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Original research

COVID-19-specific diabetes worries amongst diabetic patients: The role of social support and other co-variates

Md. Safaet Hossain Sujan[a,b,*], Rafia Tasnim[a,b], Md. Saiful Islam[a,b], Most. Zannatul Ferdous[a], Md. Abdur Rahman Apu[c], Md. Miftah Musfique[c], Shahina Pardhan[d]

[a] Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka 1342, Bangladesh
[b] Centre for Advanced Research Excellence in Public Health, Savar, Dhaka 1342, Bangladesh
[c] Department of Genetic Engineering and Biotechnology, University of Chittagong, Chittagong 4331, Bangladesh
[d] Vision and Eye Research Institute, School of Medicine, Anglia Ruskin University, Young Street, Cambridge, UK

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ABSTRACT

Background: The COVID-19 pandemic has impacted every individual's life. It has been shown that mortality in people with underlying diseases including diabetes has been very high. The present study aimed to measure diabetes related worries (outcome) and their associations with social support and lifestyle (exposures) amongst people with diabetes during the COVID-19 pandemic.
Methods: An online cross-sectional survey was completed by 928 respondents (>18 years) between 15-11-2020 and 12-12-2020. The questionnaire comprised four sections: socio-demographic details, diabetic-related worries, social support, and behavioral changes due to COVID-19. Descriptive statistics, correlations and hierarchical regression analysis were performed in the study.
Results: Data from 928 respondents (51.61% male; mean age = 52.48 [SD = 11.76]; age range = 18–86 years) were analyzed. The mean score for COVID-19 specific diabetes worries was 3.13 out of 8. Hierarchical regression analysis showed that the mean COVID-19-specific diabetes worries score was significantly associated with lower age, cigarette smoking, perceived poor health status, presence of other diabetic complications. Lack of social support from family, friends, work colleagues and diabetes care team and also eating more than usual were also significantly associated with COVID-19 specific diabetes worry.
Conclusions: Diabetes related worries were strongly associated with a lack of social support during the COVID-19 pandemic. The findings suggest the need of social support as well as improving knowledge and guidelines is important for people with diabetes during the COVID-19 pandemic.
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1. Introduction

The recent emergence of COVID-19 has had a greater impact on people with comorbid conditions such as diabetes, hypertension, coronary heart disease, obesity, cancer and HIV/AIDS [1,2]. Diabetes has been the second most common comorbidity (9.7%) among COVID-19 patients after cardio-metabolic disorders (12.5%) [1,3]. In 2019, the International Diabetes Federation (IDF) reported that 465 million (9.3%) people in the world were diagnosed with diabetes, and by 2045 the figure is predicted to grow to 700 million [4]. About 79% of people with diabetes live in low-income or middle-income countries, with more than 60% living in Asian countries [5]. In Bangladesh, there were 7.1 million people suffering with diabetes in 2015, with 3.7 million undiagnosed cases and nearly 129,000 deaths [4,6]. Other reports suggest that there are around 10 million diabetic patients in Bangladesh [7] with almost one in ten adults living with diabetes [8]. Nevertheless, to date, there are no baseline information of how many people with diabetes patients have been infected with COVID-19 and what is the current mortality rate of it in Bangladesh.

It is known that people who are living with chronic diseases such as diabetes are at increased risk of morbidity and mortality if they are infected with COVID-19 [9–12]. Maintaining good glycemic regulation is therefore important method in avoiding complications

* Corresponding author at: Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka 1342, Bangladesh.
E-mail addresses: sujanmahmuddphi@gmail.com (Md.S.H. Sujan), tasnimrifa97@gmail.com (R. Tasnim), islam.msaiful@outlook.com (Md.S. Islam), m.zannatul.ferdous@juniv.edu (Most.Z. Ferdous), mdapu.geb.cu@gmail.com (Md.A.R. Apu), miftah029.mt@gmail.com (Md.M. Musfique), shahina.pardhan@aru.ac.uk (S. Pardhan).

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arising from COVID-19 [13,14]. It is also known that diabetes management may be difficult as a result of government policies to regulate transmission such as social distancing and lockdowns. It is likely that diabetic individuals will face barriers in controlling their glycemic levels. These can include restricted access to healthcare, limited availability of fresh food, and reduced physical activity due to confinement [13]. Like many countries, in order to reduce the spread of the virus, the government in Bangladesh imposed strict social isolation and home quarantine measures [15–17] that would invariably affect regular physical movement and healthcare access.

The COVID-19 pandemic has an severe negative impact on diabetic patients. A previous study reported that hospitalized patients were more likely to have diabetes compared to patients with COVID-19 who were not transferred to an intensive care unit for the development of organ dysfunction [18]. Diabetes mellitus and cardiovascular conditions are contributing factors for increased severity of COVID-19 and consequences, including higher infection and death rates [19]. Individuals with such medical conditions are more likely to suffer from mental health problems such as depression panic attacks and anxiety [20]. A recent study conducted in Brazil reported emotional distress (29.2%), eating disorders (75.8%), and moderate/severe sleeping disorders (77.5%) among diabetes patients during the COVID-19 pandemic [21].

It is to be expected that fear of being affected by COVID-19, mass media coverage of the trajectory of the pandemic worldwide, and the high death rates would lead to a decrease in mental well-being and increase in psychological disorders, including anxiety, depression and stress [22–24]. We hypothesized that mental health parameters such as worries would be higher in people with diabetes due to the higher risk of mortality and morbidity in this group [25], making them even more vulnerable to mental health issues. This in turn would affect their glycemic control. It is also likely that the management routine of people with diabetes has been disrupted, increasing worries amongst patients and leading to changes in their behavior. However, during this crucial time, people with diabetes may also experience reduced social support due to various government restrictions. In addition, the uncontrolled diabetes can increase the risk of complications such as retinopathy, neuropathy, diabetic foot and nephropathy [26,27].

Several studies conducted with different cohorts including the general population, university students, medical students, slum-dwellers, health workers, and COVID-19 survivors have highlighted various mental health problems (e.g., anxiety, depression, panic, stress, post-traumatic stress disorder, suicidal ideation and addictive behaviors such as problematic use of smartphone, internet, social media) in Bangladesh during the pandemic [28–40]. To date, there is no prior study examining COVID-19-specific worries and diabetes related social-support among diabetic patients in Bangladesh. We developed a questionnaire based on published literature to assess worries [25], social-support and behavioral changes among people with diabetes during the COVID-19 pandemic. Consequently, the present study aimed to assess the diabetes related worries, and to determine factors associated with social support and lifestyle among the diabetic patients due to the COVID-19 outbreak in Bangladesh.

2. Methods

2.1. Study design and procedure

A cross-sectional design was utilized for conducting the present study with a convenient sampling technique. Data were collected between 15 November and 12 December 2020, during the second wave of the COVID-19 pandemic in Bangladesh. The target population were Bangladeshi citizens who could speak and understand the common language Bangla. Participants had to have been diagnosed with diabetes for at least six months prior to the study. A self-reported and semi-structured e-questionnaire was developed from previous literature [25]. This was disseminated via social platforms (such as Facebook, WhatsApp, online blogs, etc.). Before data collection, a pilot test comprising 50 samples was carried out to ensure the validity and reliability of the questionnaire. These data were not included in the final analysis. Where needed, data were collected with the help of Research Assistants (RAs), who had access to diabetic patients. For participants above the age of 70 years, those who did not have any smartphones or were digitally illiterate, responses were collected by family members who completed the online questionnaire. The inclusion criteria for the participants included being (i) above 18 years old, (ii) diagnosed with diabetes over 6 months ago, and (iii) Bangladeshi citizen. The exclusion criteria were being (i) not having diabetes, and (ii) incomplete survey, and (iii) being under 18 years old.

2.2. Sampling procedure

The sample size was calculated using the following equation:

$$n = \frac{z^2 pq}{d^2};\ n = \frac{1.96^2 \times .5 \times (1 - .5)}{.05^2} = 384.16 \approx 384$$

Here,

n = number of samples
z = 1.96 (95% confidence level)
p = prevalence estimate (50% or .5) (as no study found)
q = (1−p)
d = precision of the prevalence estimate

The calculated sampling size was 384. There are limited studies to base this on however p = .5 was initially selected. Our sample size exceeds this by a substantial proportion. Out of 1052 received responses, 928 responses were analyzed after removing incomplete or ineligible data. The survey was designed in such a way that individuals first gave informed consent by accepting the fact that they were willingly and voluntarily participating in this study. There was no compensation for completing the questionnaire. Following that, a confirmation of their diabetes status was obtained by *'Have you been diagnosed as having diabetes?'* if the answer of the person was "no", then a blank response was submitted. If the individual responded "yes", the full survey form became accessible.

2.3. Measures

The e-questionnaire consisted of four sections: socio-demographic questions, COVID-19-specific diabetes worries, social support, and behavioral changes due to COVID-19.

2.3.1. Socio-demographic measures

Socio-demographic data included questions on age, sex, occupation, marital status (single/married/divorced or widow or widower), and residence (urban/rural). In addition, data on smoking habits (yes/no), physical exercise (yes/no), and average number of sleep hours were acquired. Average sleeping hours were classified into three categories according to previous literature: normal (7–9 h), less than average (<7 h), or more than average (>9 h) [33,36]. Less than average (<7 h) and more than average (>9 h) of sleep were classed as sleep disturbance. Self-rated health status was obtained from three possible responses: good, moderate or poor (Table 1).

Table 1
Descriptive analysis of each variable and association with COVID-19-specific diabetes worries.

Categorical variables	Total		COVID-19-specific diabetes worries			
	n	(%)	Mean	(%)	t/F	*p*-Value
Sex						
Male	479	(51.6)	3.08	(1.94)	.74	.390
Female	449	(48.4)	3.18	(1.87)		
Occupation						
Housewife	368	(39.7)	3.22	(1.87)	1.96	.083
Employee	221	(23.8)	2.97	(1.83)		
Businessman	155	(16.7)	3.17	(2.04)		
Retired	139	(15.0)	2.88	(1.83)		
Student	23	(2.5)	3.65	(2.33)		
Unemployed	22	(2.4)	3.86	(2.01)		
Relationship status						
Unmarried	37	(4.0)	3.59	(2.47)	1.66	.190
Married	802	(86.4)	3.09	(1.87)		
Divorced/widow/widower	89	(9.6)	3.30	(1.92)		
Residence						
Rural	342	(36.9)	3.30	(2.08)	4.28	.039
Urban	586	(63.1)	3.03	(1.79)		
Sleep disturbance						
Yes	397	(42.8)	3.31	(2.01)	6.27	.012
No	531	(57.2)	2.99	(1.81)		
Smoking habits						
Yes	129	(13.9)	3.57	(2.45)	8.22	.004
No	799	(86.1)	3.06	(1.79)		
Physical exercise						
Yes	367	(39.5)	2.92	(1.72)	7.31	.007
No	561	(60.5)	3.27	(2.01)		
Health status						
Good	191	(20.6)	2.34	(1.65)	35.57	<.001
Moderate	648	(69.8)	3.21	(1.88)		
Poor	89	(9.6)	4.27	(1.88)		
Type of diabetes						
Type 1	433	(46.7)	3.14	(1.82)	.06	.980
Type 2	445	(48.0)	3.13	(1.98)		
LADA	31	(3.3)	3.00	(2.02)		
Gestational	19	(2.0)	3.05	(1.81)		
Complications due to diabetes						
No complication	433	(46.7)	2.65	(1.63)	14.52	<.001
1 complication	352	(37.9)	3.47	(2.00)		
2 complications	116	(12.5)	3.66	(2.07)		
3 complications	22	(2.4)	4.00	(2.02)		
4 complications	5	(.5)	4.40	(2.61)		

Continuous variables	Mean	(%)			r	*p*-Value
Age	52.48	(11.76)	–	–	−.11	.001
Duration of diabetes	7.28	(5.96)	–	–	.05	.16

2.3.2. COVID-19-specific diabetes worries measures and diabetes related questions

With regards to assessing COVID-19-specific diabetes worries, a total of eight questions with dichotomous responses (yes/no) were asked during the survey, adopted from previous published literature [25] (Table 2). Respondents were also asked additional questions regarding their condition, including type of diabetes (type 1/type 2/LADA/gestational), and the presence of diabetic complications (e.g., retinopathy, nephropathy, neuropathy, and foot ulcer).

2.3.3. Social support related questions

Social support related data were collected by asking five questions (Table 3) with three possible responses (i.e., 1 = Not supportive, 2 = Somewhat supportive, and 3 = Very supportive). Information about support from family members/friends/relatives, work colleagues, other people in the community (neighbors), and other diabetic patients were obtained (e.g., *are you getting enough support from your family members/friends/relatives to maintain your diabetes during the COVID-19?*). Furthermore, questions regarding support from healthcare providers were also included: *are you getting sufficient care from your health care team (such as doctors, nurses) in this COVID-19 situation?* [25].

2.3.4. Behavioral changes due to COVID-19

Behavioral changes due to the COVID-19 pandemic were ascertained using 'yes/no' questions (Table 3: items 6–11). These included questions such as *are you measuring your blood glucose level more than usual due to fear of COVID-19? Are you taking medicine more regularly and carefully than before? Are you doing less physical exercise than before? Are you doing more physical exercise than before? Are you eating less than before?* And *are you taking more food than before?*

2.4. Statistical analysis

Descriptive statistics (i.e., frequencies, percentages, means, standard deviations) were calculated. Inferential statistics included conducting *t*-tests or one-way Analysis of Variance (ANOVA) to determine the mean differences in the score of COVID-19-specific diabetes worries in relation to background variables, social support, and behavioral changes due to COVID-19. Additionally, Skewness, Kurtosis, and Pearson correlation between all items regarding social

Table 2
Descriptive analysis and gender differences with regard to each item of COVID-19-specific diabetes worries questionnaire.

Variables	Total		Male		Female		χ^2	df	*p*-Value
	n	(%)	n	(%)	n	(%)			
Does it worry you that people with diabetes have a higher risk of coronavirus infection?									
Yes	753	(81.1)	394	(52.3)	359	(47.7)	.80	1	.371
No	175	(18.9)	85	(48.6)	90	(51.4)			
Does it worry that you may be unable to manage your diabetes if infected with coronavirus?									
Yes	599	(64.5)	303	(50.6)	296	(49.4)	.72	1	.396
No	329	(35.5)	176	(53.5)	153	(46.5)			
Are you worried about accessing medication for your diabetes?									
Yes	165	(17.8)	77	(46.7)	88	(53.3)	1.97	1	.161
No	763	(82.2)	402	(52.7)	361	(47.3)			
Are you worried that you may not be able to access diabetes equipment (e.g., test strips)?									
Yes	245	(26.4)	117	(47.8)	128	(52.2)	1.99	1	.159
No	683	(73.6)	362	(53.0)	321	(47.0)			
Do you think that the quality of your diabetic care has been reduced?									
Yes	254	(27.4)	128	(50.4)	126	(49.6)	.21	1	.647
No	674	(72.6)	351	(52.1)	323	(47.9)			
Are you worried that you may not get adequate treatment/diabetic care during COVID-19 pandemic?									
Yes	433	(46.7)	211	(48.7)	222	(51.3)	2.71	1	.100
No	495	(53.3)	268	(54.1)	227	(45.9)			
Are you worried that you may not be able to manage your normal blood glucose level during the pandemic?									
Yes	297	(32.0)	158	(53.2)	139	(46.8)	.44	1	.508
No	631	(68.0)	321	(50.9)	310	(49.1)			
Are you worried about possible food shortages?									
Yes	158	(17.0)	86	(54.4)	72	(45.6)	.60	1	.437
No	770	(83.0)	393	(51.0)	377	(49.0)			

support and behavioral changes in relation to COVID-19-specific diabetes worries were calculated. Parameters that were statistically significant in the group difference analyses (*t*-tests/ANOVA) and Person correlations analyses, were included in a hierarchical regression analysis. These were categorized into different blocks:

Block 1: *Background variables* (i.e., age, residence, sleep disturbance, smoking habits, physical exercise, health status, and complications due to diabetes).

Block 2: *Social support* (i.e., from family members/friends/relatives, colleagues, diabetes care teams, other people in the community [neighbors], and other people with diabetes).

Block 3: *Behavioral changes due to COVID-19* (i.e., checking blood glucose more often than usual, less exercise than usual, eating less than usual, and eating more than usual).

All analyses were executed using Statistical Package for the Social Sciences (SPSS) version 25 using a *p*-value less than .05.

3. Ethical approval

This study was conducted in accordance with Institutional Research Ethics and the Helsinki Declaration. This study was approved by the Ethical Review Committee, Uttara Adhunik Medical College, Uttara, Dhaka-1260, Bangladesh [UAMC/ERC/27/2020]. The purpose of this study was clearly documented in the first phase of the questionnaire along with (i) the procedures of the current research, (ii) data confidentiality and anonymity, and (iii) freedom to withdraw data from the study at any moment.

4. Results

A total of 928 diabetes patients were included in the final analysis with a mean age of 52.48 years (SD = 11.76; age range = 18–86 years). Of these, the majority were male (51.6%), housewives (39.7%), living in urban areas (63.1%), and most were married (86.4%) (Table 1). A sizable majority did not undertake physical exercise during the pandemic (60.5%), while 42.8% had experienced sleep disturbance (42.8%). Smoking was reported by 13.9%, and the majority of respondents reported their perceived health status as moderate or poor (69.8% + 9.6%). The mean duration of diabetes was 7.28 years (SD = 5.96), and the most common form of diabetes was suffered from type-2 (48.0%) followed by type-1 (46.7%). In addition, participants also reported the number of complications (such as retinopathy, nephropathy, neuropathy, foot ulcer) due to diabetes as follows: no complications (46.7%), 1 complication (37.9%), 2 complications (12.5%), 3 complications (2.4%), and 4 complications (.5%).

4.1. COVID-19-specific diabetes worries

The mean score of COVID-19-specific diabetes worries was 3.13 (SD = 1.90) out of a total score of 8, with a higher score indicating the higher level of COVID-19-specific diabetes worries. Table 2 presents the descriptive analysis and sex differences with regards to each item on the COVID-19-specific diabetes worries questionnaire. 81.1% of people were worried that people with diabetes have a higher risk of infection. 64.5% were worried that they might not be able to manage their diabetes if infected with coronavirus. 17.8% worried about diabetes medications. 26.4% worried due to lack of diabetes equipment (e.g., test strips); and 27.4% worried about that they were receiving inadequate treatment/diabetic care during the pandemic. 32% worried that they might not be able to manage their normal blood glucose level during the pandemic. 17.0% worried about possible food shortages. Chi-square test showed no significant difference between males and females ($p > .05$).

The mean score of COVID-19-specific diabetes worries was significantly higher ($p < .05$) among participants who were of lower age, lived in rural areas, had sleep disturbance, smokers, not physically active, self-reported poor health status and with multiple complications due to diabetes (Table 1).

Table 3 shows reliability indices, the mean score, and Pearson correlations between all items regarding social support (items 1–5), behavioral changes (items 6–11) computed for COVID-19 diabetic-specific worries (item 12). COVID-19-specific diabetes worries were negatively correlated with social support (i.e., from family/friends/relatives, colleagues, diabetes care teams, other people in the community [neighbors], and other people with diabetes); conversely, behavioral changes due to COVID-19 (i.e., checking

Table 3
Descriptive statistics, reliability indices, and correlations between items regarding social supports, behavioral changes and COVID-19-specific diabetes worries (see item 12) (N = 928).

Variables	α	Kurtosis (SE)	Skewness (SE)	Range	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11
1. Family/friends/relatives	–	−.46 (.16)	−.83 (.08)	1–3	2.59 (.54)	–										
2. Work colleagues	–	−.74 (.16)	−.31 (.08)	1–3	2.25 (.65)	.56**	–									
3. Diabetes care team	–	−.81 (.16)	−.37 (.08)	1–3	2.26 (.67)	.42**	.43**	–								
4. Other people in the community (neighbors)	–	−.60 (.16)	−.16 (.08)	1–3	2.17 (.63)	.44**	.54**	.42**	–							
5. Other people with diabetes	–	−.63 (.16)	−.51 (.08)	1–3	2.40 (.62)	.43**	.47**	.38**	.61**	–						
6. Check blood glucose more often than usual	–	−1.13 (.16)	.93 (.08)	0–1	.29 (.45)	−.02	<.01	−.01	−.04	−.04	–					
7. More careful about taking medications than usual	–	−1.45 (.16)	−.75 (.08)	0–1	.67 (.47)	.11**	.09**	.13**	.07*	.08*	.30**	–				
8. Less exercise than usual	–	−2.00 (.16)	−.01 (.08)	0–1	.50 (.50)	−.08*	−.14**	−.14**	−.15**	−.08*	.02	−.06	–			
9. More exercise than usual	–	1.69 (.16)	1.92 (.08)	0–1	.15 (.36)	.01	.06	.10**	.02	.07*	.18**	.16**	−.29**	–		
10. Eating less than usual	–	−1.98 (.16)	.15 (.08)	0–1	.46 (.50)	−.08*	−.10**	−.11**	−.09**	−.02	.04	.12**	.12**	.12**	–	
11. Eating more than usual	–	3.99 (.16)	2.45 (.08)	0–1	.11 (.32)	−.05	−.05	−.05	−.04	−.09**	.07*	−.01	.12**	.04	−.24**	–
12. COVID-19-specific diabetes worries	.70	.26 (.16)	.78 (.08)	0–8	3.13 (1.90)	−.36**	−.32**	−.30**	−.24**	−.26**	.07*	<.01	.09**	.02	.10**	.17**

Note: α = Cronbach's alpha or coefficient alpha; SE = standard error; SD = standard deviation.
Social support: items number (1–5) were scored 1–3 (i.e., 1 = not supportive, 2 = somewhat supportive, and 3 = very supportive); behavioral changes: items number (6–11) were scored 0–1 were scored as yes/no (i.e., 0 = no, and 1 = yes); and COVID-19-specific diabetes worries: the higher score indicates the greater level of COVID-19-specific diabetes worries.
* $p < .05$.
** $p < .01$.

blood glucose more often than usual, less exercise than usual, eating less than usual, and eating more than usual) were positively related with COVID-19-specific diabetes worries.

4.2. Hierarchical regression analysis

The findings of the hierarchical regression analysis predicting COVID-19-specific diabetes worries are presented in Table 4. Overall, the regression model predicted about 24% of the total variance in COVID-19-specific diabetes worries [$F_{(16,911)} = 19.48$, $p < .001$].

The COVID-19-specific diabetes worries were significantly associated with lower age, smokers, poor self-reported health status, presence of multiple diabetes complications, lack of social support (i.e., from family/friends/relatives, colleagues, and diabetes care teams), and eating more compared to the pre-COVID period (Table 4).

Other variables (i.e., residence, sleep disturbance, physical exercise, and other people in the community [neighbors], other people with diabetes, checking blood glucose more often than usual, less exercise than usual, and eating less than usual) were not shown to be significant.

5. Discussion

The COVID-19 pandemic has taken a heavy toll on lives all over the world and influenced mental wellbeing. Individuals with comorbidities such as diabetes may have specific worries about COVID-19, as they are at an elevated risk for severe infection and mortality [41]. Documented mortality rates have been shown to be up to 50% higher among diabetes patients [42]. In this study, worries relating to the COVID-19 pandemic were highly prevalent in people with diabetes. To the best of the authors' knowledge, this is the first research conducted in Bangladesh that reveals COVID-19 related worries among diabetes patients. Hierarchical regression analysis shows that COVID-19-specific diabetes worries were significantly associated with lower age, smoking, perceived poor health status, presence of other diabetic complications, lack of social support (i.e., from family/friends/relatives, colleagues, and diabetes care teams) and eating more.

In the present study, 81.1% of participants with diabetes reported being worried about COVID-19 and 64.5% were worried that they would be unable to manage their diabetes if infected with coronavirus. This is in agreement with a previous study which showed that more than half of participants with diabetes were worried about being affected by COVID-19 [25]. Research suggests that a substantial majority of hospitalized patients with COVID-19 are individuals with diabetes [43–45]. Diabetic patients have shown to be susceptible to life-threatening infections such SARs, MERs, H191, possibly as a result of a dysregulated immune response [45,46]. In addition, diabetes-related complications can potentially increase mortality from COVID-19 [46]. Patients with diabetes were more likely to need intensive care treatment, which typically means invasive ventilation [45].

Data from this study suggest that COVID-19-specific worries were found to be higher among younger people with diabetes. Younger individuals may be worried about lifetime complications if affected by COVID-19. The study findings also show that smokers with diabetes were more worried about being affected by COVID-19. Smoking increases the severity of COVID-19 [47], and several studies have revealed smoking as a significant risk factor for progression of COVID-19 [47,48], and a much higher mortality rate (double) than non-smokers [49].

Our data also revealed that people who perceived their own health as poor were more worried. It is likely that during this pandemic, regular medical checkups may have been delayed or

Table 4
Hierarchical regression analysis predicting COVID-19-specific diabetes worries.

Model	*Model 1*				*Model 2*				*Model 3*				ΔR^2	R^2_{Adj}
	B	SE	β	*t*	B	SE	β	*t*	B	SE	β	*t*		
Block 1 — background variables ($F_{(7920)}$ = 20.66; p < .001)													.14	.13
Age	−.03	.01	−.17	−5.45***	−.02	.00	−.11	−3.73***	−.10	.00	−.10	−3.22**		
Residence[a]	−.16	.12	−.04	−1.29	−.02	.12	.00	−.13	.00	.12	.00	−.06		
Sleep disturbance[b]	−.19	.12	−.05	−1.61	−.13	.11	−.03	−1.14	−.03	.11	−.03	−1.02		
Smoking habits[b]	−.45	.17	−.08	−2.64**	−.43	.16	−.08	−2.68**	−.07	.16	−.07	−2.38*		
Physical exercise[b]	.16	.12	.04	1.29	.06	.12	.02	.55	.02	.12	.02	.48		
Health status[c]	.81	.12	.23	6.87***	.57	.11	.16	4.96***	.16	.11	.16	5.08***		
Complications due to diabetes[d]	.40	.08	.17	5.19***	.31	.07	.13	4.29***	.12	.07	.12	3.86***		
Block 2 — social supports ($F_{(12,915)}$ = 23.12; p < .001)													.10	.22
Family, friends and relatives					−.58	.13	−.16	−4.39***	−.16	.13	−.16	−4.41***		
Colleagues[e]					−.25	.11	−.08	−2.15	−.08	.11	−.08	−2.13*		
Diabetes care team[e]					−.34	.10	−.12	−3.53***	−.12	.10	−.12	−3.41**		
Other people in your community (neighbors][e]					.06	.12	.02	.50	.02	.12	.02	.44		
Other people with diabetes[e]					−.22	.12	−.07	−1.90	−.06	.12	−.06	−1.64		
Block 3 — behavioral changes due to COVID-19 ($F_{(16,911)}$ = 19.48; p < .001)													.02	.24
Check blood glucose more often than usual[f]									.10	.12	.02	.80		
Less exercise than usual[f]									−.05	.12	−.01	−.44		
Eating less than usual[f]									.21	.12	.05	1.78		
Eating more than usual[f]									.92	.18	.15	5.03***		

Note: B = unstandardized regression coefficient; SE = Standard error; β = standardized regression coefficient.
[a] 1 = rural, 2 = urban.
[b] 1 = yes, 2 = no.
[c] 1 = good, 2 = moderate, 3 = poor.
[d] 1 = no complication, 2 = 1 complication, 3 = 2 complications, 4 = 3 complications, 5 = 4 complications.
[e] 1 = not supportive, 2 = somewhat supportive, and 3 = very supportive.
[f] 0 = no, 1 = yes.
* p < .05.
** p < .01.
*** p < .001.

canceled as hospitals concentrate on COVID-19 patients. It is also likely that patients are less eager to visit their doctor during the pandemic. As diabetes is a chronic condition, regular consultations are important [42]. Furthermore, the unpredictability of the disease and social immobility may lead to mental health problems.

The current pandemic would be particularly challenging for diabetic patients, especially for those who develop complications related to diabetes. In this study, we found that COVID-19 related worries were greater among diabetes patients suffering from diabetic complications. The risk of diabetes related complications (such as cardiovascular and renal complications, neuropathy, blindness, etc.) [50] may increase during the pandemic as a result of uncontrolled diabetes, requiring further care for individuals. Major changes have already been observed in the healthcare systems which interrupt existing best practices that have been set up to reduce the risk of diabetic related complications [45]. The risk of complications may increase due to reduced access to medication, diabetic-related supplies (syringes, glucose strips) medical consultations, and timely laboratory results during the pandemic [41]. Moreover, it has been shown that a higher incidence of cardiac and pulmonary problems during COVID-19 result in adverse outcomes for diabetic patients [45].

Our study suggests that diabetes patients without social support (i.e., from family/friends/relatives, colleagues, and diabetes care teams) are more worried about being affected by COVID-19 than patients who have social support, agreeing with a previous study that reported that feeling isolated would lead to increased worry about COVID-19 among diabetes patients [25]. The treatment of diabetes can be very complicated and requires lifelong involvement and significant lifestyle changes [51]. Family and social support provide practical assistance to patients, and can help alleviate the burden of living with the disease [51]. Since diabetes is a chronic condition that demands substantial change in behavior and adherence to a diet, social support is seen as one of the main factors for patients to acquire self-confidence in being able to self-care [52]. Diabetes is sometimes called the "family disease" [52] as it influences all family members. Patients therefore need continued support to preserve their physical and mental health, especially in critical situations such as the COVID-19 pandemic. In addition, as mobility is limited in many parts of the world in order to control the pandemic [2], it has become a cause of suffering, particularly for those who need social support. This is amplified in those who are elderly and live alone.

Our data also suggest that patients with diabetes were eating more compared to normal, and this was significantly associated with COVID-19 related worries in this group. As people with poor immune systems are more susceptible to COVID-19 [53], individuals with diabetes may try to seek to enhance their immune system by eating more than before. Normal dietary schedules are then disrupted resulting in change in food intake and leading to uncontrolled blood glucose levels [2].

5.1. Limitations

This study has a number of limitations. Firstly, the study was cross-sectional in nature, so it does not establish the causality of any of the variables. In this respect, a longitudinal study is required for the better understanding of diabetic patients' behavior and their COVID-19 related specific worries. Secondly, the study used an online-based self-reporting method that may be vulnerable to social desirability and memory recall bias. Since the study was conducted online and used a self-reported status for diabetes, it may be possible that people without diabetes could have completed the survey. However, this was mitigated by the fact that if they responded 'no' to a question that asked if they had diabetes then the online survey was closed before they could respond to any further questions.

6. Conclusions

This study represents the high prevalence of worries and significant change in behavior among people with diabetes during the COVID-19 pandemic. These findings suggest the need for improved support for people with diabetes to manage their worries and behavior, especially those patients with other diabetic complications. Providing community support and helplines would help mediate the worries and isolation in people with diabetes. It is also important healthcare providers deliver appropriate advice and care to diabetic patients both during and beyond the COVID-19 pandemic. The findings suggest a need for a prospective study among patients with diabetes in Bangladesh to investigate diabetes related worries in relation to changed social support and lifestyles as a result of the COVID-19 pandemic.

Conflict of interest

All of the authors declare no known conflict of interest.

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