). To examine the relationship among the variables, this study approached a cross-sectional survey method as it focuses on a single lifestyle domain [8]. It was the most conducted method during the early stages of this pandemic [9] [30] [31].

2. Methods

2.1. Research Design

The method of research is a systematic way of solving a research problem with different sequential steps to apprehend the target output in the study [32]. This study is a cross-sectional one conducted from December 2022 to April 2023 that covers the people of Dhaka City, and it includes a quantitative approach to data analysis. This method is to quantify the variables to derive target results on the issue of interest by analyzing numerical data [33]. It is associated with characters as the researchers use numerical data for analysis and hypnotize the connection of the variables [34].

2.2. Sampling Size and Unit of Data Analysis

The multi-stage sampling method was used in this study as the people of Dhaka city were in different subzones [35]. In the first stage, Dhaka North City Corporation was selected randomly, and in the second stage, ward-2 and ward-3 were also selected randomly. In the third stage, every second household was selected from each ward until the sample size was fulfilled. With selecting the households first household has been selected purposively. One adult available member from selected households was interviewed and data were collected through a semi-structured self-administered questionnaire. Here the ultimate unit of analysis is the sample respondents.

Using the formula for sample size estimation: $n = z^2pq/d^2$ [where n = number of respondents z = standard normal deviation; usually set at 1.96, which corresponds to 95% confidence level p = percentage of positive response = 0.337 [36], $q = 1 - p = 1 - 0.337 = 0.663$ d = level of precision at 5% = 1.96], the sample size of this study was calculated. Hence, the required sample size was: $n = z^2pq/d^2 = (1.96)^2 \times (0.337) \times (0.663)/(0.05)^2 = 343$, which came into 368 along with a 10% non-response error. This formula is used in a given large dataset, where the properties of an estimator of finite sample size are similar to those of an arbitrarily large sample size [33].

2.3. Data Collection

The questionnaire of this study was developed based on the objectives of the study both in English and Bangla. Pre-testing of the questionnaire was conducted with 20 adult people similar to the study population in a non-study area. It comprised three parts; demographic, mental health, and lifestyle. 368 respondents answered the question. Initially, a brief description was given to them about the study objectives of this study. Both the adult males and females of 18 - 60 years of age were taken as the population. Data was collected from Ward 2 and Ward 3 of Mirpur Sub-city of Dhaka North City Corporation. The people with mentally sound, willingness to attend the survey and understand the questions were included in the study, whereas, the people with physical and or mental challenges were intentionally excluded. However, following the Drop-off and

Pick-up (DOPU) approach.

2.4. Measures

The mental health assessment of the respondents was done by using Depression, Anxiety, and Stress Scale-21, denoted as (DASS-21) [37]. In DASS-21, depression, anxiety, and stress were evaluated by separate questions that totaled 21 questions for the respondents. As recommended, 2 multiplied the scores on the DASS-21 to calculate the final score [37]. The cut-off score of Depression Anxiety Stress is 0 - 9 0 - 7 0 - 14 refers to normal, 10 - 13 8 - 9 15 - 18 refers to mild, 14 - 20 10 - 14 19 - 25 refers to moderate, 21 - 27 15 - 19 26 - 33 refers to severe, and 28+ 20+ 34+ 35 refers to extremely severe [37].

2.5. Data Analysis Techniques

Before going into the analysis, data was checked for completeness and correctness and to exclude missing or inconsistent ones by using IBM SPSS (V26). Later, data was analyzed by using the statistical software IBM SPSS (V26). Simple frequency distribution analyzed descriptive data (mean, standard deviation, percentage). Cross tabulation was applied to find out the association between dependent and independent variables, where the statistical significance was set at a 95% confidence interval (CI). A chi-square test was performed to examine the hypothesis. Finally, multivariate analysis was done to find out the risk factors. Three logistic regression models were developed for three dependent variables.

2.6. Ethical Consideration

The study was approved by the Ethical Review Committee (ERC) of the State University of Bangladesh with the approval number (2022-12-06/SUB/H-ERC/0010); this study was a partial requirement for the degree of Master of Public Health. In addition, the written consent of the respondents was taken with the provision to withdraw from the study at any time during the data collection was maintained. The study complied with the Declaration of Helsinki on conducting human subject research.

3. Results

3.1. Demographic Attributes

Out of the 368, 188 (51.1%) respondents were male, 137 respondents (37.2%) were aged between 20 - 29 years, and 131 respondents (37.2%) were aged between 30 - 39 years. The mean age was 30.2 (SD 8.8) years, while the mean age of the male and female groups was 30.3 (SD 8.9) and 30.0 (SD 8.7) years, respectively. Most of the respondents (56%) were married and about 49.9% of them with higher education (above bachelor's). 50% of the respondents were service holders, whereas 39.9% of them were with over 4 family members. In terms of monthly income, 66.8% of the respondents earn 50,000 BDT or less, as mentioned in **Table 1**.

Table 1. Descriptive analysis of demographic characteristics.

Variables		Nos.	%
Gender	Male	188	51.1
	Female	180	48.9
Age	<20	43	11.7
	20 - 29	137	37.2
	30 - 39	131	35.6
	40 - 49	45	12.2
	50 - 60	12	3.3
Marital Status	Single	151	41.0
	Married	206	56.0
	Widow/Widower/Divorced	11	3.0
Educational Status	HSC/Below HSC	90	24.5
	Bachelor Degree	98	26.6
	Above Bachelor degree	180	48.9
Current Occupation	Student	63	17.1
	Service Holder	184	50
	Business	42	11.4
	House Wife	36	9.8
	Unemployed	43	11.7
Family Member	More than 4 People	147	39.9
	Less than 4 People	221	60.1
Monthly Income (family)	<20,000 BDT	123	33.4
	20,000 - 50,000 BDT	123	33.4
	50,000 - 100,000 BDT	75	20.4
	>1,00,000 BDT	47	12.8

3.2. Health and Lifestyle

Among the total respondents, 133 (36.1%) were infected with COVID-19 (based on confirmed cases), among which only 7.6% were infected more than once. Among the COVID-19-infected respondents (confirmed and suspected cases) 50.5% experienced quarantine life. Regarding the lifestyle status during the last 1 year of COVID-19 infection, 50.8% responded that they had had sleeping problems, 206 56% had claimed some sort of changes in sleeping patterns and 53.3% claimed food habits changes. This study found that 32.1% of respondents used the internet for more than 4 hours for personal interest and 74.7% of them felt that internet usage had been during the last 1 year. A detailed analysis of lifestyle behavior has been included in Table 2.

Table 2. Descriptive analysis of Health and lifestyle behavior variables.

Variables		Nos.	%
Number of times suffered from COVID-19	Never suffered	235	63.9
	Once	105	28.5
	Twice or more	28	7.6
Experience of quarantine due to COVID 19	No	182	49.5
	Yes	186	50.5
Sleep problems in the immediate past	No	181	49.2
Feel any change in the immediate past year	No	162	44
Any change in food habits in the immediate past year	Yes	206	56
	No	172	46.7
Frequency of total meal/day	Yes	196	53.3
	1 - 3	78	21.2
	3 - 6	243	66
	Not following any routine	47	12.8
Physical exercise	Yes	167	45.4
	No	201	54.6
Duration of internet use on personal interest (hour/day)	0.1 - 4 hours	219	59.5
	More than 4 hours	118	32.1
	Unable to measure	27	7.3
	Not used	4	1.1
Internet use increased in the immediate past year	No	89	24.2
	Yes	275	74.7
	Not used	4	1.1
Habituated to any kind of Tobacco	No	323	87.8
	Yes	45	12.2
Drink alcohol	No	349	94.8
	Yes	19	5.2

3.3. Prevalence of Depression, Anxiety & Stress and their Relation with Covariates

The prevalence of depression, anxiety, and stress among the respondents was 59%, 54.1%, and 46.2% respectively, as depicted in Table 3. However, this state of prevalence differs between males and females, meaning that the mental health conditions of females are not the same as male males. Depression, anxiety, and stress among the female respondents are at 67.2%, anxiety 63.9%, and 56.1%, respectively. Again, the respondents within the 20-29 years had a higher prevalence (depression: 67.2%, anxiety: 64.2%, and stress: 57.7%). Statistical significance was also found with marital status and stress; an augmented prevalence rate was found among single participants (55%, 83 participants). In terms of education, an increased prevalence was observed among the below HSC respondents

(depression: 72.2%, anxiety: 67.8%, and stress, 60.0%). The prevalence of depression was 78.6% among business executives, while a higher prevalence was observed among unemployed respondents; 67.4% and 62.8% respectively, for anxiety and stress. Anxiety and stress were found higher (61.8% and 56.9% respectively). The respondents who had COVID-19 more than once had a greater prevalence of developing stress (75%), while the respondents had higher depression (67.6%), anxiety (60.2%), and stress (51.1%).

The respondents who faced sleeping problems had different prevalences in terms of depression (71.7, anxiety (64.7%), and stress (58.8%). They felt changes had experienced relevance as depression (66.5%), anxiety (64.6%), and stress (56.8%) in the last 1 year of the COVID-19 invasion. Their prevalence was also detected in food habit depression (64.3%), anxiety (63.3%), and stress (55.6%) in the last 1 year of the COVID-19 invasion. Eve, the higher prevalence was found among those who had used the internet over 4 hours per day for personal interest. It was 71.2% in depression, 63.62% in anxiety, and 59.363.6% in stress, 59.3%).

Table 4 shows the results of a multivariate regression analysis of risk factors and the state of mental health in terms of depression, anxiety, and stress. It shows that females were found to be associated with depression, anxiety, and stress who had faced sleeping problems during the last 1 year of the COVID-19 invasion. Mid-age people suffering from COVID-19 display a high risk of stress. Similarly, the association is found with changes in food habits and anxiety and stress. Again, the usage of the internet on the personal ground was another risk factor for developing depression and stress.

Females were found at high risk of developing depression (AOR 1.83 [95% CI: 1.11 - 3.04]), Anxiety (AOR 1.70 [95% CI: 1.03 - 2.78]), and Stress (AOR 1.65 [95% CI: 0.98 - 2.77]) than males. Young people 20 - 29 years of age have two times the risk of depression than the reference age group (depression: AOR 2.44 [95% CI: 0.85 - 7.00]). People 40 - 49 years of age are associated with a higher risk of stress than the reference group (stress: AOR 4.67 [95% CI: 1.13 - 19.3]). Similarly, a strong association was identified between occupational category and depression; businessmen are at higher risk than service holders (depression: AOR 3.96 [95% CI: 1.65 - 9.48]). Individuals suffering from COVID-19 more than twice had three times more risk of stress than those who never suffered from COVID-19 (stress: AOR 2.81 [95% CI: 0.94 - 8.40]). People with sleeping problems for the last 1 year of COVID-19 invasion had a higher risk of health prevalence with adjusted ORs of 2.79 [95% CI: 1.54 - 5.04] for depression, 1.77 [95% CI: 1.1 - 2.85] for anxiety, and 2.04 [95% CI: 1.12 - 3.71] for stress than others. Similarly, a significant association was found between changes in food habits in the last 1 year with mental health conditions in terms of anxiety (anxiety: AOR 1.96 [95% CI: 1.21 - 3.16] and stress (stress: AOR 1.77 [95% CI: 1.05 - 2.97]). In addition, higher internet usage was found associated with a higher risk of depression (depression: AOR 1.67 [95% CI: 0.97 - 2.86]) and stress (stress: AOR 1.89 [95% CI: 1.10 - 3.24]).

Table 3. Prevalence of depression, anxiety & stress and their relation with covariates.

	Depression (%)			Anxiety (%)			Stress (%)		
Variables	Normal	Mild to Extremely Severe	*P*[a] *Value*	Normal	Mild to Extremely Severe	*P*[a] *Value*	Normal	Mild to Extremely Severe	*P*[a] *Value*
Overall	41.0	59.0		45.9	54.1		53.80	46.20	
Gender									
Male	48.90	51.10	0.002*	55.30	44.70	0.000*	63.30	36.70	0.000*
Female	32.80	67.20		36.10	63.90		43.90	56.10	
Age									
<20	34.90	65.10		41.90	58.10		51.1	48.9	
20 - 29	32.80	67.20		35.80	64.20		42.3	57.7	
30 - 39	48.90	51.10	0.05	59.50	40.50	0.001*	67.2	32.8	0.000*
40 - 49	44.40	55.60		37.80	62.20		44.4	55.6	
50 - 60	58.30	41.70		58.30	41.70		83.3	16.7	
Marital Status									
Single	37.1	62.9		43.0	57.0		45.0	55.0	
Married	44.7	55.3	0.228	49.0	51.0	0.241	59.2	40.8	0.013*
Widow/Widower /Divorced	27.3	72.7		27.3	72.7		72.7	27.3	
Education									
HSC/Below HSC	27.8	72.2		32.2	67.8		40.0	60.0	
Bachelor Degree	39.8	60.2	0.005*	50.0	50.0	0.011*	51.0	49.0	0.002*
Above Bachelor degree	48.3	51.7		50.6	49.4		62.2	37.8	
Current Occupation									
Student	30.2	69.8		34.9	65.1		44.4	55.6	
Service Holder	54.3	43.7		52.2	47.8		59.8	40.2	
Business	21.4	78.6	0.000*	57.1	42.9	0.014*	64.3	35.7	0.017*
House Wife	36.1	63.9		36.1	63.9		47.2	52.8	
Unemployed	23.3	76.7		32.6	67.4		37.2	62.8	
Family Member									
More than 4 People	38.1	61.9	0.350	46.3	53.7	0.916	51.7	48.3	0.509
Less than 4 People	43.0	57.0		45.7	54.3		55.2	44.8	
Monthly Income (family)									
<20,000 BDT	34.1	65.9		38.2	61.8		43.1	56.9	
20,000 - 50,000 BDT	42.3	57.7	0.235	43.9	56.1	0.044*	53.7	46.3	0.008*
50,000 - 100,000 BDT	48.0	52.0		57.3	42.7		66.7	33.3	
>1,00,000 BDT	44.7	55.3		53.2	46.8		61.7	38.3	

Continued

Number of times suffered from COVID-19									
Never suffered	40.0	60.0		47.7	52.3		54.5	45.5	
Once	47.6	52.4	0.084	47.6	52.4	0.069	60.0	40.0	0.004*
Twice or More	25.0	75.0		25.0	75.0		25.0	75.0	
Experience of quarantine due to COVID-19									
No	45.1	54.9	0.121	52.2	47.8	0.017*	58.8	41.2	0.058
Yes	37.1	62.9		39.8	60.2		48.9	51.1	
Facing sleep problems in the immediate past year									
No	54.1	45.9	0.000*	56.9	43.1	0.000*	66.9	33.1	0.000*
Yes	28.3	71.7		35.3	64.7		41.2	58.8	
Feel any change in sleep pattern in the immediate year									
No	50.6	49.4	0.001*	59.3	40.7	0.000*	67.3	32.7	0.000*
Yes	33.5	66.5		35.4	64.6		43.2	56.8	
Any change in food habits in the immediate year									
No	47.1	52.9	0.027*	56.4	43.6	0.000*	64.5	35.5	0.000*
Yes	35.7	64.3		36.7	63.3		44.4	55.6	
Frequency of total meal/day									
1 - 3	30.8	69.2		35.9	64.1		52.6	47.4	
3 - 6	42.4	57.6	0.063	48.6	51.4	0.135	54.7	45.3	0.872
Not following any routine	51.1	48.9		48.9	51.1		51.1	48.9	
Physical exercise									
Yes	41.3	58.7	0.919	50.3	49.7	0.125	56.9	43.1	0.280
No	40.8	59.2		42.3	57.7		51.2	48.8	
Duration of internet use on personal interest (hour/day)									
0.1 - 4 hour	46.1	53.9		49.8	50.2		60.7	39.3	
More than 4 hour	28.8	71.2	0.006*	36.4	63.6	0.042*	40.7	59.3	0.003*
Unable to measure	55.6	44.4		59.3	40.7		59.3	40.7	
Not used	25.0	75.0		25.0	75.0		25.0	75.0	
Internet use increased in the immediate year									
No	44.9	55.1		48.3	51.7		53.9	46.1	
Yes	40.0	60.0	0.574	45.5	54.5	0.627	54.2	45.8	0.509
Not used	25.0	75.0		25.0	75.0		25.0	75.0	
Habituated to any kind of Tobacco									
No	42.1	57.9	0.262	46.1	53.9	0.832	52.9	47.1	0.374
Yes	33.3	66.7		44.4	55.6		60.0	40.0	

[a]Chi-square test was used to measure the association with covariates. * Statistically significant at 5%.

Table 4. Multivariate Regression Analysis of risk factors associated with Depression, Anxiety & Stress.

	Depression		Anxiety		Stress	
Variables	**AOR (95% CI)**	***P Value***	**AOR (95% CI)**	***P Value***	**AOR (95% CI)**	***P Value***
Gender						
Male	Reference	0.018*	Reference	0.035*	Reference	0.05*
Female	1.83 (1.11 - 3.04)		1.702 (1.03- 2.78)		1.65 (0.98 - 2.77)	
Age						
<20	Reference		Reference		Reference	
20 - 29	2.44 (0.85 - 7.00)	0.095**	2.24 (0.83 - 6.04)	0.109	2.45 (0.92 - 6.50)	0.071
30 - 39	1.99 (0.57 - 6.94)	0.280	1.38 (0.42 - 4.56)	0.59	1.95 (0.56 - 6.76)	0.289
40 - 49	2.70 (0.69 - 10.5)	0.154	3.0 (0.79 - 11.42)	0.106	4.67 (1.13 - 19.3)	0.033*
50 - 60	1.04 (0.19 - 5.75)	0.960	0.92 (0.178 - 4.84)	0.93	0.36 (0.04 - 3.00)	0.35
Marital Status						
Married	NA	NA	NA	NA	Reference	
Single	NA	NA	NA	NA	1.191 (0.566 - 2.505)	0.645
Others	NA	NA	NA	NA	0.782 (0.173 - 3.533)	0.75
Education						
Above Bachelor	Reference		Reference		Reference	
Bachelor Degree	2.06 (0.75 - 5.67)	0.158	1.36 (0.50 - 3.73)	0.539	2.03 (0.73 - 5.67)	0.174
HSC/Below HSC	0.90 (0.48 - 1.67)	0.744	0.54 (0.28 - 1.04)	0.066**	0.98 (0.51 - 1.90)	0.973
Current Occupation						
Service Holder	Reference		Reference		Reference	
Student	1.86 (0.70 - 4.90)	0.209	1.29 (0.50 - 3.32)	0.59	0.97 (0.36 - 2.63)	0.959
Business	3.96 (1.65 - 9.48)	0.002*	0.57 (0.25 - 1.32)	0.192	0.51 (0.20 - 1.33)	0.172
House Wife	1.19 (0.48 - 2.89)	0.701	1.16 (0.47 - 2.85)	0.737	1.03 (0.40 - 2.63)	0.944
Unemployed	3.14 (1.26 - 7.81)	0.014	1.90 (0.79 - 4.55)	0.148	1.71 (0.69 - 4.21)	0.240
Monthly Income (family)-BDT						
>1,00,000	NA	NA	Reference		Reference	
20,000 - 50,000	NA	NA	1.57 (0.68 - 3.60)	0.285	1.51 (0.63 - 3.62)	0.354
50,000 - 100,000	NA	NA	1.32 (0.61 - 2.87)	0.476	1.10 (0.48 - 2.52)	0.807
<20,000	NA	NA	0.92 (0.40 - 2.08)	0.848	0.84 (0.34 - 2.06)	0.714
Number of times suffered from COVID-19						
Never suffered	NA	NA	NA	NA	Reference	
Once	NA	NA	NA	NA	0.77 (0.41 - 1.44)	0.426
Twice or More	NA	NA	NA	NA	2.81 (0.94 - 8.40)	0.036*
Ever experienced quarantine due to COVID-19						
No	NA	NA	Reference	0.128	Reference	0.41
Yes	NA	NA	1.45 (0.89 - 2.34)		1.26 (0.72 - 2.22)	

Continued

Sleep problem in last 1 year						
No	Reference	0.001*	Reference	0.019*	Reference	0.019*
Yes	2.79 (1.54 - 5.04)		1.77 (1.1 - 2.85)		2.04 (1.12 - 3.71)	
Feel any change in sleep pattern in the immediate year						
No	Reference	0.331	NA	NA	Reference	0.622
Yes	0.72 (0.38 - 1.38)		NA	NA	1.17 (0.61 - 2.24)	
Any change in food habits in the immediate year						
No	Reference	0.415	Reference	0.006*	Reference	0.03*
Yes	1.23 (0.74 - 2.02)		1.96 (1.21 - 3.16)		1.77 (1.05 - 2.97)	
Duration of internet use on personal interest (hour/day)						
0.1 - 4 hour	Reference		Reference		Reference	
More than 4 hour	1.67 (0.97 - 2.86)	0.06**	1.44 (0.85 - 2.44)	0.17	1.89 (1.10 - 3.24)	0.021*
Unable to measure	0.71 (0.29 - 1.75)	0.467	0.59 (0.24 - 1.46)	0.262	1.07 (0.42 - 2.67)	0.885
Not used	1.47 (0.11 - 18.27)	0.764	1.28 (0.09 - 16.92)	0.847	1.687 (0.12 - 22.7)	0.694

AOR = Adjusted Odd Ratio. * Statistically significant at 5%. ** Statistically significant at 5%. NA = Insignificant in bivariate analysis.

4. Discussion

This study aimed to explore the impact of the COVID-19 invasion on the mental health of people of Dhaka city based on a representative sample of adults assuming that the invasion of COVID-19 created threats to both the physical and mental state of health of people in different aspects. Thus, this study investigated the post-COVID-19 prevalence of mental health conditions and identified risk factors in terms of lifestyle and demographic covariates among the people of Dhaka city. It revealed that 46.2% to 59% of the respondents exhibit the risk of depression, anxiety, and stress within the immediate 1 year of COVID-19 invasion. Some significant vulnerable groups emerged, such as females, young people, business executives, and individuals who had COVID-19 differently and experienced different real-life issues, like sleeping problems, changes in food habits, excessive internet usage, etc. This study also revealed the post-COVID individual lifestyle behavior in terms of depression, anxiety, and stress.

The perception that the pandemic disrupts life, affects mental health, and demographic attributes of people, like jobs, income level, and education, leading to unknown situations, and uncertainty of healthcare support, is significantly associated with the poor state of mental health outcomes. Multivariate logistic regressions also revealed that socio-demographics significantly moderate the relationship between the perceptions of COVID-19 and mental health outcomes. According to scholars, engaging in physical activity during any confinement creates a positive impact on mental health, and thus plays a vital role in maintaining mental stability during COVID-19 [25]. COVID-19 anxiety negatively affected the mental health behaviors that widely created mental health disorders, particularly psychiatric issues, like depression, anxiety, and stress-related diseas-

es [24]. The causes of depression lie in complex interactions of social, psychological, and biological factors [24]. A loss of jobs and unemployment because of COVID-19 contributed to the development of depression, which is an unparalleled and devastating experience in the public health crisis in the world [24]. Scholars found that excessive stress reduced the mental and physical functional systems of people significantly in the post-COVID-19 era [38] [39]. The COVID-19 pandemic affected their physical health and stressed them, leading to their well-being state [25]. Again, education, gender, marital status, job category, and income level are the constructs of demographic attributes, which have the capability of influencing the mental state of a person [28] [40].

Respondents were observed with a prevalence of normal depression (38.68%) followed by moderate (21.41%) and severe depression (16.82%). The prevalence of anxiety and stress among the respondents was also normal and moderate. Student and female respondents were observed significantly higher risk of adverse mental health complications. Respondents who were confident and satisfied in their current living place were less likely to be affected by mental health complications during COVID-19. Respondents concerned about their earnings were identified with more mental health complications. The prevalence of moderate to extremely severe levels of depression, anxiety, and stress was 47.2%, 46.0%, and 32.5%, respectively, with no significant gender differences. The prevalence of anxiety and stress was significantly higher in participants aged > 30 than in participants aged 18 - 30 years. These findings were supported by other studies stating that the invasion of COVID-19 brought significant changes in lifestyle patterns, stressed mental health, and reduced quality of life [1] [26] [41]. Scholars also endorsed those different restrictions, including confinement and social distancing during the COVID-19 reduced overall physical activity of people led them to increased body weight and risk of many diseases [14].

5. Implications and Limitations

On theoretical aspects, the findings of this study will certainly enrich the existing literature regarding the effects of pandemics, like COVID-19, as such findings are related to real-life situations. Apart from the theoretical significance, this study has provided some implications related to the lifestyle and mental health issues of people required to maintain during such a pandemic. Especially, care should be taken for the women, the aged, and the frontline service providers as these groups are found vulnerable to developing mental health diseases. As such issues are triggered by the invasion of pandemics, like COVID-19, and also differ based on demographic attributes of people, thus this study will provide a significant message to the people of Dhaka City. That means, this study is urban-based and provides evidence that people suffer from mental health illness to some extent. However, this study could be conducted in rural areas also to collect comprehensive evidence nationwide. Another limitation of this study is that it only considered literate people. So, these limitations have created a venue for

future researchers to continue their research endeavors.

6. Conclusions

This study delved into the relationship among the lifestyle of people, mental state, and their demographic attributes in line with the effect of a pandemic like COVID-19 among the people of Dhaka City. Almost equal numbers of male and female participants attended this study, and most of them were adults. More than one-third of them suffered from COVID-19, among whom 50% experienced quarantine during the invasion. Again, 50% of COVID-19-affected respondents claimed to have sleep problems and food habit changes within the next 1 year of such invasion. The study also revealed that the three components of mental health-depression, anxiety, and stress have a significant relationship with the demographic attributes of people, which was seen over the immediate past year of the COVID-19 invasion. However, in most cases, the demographic attributes of people, like sex, occupation, sleep pattern, and food habits were common risk factors for stress, anxiety, and depression. Especially, the joblessness and usage of increased internet were more severe during COVID-19. The important note is that such changes in demographic attributes brought significant changes in the lifestyle of people, some of which took a permanent nature in their behavior. In sum, this study has provided an overview of lifestyle and mental health conditions during and immediate past of the COVID-19 invasion, which might be taken into consideration for creating required awareness about any pandemic in the future.

Authors' Contributions

The study was conceptualized by Ms. Tania Ahmed Chowdhury. In this case, Dr. Nasrin Akhter contributed a lot with her conceptual knowledge. Dr. Ishrat Hossain, Dr Rezwana Jahan, and Dr. Pallabi Sultana were involved in the technical development part including data collection and processing. Ms. Tania Ahmed Chowdhury, Dr. Nasrin Akhter, and Mr. Mohammad Jahangir Alam were involved in data analysis and discussion. Ms. Tania Ahmed Chowdhury prepared the manuscript with the help of all, and Mr. Mohammad Jahangir Alam made a special contribution.

Data Availability

The survey data is available upon reasonable request.

Ethical Approval

The project was approved by the Ethical Review Committee (ERC) of the State University of Bangladesh with the approval number (2022-12-06/SUB/H-ERC/0010).

Interest of Consent

The researcher obtained written consent from all respondents who participated

in the study.

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Conflicts of Interest

The authors declared no conflicts of interest regarding the publication of this article in this paper.

References

[1] Alnazly, E., Khraisat, O.M., Al-Bashaireh, A.M. and Bryant, C.L. (2021) Anxiety, Depression, Stress, Fear and Social Support during COVID-19 Pandemic among Jordanian Healthcare Workers. *PLOS ONE*, **16**, e0247679. https://doi.org/10.1371/journal.pone.0247679

[2] Korkmaz, S., Kazgan, A., Çekiç, S., Tartar, A.S., Balcı, H.N. and Atmaca, M. (2020) The Anxiety Levels, Quality of Sleep and Life and Problem-Solving Skills in Healthcare Workers Employed in COVID-19 Services. *Journal of Clinical Neuroscience*, **80**, 131-136. https://doi.org/10.1016/j.jocn.2020.07.073

[3] Martinez-Ferran, M., De La Guía-Galipienso, F., Sanchis-Gomar, F. and Pareja-Galeano, H. (2020) Metabolic Impacts of Confinement during the COVID-19 Pandemic Due to Modified Diet and Physical Activity Habits. *Nutrients*, **12**, Article 1549. https://doi.org/10.3390/nu12061549

[4] Institute of Epidemiology Disease Control and Research (IEDCR) (2020) Bangladesh Covid-19 Update. https://www.iedcr.gov.bd/

[5] Alam, D. and Razi, A. (2018) Why Dhaka's Livability Is Only Worsening. https://www.thedailystar.net/supplements/unpacking-2017/why-dhakas-liveability-only-worsening-1512988

[6] Dhaka Tribune (2022) Two-Thirds of University Students Suffer from Mental Health Issues. https://www.dhakatribune.com/bangladesh/295481/two-thirds-of-university-students-suffer-from

[7] Grubaugh, N.D., Ladner, J.T., Lemey, P., Pybus, O.G., Rambaut, A., Holmes, E.C., and Andersen, K.G. (2019) Tracking Virus Outbreaks in the Twenty-First Century. *Nature Microbiology*, **4**, 10-19. https://doi.org/10.1038/s41564-018-0296-2

[8] Jiang, S., Xia, S., Ying, T. and Lu, L. (2020) A Novel Coronavirus (2019-NCoV) Causing Pneumonia-Associated Respiratory Syndrome. *Cellular & Molecular Immunology*, **17**, 554. https://doi.org/10.1038/s41423-020-0372-4

[9] Zhou, M., Zhang, X. and Qu, J. (2020) Coronavirus Disease 2019 (COVID-19): A Clinical Update. *Frontiers of Medicine*, **14**, 126-135. https://doi.org/10.1007/s11684-020-0767-8

[10] Patel, M. and Patel, N. (2019) Exploring Research Methodology. *International Journal of Research and Review*, **6**, 48-55. https://doi.org/10.4324/9781351235105-3

[11] Cheng, C. and Cheung, M.W. (2005) Psychological Responses to Outbreak of Severe Acute Respiratory Syndrome: A Prospective, Multiple Time-Point Study. *Journal of Personality*, **73**, 261-285. https://doi.org/10.1111/j.1467-6494.2004.00310.x

[12] Rubin, G.J. and Wessely, S. (2020) The Psychological Effects of Quarantining A City. *BMJ*, **368**, m313. https://doi.org/10.1136/bmj.m313

[13] Arndt, J., Solomon, S., Kasser, T. and Sheldon, K.M. (2004) The Urge to Splurge: A Terror Management Account of Materialism and Consumer Behavior. *Journal of Consumer Psychology*, **14**, 198-212. https://doi.org/10.1207/s15327663jcp1403_2

[14] Huang, Y. and Zhao, N. (2020) Generalized Anxiety Disorder, Depressive Symptoms and Sleep Quality during COVID-19 Outbreak in China: A Web-Based Cross-Sectional Survey. *Psychiatry Research*, **288**, Article ID: 112954. https://doi.org/10.1016/j.psychres.2020.112954

[15] Srinivasan, R.C., Pederson, W.C. and Morrey, B.F. (2020) Distal Biceps Tendon Repair and Reconstruction. *The Journal of Hand Surgery*, **45**, 48-56. https://doi.org/10.1016/j.jhsa.2019.09.014

[16] Suzuki, S. (2020) Zen Mind, Beginner's Mind. Shambhala Publications, Boulder.

[17] López-Bueno, R., López-Sánchez, G.F., Casajús, J.A., Calatayud, J., Gil-Salmerón, A., Grabovac, I., Tully, M.A. and Smith, L. (2020) Health-Related Behaviors among School-Aged Children and Adolescents during the Spanish Covid-19 Confinement. *Frontiers in Pediatrics*, **8**, Article 573. https://doi.org/10.3389/fped.2020.00573

[18] Maugeri, G., Castrogiovanni, P., Battaglia, G., Pippi, R., D'Agata, V., Palma, A., Di Rosa, M. and Musumeci, G. (2020) the Impact of Physical Activity on Psychological Health during the Covid-19 Pandemic in Italy. *Heliyon*, **6**, E04315. https://doi.org/10.1016/j.heliyon.2020.e04315

[19] Moreno, C., Wykes, T., Galderisi, S., Nordentoft, M., Crossley, N., Jones, N., Cannon, M., Correll, C.U., Byrne, L., Carr, S. and Chen, E.Y. (2020) How Mental Health Care Should Change as a Consequence of the COVID-19 Pandemic. *The Lancet Psychiatry*, **7**, 813-824. https://doi.org/10.1016/S2215-0366(20)30307-2

[20] Shevlin, M., Nolan, E., Owczarek, M., McBride, O., Murphy, J., Gibson Miller, J., Hartman, T.K., Levita, L., Mason, L., Martinez, A.P. and McKay, R. (2020) COVID-19-Related Anxiety Predicts Somatic Symptoms in the UK Population. *British Journal of Health Psychology*, **25**, 875-882. https://doi.org/10.1111/bjhp.12430

[21] Bil, J.S., Buława, B. and Świerzawski, J. (2021) Mental Health and the City in the Post-COVID-19 Era. *Sustainability*, **13**, Article 7533. https://doi.org/10.3390/su13147533

[22] Javed, A., Lee, C., Zakaria, H., Buenaventura, R.D., Cetkovich-Bakmas, M., Duailibi, K., Ng, B., Ramy, H., Saha, G., Arifeen, S. and Elorza, P.M. (2021) Reducing the Stigma of Mental Health Disorders with a Focus on Low- and Middle-Income Countries. *Asian Journal of Psychiatry*, **58**, Article ID: 102601. https://doi.org/10.1016/j.ajp.2021.102601

[23] Kola, L., Kohrt, B.A. and Hanlon, C. (2021) COVID-19 Mental Health Impact and Responses in Low-Income and Middle-Income Countries: Reimagining Global Mental Health. *Lancet Psychiatry*, **8**, 535-550. https://doi.org/10.1016/S2215-0366(21)00025-0

[24] Han, S.Y., Jang, H.Y. and Ko, Y. (2022) COVID-19-Related Anxiety and Lifestyle Changes. *Frontiers in Public Health*, **10**, Article 886137. https://doi.org/10.3389/fpubh.2022.886137

[25] Makhbul, Z.K.M. and Rawshdeh, Z.A. (2021) Mental Stress Post-COVID-19. *International Journal of Public Health Science*, **10**, 194-201. https://doi.org/10.11591/ijphs.v10i1.20497

[26] Park, K.H., Kim, A.R., Yang, M.A., Lim, S.J. and Park, J.H. (2021) Impact of the COVID-19 Pandemic on the Lifestyle, Mental Health, and Quality of Life of Adults in South Korea. *PLOS ONE*, **16**, e0247970. https://doi.org/10.1371/journal.pone.0247970

[27] Cervera-Martínez, J., Atienza-Carbonell, B., Mota, J.C., Bobes-Bascarán, T., Crespo-Facorro, B., Esteban, C., García-Portilla, M.P., Gomes-Da-Costa, S., González-Pinto, A., Jaén-Moreno, M.J. and Sarramea, F. (2021) Lifestyle Changes and Mental Health during the COVID-19 Pandemic: A Repeated, Cross-Sectional Web Survey. *Journal of Affective Disorders*, **295**, 173-182. https://doi.org/10.1016/j.jad.2021.08.020

[28] Amegayibor, G.K. (2021) The Effect of Demographic Factors on Employees' Performance: A Case of An Owner-Manager Manufacturing Firm. *Annals of Human Resource Management Research*, **1**, 127-143. https://doi.org/10.35912/ahrmr.v1i2.853

[29] Mkwizu, K.H. (2018) The Influence of Television Advertising on Domestic Tourism: A Case Study of Southern Tourist Attractions in Tanzania. Master's Thesis, The Open University of Tanzania, Dar es Salaam.

[30] Salfi, F., Lauriola, M., Tempesta, D., Calanna, P., Socci, V., De Gennaro, L. and Ferrara, M. (2020) Effects of Total and Partial Sleep Deprivation on Reflection Impulsivity and Risk-Taking in Deliberative Decision-Making. *Nature and Science of Sleep*, **12**, 309-324. https://doi.org/10.2147/NSS.S250586

[31] Böning, D., Bloch, W. and Kuebler, W.M. (2021) Reply to Vogel et al. *American Journal of Physiology-Lung Cellular and Molecular Physiology*, **321**, L638-L639. https://doi.org/10.1152/ajplung.00327.2021

[32] Caltech, N.D. (n.d.) Large Sample Theory. http://www.its.caltech.edu/~mshum/stats/lect5.pdf

[33] Apuke, O.D. (2017) Quantitative Research Methods: A Synopsis Approach. *Kuwait Chapter of Arabian Journal of Business and Management Review*, **33**, 1-8.

[34] Martinez, S.A., Beebe, L.A., Thompson, D.M., Wagener, T.L., Terrell, D.R. and Campbell, J.E. (2018) A Structural Equation Modeling Approach to Understanding Pathways That Connect Socioeconomic Status and Smoking. *PLOS ONE*, **13**, e0192451. https://doi.org/10.1371/journal.pone.0192451

[35] Chauvet, G. (2015) Coupling Methods for Multistage Sampling. *The Annals of Statistics*, **43**, 2484-2506. https://doi.org/10.1214/15-AOS1348

[36] Banna, M.H., Sayeed, A., Kundu, S., Christopher, E., Hasan, M.T., Begum, M.R., Kormoker, T., Dola, S.T., Hassan, M.M., Chowdhury, S. and Khan, M.S. (2022) The Impact of the COVID-19 Pandemic on the Mental Health of the Adult Population in Bangladesh: A Nationwide Cross-Sectional Study. *International Journal of Environmental Health Research*, **32**, 850-861. https://doi.org/10.1080/09603123.2020.1802409

[37] Lovibond, S.H. and Lovibond, P.F. (1995) Manual for the Depression Anxiety Stress Scales. 2nd Edition, Psychology Foundation, Sydney, 4-42. https://doi.org/10.1037/t01004-000

[38] Bao, Y., Sun, Y., Meng, S., Shi, J. and Lu, L. (2020) 2019-NCoV Epidemic: Address Mental Health Care to Empower Society. *The Lancet*, **395**, E37-E38. https://doi.org/10.1016/S0140-6736(20)30309-3

[39] Sharma, S. and Bhatta, J. (2020) Public Health Challenges during the COVID-19 Outbreak in Nepal: A Commentary. *Journal of Health Research*, **34**, 373-376. https://doi.org/10.1108/JHR-05-2020-0124

[40] Atuman, Y.J., Ogunkoya, A.B., Adawa, D.A.Y., Nok, A.J. and Biallah, M.B. (2014) Dog Ecology, Dog Bites and Rabies Vaccination Rates in Bauchi State, Nigeria. *International Journal of Veterinary Science and Medicine*, **2**, 41-45. https://doi.org/10.1016/j.ijvsm.2014.04.001

[41] Lau, J.T., Yang, X., Tsui, H.Y., Pang, E. and Wing, Y.K. (2006) Positive Mental Health-Related Impacts of the SARS Epidemic on the General Public in Hong Kong and Their Associations with Other Negative Impacts. *Journal of Infection*, **53**, 114-124. https://doi.org/10.1016/j.jinf.2005.10.019