Contents lists available at ScienceDirect

Canadian Journal of Diabetes

journal homepage:
www.canadianjournalofdiabetes.com

Original Research

Perceptions and Correlates of Distress Due to the COVID-19 Pandemic and Stress Management Strategies Among Adults With Diabetes: A Mixed-Methods Study

James H.B. Im BMSc [a,1]; Carlos Escudero MSc [b,1]; Kendra Zhang BA [c]; Dorothy Choi BSc [d]; Arani Sivakumar BMSc [d]; Gillian L. Booth MD [d,e]; Joanna Sale PhD [d,e,f]; Cheryl Pritlove PhD [d,g]; Andrew Advani MBChB(Hons), PhD [d]; Catherine H. Yu MD [a,d,h,*]

[a] Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada
[b] GKT School of Medical Education, King's College London, London, United Kingdom
[c] School of Medicine, Queen's University, Kingston, Ontario, Canada
[d] St. Michael's Hospital, Unity Health Toronto, Toronto, Ontario, Canada
[e] Institute for Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada
[f] Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada
[g] School of Kinesiology and Health Science, York University, Toronto, Ontario Canada
[h] Department of Medicine, University of Toronto, Toronto, Ontario, Canada

Key Messages

- People with diabetes have had decreased physical and psychological wellness after past public health emergencies.
- Perceptions of the pandemic and stress and illness management strategies differed based on sociodemographic and clinical characteristics.
- Diabetes distress, resilient coping and diabetes self-efficacy were associated with COVID distress among people with diabetes.

ARTICLE INFO

ABSTRACT

Background: Greater risk of adverse health outcomes and public health measures have increased distress among people with diabetes during the coronavirus-2019 (COVID-19) pandemic. The objectives of this study were to explore how the experiences of people with diabetes during the COVID-19 pandemic differ according to sociodemographic characteristics and identify diabetes-related psychosocial correlates of COVID distress.

Methods: Patients with type 1 or 2 diabetes were recruited from clinics and community health centres in Toronto, Ontario, as well as patient networks. Participants were interviewed to explore the experiences of people with diabetes with varied sociodemographic and clinical identities, with respect to wellness (physical, emotional, social, financial, occupational), level of stress and management strategies. Multiple linear regression was used to assess the relationships between diabetes distress, diabetes self-efficacy and resilient coping with COVID distress.

Results: Interviews revealed that specific aspects of psychosocial wellness affected by the pandemic, and stress and illness management strategies utilized by people with diabetes differed based on socioeconomic status, gender, type of diabetes and race. Resilient coping (β=−0.0517; 95% confidence interval [CI], −0.0918 to −0.0116; p=0.012), diabetes distress (β=0.0260; 95% CI, 0.0149 to 0.0371; p<0.0001) and diabetes self-efficacy (β=−0.0184; 95% CI, −0.0316 to −0.0052; p=0.007) were significantly associated with COVID distress.

Conclusions: Certain subgroups of people with diabetes have experienced a disproportionate amount of COVID distress. Assessing correlates of COVID distress among people with diabetes will help inform

* Address for correspondence: Catherine H. Yu MD, Dalla Lana School of Public Health, University of Toronto, 30 Bond Street, Toronto, Ontario, M5B 1W8, Canada.
  E-mail address: catherine.yu@unityhealth.to
1 Co-first authors.

interventions such as diabetes self-management education to address the psychosocial distress caused by the pandemic.

R É S U M É

Introduction : Le risque accru de résultats cliniques défavorables et les mesures de santé publique ont contribué à l'augmentation de la détresse des personnes diabétiques durant la pandémie de la maladie à coronarovirus 2019 (COVID-19, de l'anglais *coronavirus disease* 2019). Les objectifs de la présente étude étaient d'expliquer comment les expériences des personnes diabétiques durant la pandémie de la COVID-19 différaient selon les caractéristiques sociodémographiques et de cerner les corrélats psychosociaux de la détresse liée à la COVID des personnes diabétiques.

Méthodes : Les patients atteints du diabète de type 1 ou 2 étaient recrutés dans des cliniques et des centres de santé communautaire de Toronto, en Ontario, et dans des réseaux de patients. Nous avons interrogé les participants pour comprendre les expériences des personnes diabétiques qui ont des caractéristiques sociodémographiques et cliniques variées en ce qui concerne le bien-être (physique, émotionnel, social, financier, professionnel), le niveau de stress et les stratégies de prise en charge. Nous avons utilisé la régression linéaire multiple pour évaluer les relations entre la détresse liée au diabète, l'auto-efficacité relative au diabète et l'adaptation résiliente à la détresse liée à la COVID.

Résultats : Les entretiens ont révélé que la pandémie a nui aux aspects spécifiques au bien-être psychosocial, et que les stratégies de prise en charge du stress et de la maladie utilisées par les personnes diabétiques différaient selon le statut socioéconomique, le sexe, le type de diabète et la race. L'adaptation résiliente ($\beta = -0{,}0517$; intervalle de confiance [IC] à 95 %, de $-0{,}0918$ à $-0{,}0116$; $p = 0{,}012$), la détresse liée au diabète ($\beta = 0{,}0260$; IC à 95 %, de $0{,}0149$ à $0{,}0371$; $p < 0{,}0001$) et l'auto-efficacité relative au diabète ($\beta = -0{,}0184$; IC à 95 %, de $-0{,}0316$ à $-0{,}0052$; $p = 0{,}007$) étaient associées de façon significative à la détresse liée à la COVID.

Conclusions : Certains sous-groupes de personnes diabétiques ont vécu un niveau disproportionné de détresse liée à la COVID. L'évaluation des corrélats de la détresse liée à la COVID des personnes diabétiques contribuera à l'élaboration d'interventions telles que l'éducation à la prise en charge autonome du diabète pour faire face à la détresse psychosociale causée par la pandémie.

Introduction

The novel coronavirus disease-2019 (COVID-19) pandemic represents one of the greatest contemporary public health challenges (1). People with diabetes (PwD) are at greater risk of medical complications and fatality, and have endured strict quarantine measures to minimize their risk (2). PwD may also have endured worsening glycemic control during lockdown due to reduced capacity to exercise and control their diet, and reduced availability of antidiabetes medications and medical advice (3). Despite the many possible challenges of managing diabetes during the pandemic, the lived experiences of PwD and how they have been impacted psychosocially have not been adequately explored.

It has been shown that the COVID-19 pandemic negatively impacts certain populations more so than others, depending on factors such as gender, race and socioeconomic status (SES) (4,5). Among PwD, these sociodemographic variables may pose further challenges to coping with the pandemic. Thus, research on the impacts of the pandemic on PwD should consider the experiences of underserved populations so that health-care providers can address disparities.

Given the high prevalence of psychological distress among PwD during the pandemic (6), investigating ways to alleviate COVID distress would be beneficial. General self-efficacy has been linked to lower levels of distress and may be a correlate of reduced COVID distress (7). Another factor potentially associated with COVID distress is diabetes distress, which is associated with negative health outcomes, such as reduced adherence to medication

regimens (8). Resilient coping is associated with a greater quality of life and metabolic control in patients with diabetes (9). Despite their potential implications for psychosocial well-being, there is a lack of research into how these factors are associated with COVID distress.

In this study, we aimed to assess the psychosocial experiences of PwD (type 1 and type 2) of different sociodemographic and clinical groups and the associations between modifiable psychosocial constructs and COVID distress to inform clinicians of targets for minimizing distress among their patients with diabetes.

Methods

Study design and setting

This work was a mixed-methods study, involving qualitative interviews and an online cross-sectional survey. Given the disparities in distress experienced by subgroups in our interview sample, we examined, through the cross-sectional survey, certain diabetes-related psychosocial constructs that may be associated with COVID distress.

Participant recruitment

Community-dwelling adults ≥ 18 years of age with either type 1 or type 2 diabetes and living in Ontario, Canada, and those part of patient networks in Canada, were included in this study. Pregnant women, adults in long-term care and at end of life or those who

could not give consent were excluded from this study because their experiences were presumed to be different from PwD in the general population (10).

Recruitment of participants for the interviews and cross-sectional survey occurred from May 2020 to September 2020 and May 2020 to February 2021, respectively. Recruitment occurred via individuals from participants' circles of care from St. Michael's Hospital specialty clinics, primary care clinics and community health centres in Toronto, Ontario. Professional, research and patient networks, such as Diabetes Canada and KT Canada Network, were also used to recruit patients. Purposive sampling was used to deliberately select participants for recruitment to ensure demographic diversity and capture under-represented populations (11). Participants who were interviewed were also invited to participate in the survey.

All participants provided verbal informed consent to participate in the study. This study was approved by the research ethics board of St. Michael's Hospital in Toronto, Ontario.

Individual interviews

Data collection: Interviews were conducted, audiotaped and then transcribed verbatim and annotated using field notes for subsequent analysis. Data were collected via 45- to 60-minute semistructured telephone interviews with open-ended questions to explore participants' experiences (12). Interview questions were informed by the Wellness Evaluation of Lifestyle Inventory, developed from the Wheel of Wellness theoretical framework, the "gold standard" of wellness assessments in clinical settings (13,14), and stress and coping theory, which comprehensively explores psychological and emotional responsiveness and coping with multiple types of stressors (15). Interview questions were pilot-tested with knowledge users. Participants with significant language barriers were interviewed alongside a caregiver.

Data analysis: Data collection and analysis were conducted concurrently until saturation was attained (16–18). The interview guide was iteratively refined throughout data collection to capture emerging ideas. Transcripts were coded to develop concise summaries of key themes within and across interviews (19). Coding was conducted independently by 4 individuals (J.H.B.I., C.E.K., D.C., A.S.), and codes were refined and organized according to Shaw's framework for coping, illness behaviour and outcomes (20) to provide a greater focus on the impact of the pandemic on PwD. Specifically, we focussed on participants' appraisal of the situation, coping strategies and health behaviours. Transcripts were critically analyzed using inductive thematic analysis and constant comparative analysis (21). As an initial exploration, a categorical comparison with SES, type of diabetes, gender and race was used to compare subgroups and identify characteristics within which there appeared to be inequities in COVID-19 burden. NVivo version 12 software was used to manage data.

Cross-sectional survey

Outcomes and covariates: Validated psychometric scales were used to measure diabetes distress, resilient coping, diabetes self-efficacy and COVID distress (Table 1). The Problem Areas in Diabetes Scale, a 20-question scale with an internal consistency of 0.92, was used to measure diabetes distress. Each question is scored on a 5-point Likert scale (22). Resilient coping was measured using the Brief Resilient Coping Scale, a 4-question scale with an internal consistency of 0.69. Similarly, questions on the Brief Resilient Coping Scale are also scored using a 5-point Likert format (23). Diabetes self-efficacy was measured using the Self-Efficacy for

Managing Chronic Diseases Scale, which has an internal consistency of 0.80 and contains 6 questions measured on a 10-point Likert scale (24). Last, the Impact of Event Scale-6, which assesses posttraumatic stress reaction, was used as a measure of COVID distress. The Impact of Event Scale-6 has an internal consistency of 0.93, contains 6 questions and is measured on a 5-point Likert scale (25). All scales were treated as continuous variables.

Data collection: All outcome and covariate data were self-reported by participants. Surveys were conducted over the telephone for participants with low literacy skills and offered in multiple languages for participants who were unable to speak English, although all were conducted in English.

Statistical analysis

Multiple linear regression was used to assess the associations between psychosocial constructs (diabetes distress, resilient coping, diabetes self-efficacy) and COVID distress, adjusting for age, gender, type of diabetes, race, occupation and diabetes duration. For all models, beta (β) coefficients and associated 95% confidence intervals (CIs) were reported. Diabetes distress and resilient coping were assessed as potential mediators by including them as covariates for adjustment in the regression model with diabetes self-efficacy as the primary predictor and COVID distress as the outcome (26). A two-sided p value of <0.05 was used as the cutoff for statistical significance.

The size of the sample was based on guidelines for regression analyses by Harrell of 10 observations per coefficient (27). Complete case analysis was performed because the proportion of missing data in included covariates was very small and there was little evidence to suggest the data were not missing at random (28). Furthermore, all regression analyses included approximately 140 observations and were thus considered to be sufficiently powered. All statistical analyses were conducted using R version 4.0.2 (R Foundation for Statistical Computing, Vienna, Austria).

Results

Individual interviews

Participants' characteristics: The characteristics of the 47 included participants are shown in Table 2.

Perceptions of the COVID-19 pandemic and stress management strategies: Participants' clinical and sociodemographic characteristics seemed to impact their perceptions of the pandemic and stress management strategies. Accordingly, we identified contrasting experiences of (1) White vs non-White participants; (2) participants of high SES vs low SES; (3) participants with type 1 vs type 2 diabetes; and (4) women vs men, as detailed in what follows.

Theme 1: Participants with type 1 diabetes were minimally impacted by the pandemic and used more problem-focussed management strategies to confront stressors compared with participants with type 2 diabetes.

Participants with type 1 diabetes perceived less fear from the pandemic and its associated limitations:

I'm never really worried about the pandemic because I'm inside...the pandemic hasn't caused me any distress. (P18)

In contrast, participants with type 2 diabetes perceived a higher personal risk, which in turn contributed to a heightened sense of anxiety and fear of potential consequences:

Table 1
Psychometric scales used and constructs measured

Scale	Construct measured	Internal consistency (α)	Scoring format	Number of items
Problem Areas in Diabetes	Diabetes distress	0.92	5-point Likert scale ranging from 0 (not a problem) to 4 (serious problem)	20
Brief Resilient Coping Scale	Resilient coping	0.69	5-point Likert scale ranging from 1 (does not describe me at all) to 5 (describes me very well)	4
Impact of Event Scale-6	Posttraumatic stress reaction (as a measure of COVID distress)	0.80	5-point Likert scale ranging from 0 (not at all) to 4 (extremely)	6
Self-Efficacy for Managing Chronic Diseases	Self-efficacy	0.93	10-point Likert scale ranging from 1 (not at all confident) to 10 (totally confident)	6

I think about my health a lot more and I'm a bit more afraid because I'm a diabetic (sic)… (P5)

Furthermore, participants with type 2 diabetes also reported greater distress from having reduced contact with members of their support network due to the social limitations of the pandemic:

So the stress levels go down automatically because you're going and meeting new people…Now everything got pent up because you're not meeting anyone. (P31)

The perceptions of participants with type 1 and type 2 diabetes also seemed to impact the coping strategies employed to manage stressors. Participants with type 1 diabetes seemed to engage in more active problem-focussed behaviours to manage stressors and reduce distress:

We're not walking anywhere, we can't just sit on our butts all day and work and expect not to gain weight or become unhealthy so we actively decided to do an hour walk every day. (P33)

Participants with type 1 diabetes also indicated a greater self-reliance in terms of managing their stressors and diabetes. For example, when asked about the role of support networks in their diabetes management, this participant responded:

I prefer to be more of a one-way street. I'll keep you (other people in support network) fully informed on my health but at the same time I'd prefer if you didn't comment on what I'm doing. (P2)

On the other hand, participants with type 2 diabetes reported greater distress from having reduced contact with their support network and made more attempts to interact with their support network to manage stress:

I made sure that I was contacting people either through Zoom or by phone and I was talking to several people every week. (P47)

Participants' perceptions of the pandemic and management methods influenced the kinds of health-care interventions they thought were necessary. Participants with type 1 diabetes indicated that messaging from clinics could supplement current methods to help ascertain other resources:

The Ontario government has released a lot of stuff but…I don't typically consume that kind of stuff…I think an e-mail or something like that could definitely be really helpful from each of the doctors and the government. (P2)

On the other hand, because participants with type 2 diabetes were generally more fearful and anxious, many indicated that increasing health-care resources to accommodate for all participants was one improvement the health-care system should adopt:

Figure out how you can cut the wait time to see a specialist right? It was already really bad before COVID. COVID just made it worse… So hire more doctors. (P31)

In general, participants with type 1 diabetes perceived less distress from the pandemic and used problem-focussed management strategies.

Theme 2: Non-White participants were more accepting of the pandemic and relied on their support network and faith-based strategies to manage stressors.
Non-White participants perceived the pandemic as less negative compared to White participants. Although some non-White participants reported distress regarding their personal risk, many expressed acceptance of the pandemic and its impacts. For example, one Black participant minimized the impact of the pandemic on her day-to-day living:

I keep myself from it (the pandemic) and I do what I used to do… I am not stressing myself about it. (P36)

Similarly, non-White participants perceived minimal impact on relationships and their stability. Furthermore, some participants also adopted positive mindsets, which may have moderated some of the impacts of the pandemic:

I don't think my support network's been impacted too much during the pandemic…they were able to provide the same (social) support as they were before. I'm fortunate that I haven't been impacted too much. (P45)

In contrast, White participants more commonly reported a general sense of anxiety, which was pervasive and sustained throughout their daily lives:

There's a general feeling of anxiety around what goes on. The longer it goes, the more stressful it feels. (P8)

A major source of anxiety for White participants was a concern for their mental health and feeling of uncertainty about the future:

I'm just worried about my mental health more than anything… I don't know why I just seem more hopeless about the future. (P42)

White participants also spoke to experiencing anxiety over the potential social uncertainties due to the limitations of the pandemic:

Table 2
Characteristics of included participants for individual interviews (n=47) and cross-sectional surveys (n=153)

Characteristics	Individual interviews (N=47)		Cross-sectional surveys (N=153)	
	n	%	n	%
Age, years				
18−30	6	12.8	16	10.5
31−50	8	17.0	32	20.9
51−64	11	23.4	44	28.8
≥65	20	42.6	60	39.2
Missing	2	4.3	1	0.7
Gender				
Men	24	51.1	72	47.1
Women	23	48.9	79	51.6
Missing	0	0.0	2	1.3
Race				
White	24	51.1	100	65.4
Non-White	23	48.9	52	34.0
Missing	0	0.0	1	0.6
Type of diabetes				
Type 1	15	31.9	55	35.9
Type 2	32	68.1	96	62.7
Missing	0	0.0	2	1.3
Diabetes duration				
≤5 years ago	8	17.0	20	13.1
>5 years ago	39	83.0	131	85.6
Missing	0	0.0	2	1.3
Annual household income				
<$25,000	4	8.5	13	8.5
$25,000−$39,999	3	6.4	16	10.5
$40,000−$59,999	4	8.5	21	13.7
$60,000−$79,999	7	14.9	20	13.1
$80,000−$99,999	8	17.0	16	10.5
≥$100,000	16	34.0	53	34.6
Missing	5	10.6	14	9.2
Highest level of education achieved				
High school diploma or less	13	27.7	34	22.2
Professional or trade certification	0	0.0	18	11.8
College diploma or undergraduate university degree	16	34.0	60	39.2
Postgraduate degree	18	38.3	40	26.1
Missing	0	0.0	1	0.6
Occupational status				
Full- or part-time employment	20	42.6	64	41.8
Full- or part-time student	2	4.3	8	5.2
Unemployed	4	8.5	14	9.2
Retired	21	44.7	64	41.8
Missing	0	0.0	3	1.9
Living situation				
Living alone	4	8.5	35	22.9
Living with others	43	91.5	115	75.1
Missing	0	0.0	3	2.0

I think it's a concern from everybody, you know? You start wondering, will you ever shake somebody's hand again when you first meet them? (P1)

The approach to managing stressors appeared to have differed between non-White and White participants. Many non-White participants reported relying on their support networks to manage stress. For example, when asked about her normal approach to stress, a participant responded:

I usually talk with my husband. He's my friend and he usually listens to me a lot. That helps me. (P17)

Faith and spirituality also appeared to be much more important and prevalent aspects of non-White participants' lives in comparison to reports by White participants. Many non-White participants noted that faith and spirituality helped them manage stress and it also provided them with a strong community of support during the pandemic:

My friends will send inspirations…or we'll pray together every now and then… That's how we keep our connection and we have group chats on Whatsapp. (P32)

On the other hand, White participants typically reported employing more task-based stress management methods. In response to changing schedules, many White participants reported adapting their routines by engaging in more health-related behaviours, such as improving their diets, which facilitated the management of their diabetes:

I had to change my eating habits cause I can't go shopping as much…I don't have any junk food in the house anymore…I've had to do my own adjusting for my ratios. (P42)

In general, perceived instability regarding the future and relationships was a major driver of anxiety and distress, especially among White participants.

Theme 3: Participants of high SES perceived the COVID-19 pandemic as less negative and were better positioned to adapt to the pandemic compared with participants of low SES.

The experiences of participants of low SES contrasted sharply with those of high SES. Participants of low SES were more anxious and distressed about the pandemic. Many noted a loss of a sense of control in their lives derived from upheavals of their daily routines and inabilities to readjust their lives. One participant had just started a new job when the pandemic occurred and noted difficulties in adjusting to a new lifestyle:

> Things were changing very quickly such as having to work from home…it definitely took an emotional toll. Stress and anxiety levels were very high… I'm very used to being in control with my own life and things were changing so rapidly it felt like there was just no control over life. (P25)

On the other hand, participants of high SES perceived the pandemic as less negative and something that facilitated the organization of their daily lives. Specifically, participants of high SES seemed to be able to work from home more frequently, which they perceived as advantageous for their diabetes management:

> My job is very stressful so when I came home, I got better control of my blood sugars because I had more control over my time-table and what I did in the day. Things were less chaotic than they are at work, so it was a little bit easier. I maintain my diet very tightly. (P26)

This perceived sense of control (or lack thereof) appeared to impact the strategies employed to manage their diabetes and other stressors. Participants of low SES had trouble finding strategies to mitigate the impacts of the pandemic:

> Yeah, I used to go out and walk. I had a class downstairs where I live and exercise. Now I don't have anything because of COVID. (P28)

A major strategy utilized by participants of low SES was interacting with their support networks. Relatively little tension within support networks was reported by participants of low SES and, accordingly, support from friends and families seemed to be important when dealing with stress for many participants of low SES:

> I usually approach stress by talking to my husband, having a conversation and telling ideas to each other. Sometimes with my family as well. (P29)

On the other hand, participants of high SES were more likely to use problem-focussed strategies and respond adaptively to pandemic-related changes:

> I'm not eating out…I'm not getting lunch when I don't have time to eat lunch because I'm home right? I can easily just make a healthy lunch at home so if anything, my diet is much better. (P33)

Thus, sense of control impacted participants' perceptions of the pandemic and the adaptiveness of their management strategies.

Theme 4: Women perceived the impact of the pandemic as more negative but used problem-focussed stress management methods to actively improve their well-being and health.

The experiences of women during the pandemic contrasted starkly with those of men. Women reported having much greater burdens during the pandemic than men. In particular, the strain of having to adopt multiple roles within the family was a major driver of distress:

> I feel as a female, because they are more a foundation, they are not just taking care of themselves, they have other people to take care of. I think for females, it is a burden even more. (P13)

In addition, another major source of distress among many women was the strain resulting from a mixing of their home and work lives:

> I'm definitely spending more time at home with 3 kids…the stress of multitasking and the pressure of the daily has definitely affected me during the pandemic, just handling everything. (P5)

On the other hand, although some men also found that the pandemic and their elevated personal risks were sources of distress, many men found that the pandemic facilitated better management of their diabetes:

> I've found it easier to manage my blood sugars. Working set hours made it difficult before the pandemic. (P10)

The stress management strategies of women and men also differed markedly. Although women reported greater distress and burden, women also appeared to have more self-directedness toward their own situations:

> Doesn't matter how long it will take…I have to carefully figure out how you deal with problems and stress. (P21)

In addition, this self-directedness also seemed to enable the utilization of problem-focussed management strategies, which facilitated greater improvements in their health:

> I was doing some research, reading some books regarding healthy eating so I did achieve a little bit of a lifestyle of homemade food. Now when I go to work…I make sure that I eat it on time. (P13)

Men appeared to manage stress primarily through methods focussed on avoidance. One man found that avoidance was the optimal solution during the pandemic, and this sentiment was echoed by several others:

> There's things you can do to not think about your condition and relieve stress in that sense. You know, picking up a hobby. If it's doing a little bit of woodworking or something just to take your mind off things. (P1)

Women reported having greater distress and burdens during the pandemic but seemed to have a sense of self-directedness, which facilitated usage of problem-focussed management strategies.

Cross-sectional survey

Sample characteristics: Characteristics of the included participants are shown in Table 2. The distribution of men (47.1%) and women (51.6%) in the sample was approximately equal. Participants ≥65 years of age comprised 39.2% of the sample. The majority of the participants were White (65.4%) and had type 2 diabetes (62.7%).

Adjusted relationship between resilient coping, diabetes distress and diabetes self-efficacy with COVID distress: As shown in Table 3,

Table 3
Adjusted relationships between selected scales and COVID distress

Scale comparisons	Additional covariates *	Beta coefficient (95% CI)	p Value
Resilient Coping and COVID Distress	No additional	−0.0517 (−0.0918 to −0.0116)	0.012
Diabetes Distress and COVID Distress	No additional	0.0260 (0.0149 to 0.0371)	<0.0001
Diabetes Self-Efficacy and COVID Distress	No additional	−0.0184 (−0.0316 to −0.0052)	0.007
	Diabetes distress	−0.0065 (−0.0206 to 0.0076)	0.364
	Resilient coping	−0.0143 (−0.0283 to −0.0002)	0.047
	Diabetes distress and resilient coping	−0.0004 (−0.0154 to 0.0147)	0.963

CI, confidence interval; COVID, coronavirus disease.
  * All models adjusted for age, gender, race, diabetes duration, type of diabetes and occupation.

higher levels of diabetes distress (β=0.0260; 95% CI, 0.0149 to 0.0371; p<0.0001) were significantly associated with higher COVID distress, whereas higher levels of resilient coping (β=−0.0517; 95% CI, −0.0918 to −0.0116; p=0.012) and diabetes self-efficacy (β=−0.0184; 95% CI, −0.0316 to −0.0052; p=0.007) were associated with lower levels of COVID distress, adjusted for all covariates.

Discussion

This study examined the impacts of the pandemic on diverse PwD and psychosocial factors associated with COVID distress. Our results reveal how sociodemographic characteristics shaped PwD's experiences of the pandemic, and potential avenues for mitigating the negative impacts of the pandemic.

From the qualitative component of our study, we identified several differences in participants' experiences of the pandemic. First, our results demonstrate that anxiety was lower among people with type 1 diabetes; distress may have been heightened in participants with type 2 diabetes due to additional comorbidities, including obesity and hypertension (29). These findings indicate the need to address the psychosocial well-being of PwD uniquely depending on their type of diabetes.

Second, we found that the perceptions and coping strategies of White vs non-White PwD differed. White participants expressed both a more general sense of anxiety and distress and distress specifically regarding uncertainties about the future due to the pandemic. In contrast, cross-sectional studies by Özcan et al and Stoop et al found that diabetes distress was more prevalent among ethnic minorities (30,31); however, cross-sectional studies by Peyrot et al and Pouwer et al found that ethnic minorities had better quality of life and well-being (32,33). These differences in sources of distress and coping strategies may be due to unmeasured factors related to ethnicity, such as migration stress, language barriers and cultural values (30).

Third, our participants of lower SES were unable to use the same glycemic control strategies as those of higher SES. Participants of lower SES also reported greater anxiety and distress due to a loss of daily routine and control over their life circumstances and had greater difficulties managing stressors in our study. A cross-sectional study by Fidan et al showed that low education levels were associated with difficulties in coping, which may be due to a lack of resources to buffer the impacts of stressful events (34). Similarly, our results show that PwD of higher SES were better able to cope with their distress by finding ways to maintain activities disrupted by the pandemic such as exercising and eating well, which in turn translated into greater mental well-being compared with PwD of lower SES.

Fourth, we found that women with diabetes expressed more anxiety and distress than did men. This finding aligns with several studies, which showed that women in general have experienced higher levels of psychological distress during the pandemic and are at increased risk for mental health problems (35–37). Women with diabetes may experience more anxiety due to an interplay between diabetes-related responsibility and additional responsibilities related to employment and caring for families (38).

From the quantitative component of our study, we determined that higher levels of resilient coping, diabetes self-efficacy and lower levels of diabetes distress were associated with lower levels of COVID distress. Thus, utilizing resilient coping behaviours, such as setting behavioural goals, fulfilling health-care obligations and increasing motivation, would help reduce PwD's COVID distress (39). Self-efficacy has been shown to be relevant in adequately managing chronic health conditions, as it heavily influences the pursuit of health behaviours (40). Diabetes distress may have increased in PwD due to pandemic-induced disruptions in self-management routines (e.g. diet and physical activity) (41,42). This was reflected in our interviews, particularly among participants with type 2 diabetes, who expressed worry about their diabetes status as well as more fear and anxiety surrounding the pandemic. Thus, diabetes self-management education and psychological interventions such as cognitive behavioural therapy, which have shown success in reducing diabetes distress (43,44), may be useful for PwD for reducing COVID distress as well.

Strengths and limitations

Our study has limitations. First, participants were not completely balanced in terms of sociodemographic characteristics. A higher proportion of participants were of higher SES, and thus their perspectives may not be representative of all PwD. Second, data were collected across different periods of public health restrictions, which may have led to differences in perceptions, experiences and levels of distress. In the quantitative component, causality cannot be inferred from the relationships examined given the cross-sectional nature of this study. In addition, these data may not be generalizable to the general population of PwD in Ontario. Older adults, women and those of high SES were over-represented in our sample. In the qualitative component, we were unable to assess whether differences in observed themes were attributable to other, or intersecting, participant characteristics due to sample size limitations.

Nevertheless, our study also has strengths. It is one of the first to explore the multifaceted impact of COVID-19 on PwD and strategies used to manage stressors. It is also among the first to evaluate possible determinants of COVID distress among PwD. In addition, methodologic rigour was promoted as coding was performed by 4 independent coders and qualitative data were interpreted and analyzed by 5 individuals. Feedback from a team with expertise in qualitative data analysis and diabetes care was incorporated at multiple stages in the study (45). Moreover, we used validated and reliable psychometric scales to assess all constructs in this study.

In conclusion, our results suggest that the impacts of the pandemic have varied across sociodemographic and clinical groups, and that clinicians and educators can target resilient coping, diabetes self-efficacy and diabetes distress to minimize COVID distress. Therefore, this study has highlighted the need to evaluate and contextualize the psychosocial well-being of PwD at routine checkups.

Acknowledgments

Author Disclosures

Conflicts of interest: None.

Author Contributions

J.H.B.I. contributed to data acquisition and analyses and writing of the manuscript. C.E. contributed to study design, data acquisition and analyses and writing of the manuscript. D.C. and A.S. contributed to data acquisition and analyses and editing of the manuscript. K.Z. contributed to writing of the manuscript and reviewed and edited the manuscript. A.A. and G.L.B. contributed to study conception and design, interpretation of the findings and editing of the manuscript. C.P. and J.S. contributed to the interpretation of findings and editing of the manuscript. C.H.Y. contributed to study design, data acquisition and analyses and editing of the manuscript. C.H.Y. is the guarantor of this work and takes responsibility for the contents of the published article.

References

1. Acter T, Uddin N, Das J, Akhter A, Choudhury TR, Kim S. Evolution of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as coronavirus disease 2019 (COVID-19) pandemic: A global health emergency. Sci Total Environ 2020;730:138996.
2. Dariya B, Nagaraju GP. Understanding novel COVID-19: Its impact on organ failure and risk assessment for diabetic and cancer patients. Cytokine Growth Factor Rev 2020;53:43−52.
3. Gupta S, Tang C, Higgs P. Social isolation during Covid-19: Boon or bane to diabetes management. Diabetes Metab Syndr 2020;14:567−8.
4. Phiri P, Delanerolle G, Al-Sudani A, Rathod S. COVID-19 and Black, Asian, and minority ethnic communities: A complex relationship without just cause. JMIR Public Health Surveill 2021;7:e22581.
5. Dang HH, Nguyen CV. Gender inequality during the COVID-19 pandemic: Income, expenditure, savings, and job loss. World Dev 2021;140:105296.
6. Alessi J, de Oliveira GB, Franco DW, et al. Mental health in the era of COVID-19: Prevalence of psychiatric disorders in a cohort of patients with type 1 and type 2 diabetes during the social distancing. Diabetol Metab Syndr 2020;12:76.
7. Benight CC, Swift E, Sanger J, Smith A, Zeppelin D. Coping self-efficacy as a mediator of distress following a natural disaster. J Appl Soc Psychol 1999;29:2443−64.
8. Owens-Gary MD, Zhang X, Jawanda S, Bullard KM, Allweiss P, Smith BD. The Importance of addressing depression and diabetes distress in adults with type 2 diabetes. J Gen Intern Med 2019;34:320−4.
9. Fisher EB, Thorpe CT, Devellis BM, Devellis RF. Healthy coping, negative emotions, and diabetes management: A systematic review and appraisal. Diabetes Educ 2007;33:1080−103.
10. Qeadan F, Mensah NA, Tingey B, Stanford JB. The risk of clinical complications and death among pregnant women with COVID-19 in the Cerner COVID-19 cohort: A retrospective analysis. BMC Pregnancy Childbirth 2021;21:305.
11. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Adm Policy Ment Health 2015;42:533−44.
12. Jamshed S. Qualitative research method-interviewing and observation. J Basic Clin Pharm 2014;5:87.
13. Bart R, Ishak WW, Ganjian S, et al. The assessment and measurement of wellness in the clinical medical setting: a systematic review. Innov Clin Neurosci 2018;15:14−23.
14. Myers JE, Sweeney TJ, Witmer JM. The wheel of wellness counseling for wellness: A holistic model for treatment planning. J Couns Psychol 2000;78:251−66.
15. Biggs A, Brough P, Drummond S. Lazarus and Folkman's psychological stress and coping theory. In: Cooper CL, Quick JC, editors. The Handbook of Stress and Health: A Guide to Research and Practice. Chichester, UK: John Wiley & Sons, 2017. p. 349−64.
16. Saunders B, Sim J, Kingstone T, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. Qual Quant 2018;52:1893−907.
17. Morse JM. Determining sample size. Qual Health Res 2000;10:3−5.
18. Vasileiou K, Barnett J, Thorpe S. Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Med Res Methodol 2018;18:148.
19. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res 2005;15:1277−88.
20. Shaw C. A framework for the study of coping, illness behaviour and outcomes. J Adv Nurs 1999;29:1246−55.
21. Boeije H. A purposeful approach to the constant comparative method in the analysis of qualitative interviews. Qual Quant 2002;36:391−409.
22. Schmitt A, Reimer A, Kulzer B, Haak T, Ehrmann D, Hermanns N. How to assess diabetes distress: comparison of the Problem Areas in Diabetes Scale (PAID) and the Diabetes Distress Scale (DDS). Diabet Med 2016;33:835−43.
23. Sinclair VG, Wallston KA. The development and psychometric evaluation of the Brief Resilient Coping Scale. Assessment 2004;11:94−101.
24. Freund T, Gensichen J, Goetz K, Szecsenyi J, Mahler C. Evaluating self-efficacy for managing chronic disease: Psychometric properties of the six-item Self-Efficacy Scale in Germany. J Eval Clin Pract 2013;19:39−43.
25. Thoresen S, Tambs K, Hussain A, Heir T, Johansen VA, Bisson JI. Brief measure of posttraumatic stress reactions: Impact of Event Scale-6. Soc Psychiatry Psychiatr Epidemiol 2010;45:405−12.
26. Baron RM, Kenny DA. The moderator−mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. J Pers Soc Psychol 1986;51:1173.
27. Harrell Jr FE. Regression Modeling Strategies: With Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis. 2nd ed. Cham, Switzerland: Springer, 2015.
28. Bhaskaran K, Smeeth L. What is the difference between missing completely at random and missing at random? Int J Epidemiol 2014;43:1336−9.
29. Sepúlveda E, Poínhos R, Constante M, Pais-Ribeiro J, Freitas P, Carvalho D. Health-related quality of life in type 1 and type 2 diabetic patients in a Portuguese central public hospital. Diabetes Metab Syndr Obes 2015;8:219−26.
30. Özcan B, Rutters F, Snoek FJ, et al. High diabetes distress among ethnic minorities is not explained by metabolic, cardiovascular, or lifestyle factors: Findings from the Dutch Diabetes Pearl Cohort. Diabetes Care 2018;41:1854−61.
31. Stoop CH, Nefs G, Pop VJ, et al. Diabetes-specific emotional distress in people with Type 2 diabetes: A comparison between primary and secondary care. Diabet Med 2014;31:1252−9.
32. Peyrot M, Egede LE, Campos C, et al. Ethnic differences in psychological outcomes among people with diabetes: USA results from the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study. Curr Med Res Opin 2014;30:2241−54.
33. Pouwer F, Wijnhoven HA, Ujcic-Voortman JK, et al. Ethnic aspects of emotional distress in patients with diabetes−the Amsterdam Health Monitor Study. Diabet Med 2013;30:e25−31.
34. Fidan Ö, Takmak Ş, Zeyrek A, Kartal A. Patients with type 2 diabetes mellitus: Obstacles in coping. J Nurs Res 2020;28:e105.
35. Conversano C, Di Giuseppe M, Miccoli M, Ciacchini R, Gemignani A, Orrù G. Mindfulness, age and gender as protective factors against psychological distress during COVID-19 pandemic. Front Psychol 2020;11:1900.
36. Horesh D, Lev-Ari RK, Hasson-Ohayon I. Risk factors for psychological distress during the COVID-19 pandemic in Israel: Loneliness, age, gender, and health status play an important role. Br J Health Psychol 2020;25:925−33.
37. Shanahan L, Steinhoff A, Bechtiger L, et al. Emotional distress in young adults during the COVID-19 pandemic: Evidence of risk and resilience from a longitudinal cohort study. Psychol Med; 2020:1−10.

38. Siddiqui M, Khan M, Carline T. Gender differences in living with diabetes mellitus. Mater Sociomed 2013;25:140.

39. Singhai K, Swami MK, Nebhinani N, Rastogi A, Jude E. Psychological adaptive difficulties and their management during COVID-19 pandemic in people with diabetes mellitus. Diabetes Metab Syndr 2020;14:1603–5.

40. Lorig KR, Holman H. Self-management education: History, definition, outcomes, and mechanisms. Ann Behav Med 2003;26:1–7.

41. Hartmann-Boyce J, Morris E, Goyder C, et al. Diabetes and COVID-19: Risks, management, and learnings from other national disasters. Diabetes Care 2020;43:1695–703.

42. Kent D, Haas L, Randal D, et al. Healthy coping: Issues and implications in diabetes education and care. Popul Health Manag 2010;13:227–33.

43. Berry E, Lockhart S, Davies M, Lindsay JR, Dempster M. Diabetes distress: Understanding the hidden struggles of living with diabetes and exploring intervention strategies. Postgrad Med J 2015;91:278–83.

44. Sturt J, Dennick K, Due-Christensen M, McCarthy K. The detection and management of diabetes distress in people with type 1 diabetes. Curr Diab Rep 2015;15:101.

45. Borkan J. Immersion/crystallisation. In: Crabtree B, Miller W, editors. Doing Qualitative Research. Thousand Oaks, CA: Sage, 1999. p. 179–94.