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ORIGINAL RESEARCH

Barriers to Self-Management of Type 2 Diabetes During COVID-19 Medical Isolation: A Qualitative Study

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Purpose: Diabetes self-management behaviors are necessary to obtain optimum glycemic control, reduce the risk of complications, and improve health outcomes. The COVID-19 pandemic imposes an additional struggle for self-management by diabetes patients. Although previous studies have reported socio-demographic, behavioral, psychological, and cultural barriers to diabetes self-management, little is known about perceived barriers to diabetes self-management among patients during isolation following their recovery from COVID-19. The purpose of this study was to explore perceived barriers among type 2 diabetes patients during isolation following their recovery from COVID-19.

Patients and Methods: A qualitative, exploratory, and descriptive research design was utilized. Semi-structured telephonic interviews were conducted with 12 patients with diabetes who had been discharged from one COVID-19 designated hospital and underwent isolation in the designated facilities in Wuhan City, Hubei Province, China. Data were analyzed using Colaizzi's seven steps.

Results: Barriers to diabetes self-management identified by patients with diabetes during isolation were categorized into five major themes: inadequate knowledge and behavioral beliefs, shortage of resources, suffering from health problems, negative emotions, and lack of support.

Conclusion: Perceived barriers to diabetes self-management described by diabetes patients indicated a lack of environmental resources and support strategies to meet their needs. Efforts to remove barriers are important in assisting patients with diabetes to improve their quality of life and health outcomes.

Keywords: diabetes mellitus, quarantine, recovery from Coronavirus, treatment

Introduction

Coronavirus disease 2019 (COVID-19), which was declared a Public Health Emergency of International Concern by the World Health Organization (WHO) on 30 January 2020, has posed a severe threat to global public health.[1,2] Diabetes mellitus (DM) is a common chronic disease in China with a prevalence of 10.4%.[3] Although people of all ages are generally susceptible to COVID-19, patients with diabetes are at higher risk for COVID-19 due to the multiple concomitant chronic diseases and immunosuppression.[4,5] According to the currently published literature, the prevalence of DM among COVID-19 patients and critically ill COVID-19 patients were 7.4–20.0%[6–9] and 17%,[10] respectively. The Chinese Center for Disease Control and Prevention (China CDC) has stipulated that COVID-19

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patients discharged from hospitals are subject to a 14-day period of isolation and medical observation.[11] As of midnight on August 19, 2020, the total number of confirmed COVID-19 cases had reached 84,895 in China.[12] These facts indicated that a large number of COVID-19 patients with diabetes underwent isolation after being discharged from hospitals.

Patients with diabetes recovering from COVID-19, who experienced the chronic hyperglycemic state and persistent inflammatory states, are at higher risk of COVID-19 reinfection and the occurrence and progression of DM complications.[13] There is a compelling need for this vulnerable population to reduce this risk through good blood sugar control during their isolation. However, ideal blood sugar levels cannot be maintained solely by anti-diabetic medications;[14] good self-management behaviors play a crucial role in DM treatment—especially for those with type 2 diabetes mellitus (T2DM).[15] Self-management refers to long-term, and effective decisions and behaviors, to maintain patients' well-being, which involves medical, behavioral, and emotional management.[16] Positive and effective self-management not only alleviates the progression of DM on physiological indicators but also improves the patients' quality of life.[17] Scholars from Stanford University pioneered the application of the concept and methods of self-management in a community-based diabetes self-management program.[18] These early studies have opened new channels for the prevention, control, and treatment of DM and substantially improved the quality of life of patients with diabetes.[19]

Promoting effective diabetes self-management has long been a challenging issue for the health systems, healthcare providers, community workers, and patients with diabetes.[20] Although the data regarding diabetes management for T2DM patients recovering from COVID-19 during isolation remain scarce, notably, previous studies have reported that among Chinese T2DM patients, only 22.76%–40.09% have achieved optimal glycemic control (hemoglobin A1c level<7.0%, 53 mmol/mol)[21–23] and 9.20%–16.43% have manifested good self-management behaviors.[21,24] This raises the issue of how to identify factors that hinder diabetes self-management and to address these potential barriers. Studies in developed countries such as the United States, Canada, the United Kingdom, and Singapore have found that common barriers to self-management include poor communication between patients and healthcare providers, limited accessibility to healthcare facilities, lack of family support, inadequate disease knowledge and limited disease treatment methods, lack of motivation for change, physical and cognitive disorders, limited access to diabetes education, and financial barriers.[25–32] Evidently, factors that hinder diabetes self-management are complex and multifaceted. However, the barriers to diabetes self-management for patients with diabetes recovering from COVID-19 during their isolation are not precisely known.

To date, a considerable amount of literature on glycemic treatment and control in COVID-19 patients with preexisting DM has been published.[33,34] Most studies, however, focused on hospital and physician practice, while few studies investigated or mentioned self-management among patients with diabetes during their isolation following recovery from COVID-19. A qualitative study is an ideal design for an in-depth understanding of the feelings and experiences of patients with diabetes. Such studies are of great significance to elucidate the perceived barriers to diabetes self-management among isolated patients. This study addressed a gap in this field by interviewing patients with diabetes subjected to medical isolation after recovering from COVID-19 to gain a deeper understanding of the barriers to diabetes self-management, and provide new perspectives and approaches for the design of interventions and formulation of policies.

Patients and Methods

Study Design

This study adopted a descriptive qualitative methodology to collect data through telephonic interviews, which provided a rich and thick description of the participants' perceptions of barriers to diabetes self-management. A phenomenological approach was used to achieve an in-depth understanding of the factors hindering diabetes self-management from the patient's perspective.[35]

Participant Selection

Participants were recruited through purposive sampling based on the following inclusion criteria: (1) T2DM patients with a disease duration of greater than 1 year, (2) COVID-19 patients with diabetes after being discharged from the hospital, (3) had stayed at designated isolation sites for at least 7 days, (4) spoke and understood Chinese (Mandarin), and (5) agreed to participate in the study. Patients with type 1 DM or younger than 18 years old were excluded. The primary researchers of this study, who were nurses at a designated COVID-19 hospital in Wuhan City, Hubei Province, China, contacted patients

who met the inclusion criteria through the contact information listed on their medical records. The sample size was determined by data saturation—when no new information was obtained during the last two interviews.[36] Variations in age, education level, and duration of diabetes were considered to ensure diversity in the perception of barriers to self-management. We followed the consolidated criteria for reporting qualitative research to report the findings of this study.[37]

Data Collection

Semi-structured, in-depth telephonic interviews were conducted from February 20 to March 4, 2020, at a convenient time after dinner (approximately 19:00–20:00 Beijing Time) in a quiet and comfortable environment. Before each telephonic interview, the primary researchers explained the objectives and methods of the study to the participants, promised to perform confidentiality measures, and obtained verbal informed consent from all participants. All interviews were recorded using a cellphone and a recording pen (Newsmy V29, 16 GB internal memory) with the consent of the participants. An interview guide (Table 1) was used to conduct the interviews, which consisted of a series of open-ended questions regarding the various aspects of self-management. The interview guide was tested using pre-interviews with two patients of diabetes not included in the actual study, which resulted in corrections of the language and content. During the formal interviews, the interviewees were encouraged to express their thoughts and perceptions thoroughly and probing questions, such as, "Can you please elaborate on this?" were included to increase the depth of the discussion. The nonverbal information (eg, tone of voice, pause) and the important statements stressed by the patients were documented during the interview. Each interview lasted between 15 and 30 minutes.

Table 1 Interview Guide Used to Facilitate Conversation in Telephonic Interviews

Dimensions	Open-Ended Questions
A. Dietary modifications	(1) How was your diet managed during the isolation period? (2) What kind of diet did you expect to get at an isolation site?
B. Physical activity	(1) How was your physical activity during the isolation period? (2) What forms did your physical exercise take?
C. Medication compliance	(1) How did you take your hypoglycemic medicines during the isolation period? (2) How did you obtain your hypoglycemic medicines?
D. Blood glucose monitoring	(1) How did you perform blood glucose monitoring during the isolation period? (2) How were your blood sugar levels during the isolation period?
E. Social support	(1) What did your family and friends provide you to facilitate your glycemic control? (2) What services did you hope to get from the isolation site to assist with the management of your diabetes?
F. Psychological state	(1) What were the psychological and emotional changes that you experienced at the isolation site? (2) How did these emotional changes influence your self-management of diabetes?

Data Analysis

Each audio recording was transcribed by a co-author within 24 hours of the interview and reviewed by another author who interviewed the patients to ensure accuracy of the transcript. The interviews, raw transcripts, and data analysis were conducted in Mandarin Chinese. Data analysis was conducted by two co-authors using Colaizzi's seven-step method[38] to extract themes and sub-themes. The detailed steps were as follows: (1) reading and re-reading raw data transcribed from the audio recordings; (2) marking and extracting significant statements pertaining to the investigated phenomena; (3) coding recurrent important viewpoints; (4) summarizing all coded viewpoints; (5) elaborating and articulating the meanings of the viewpoints; (6) integrating, categorizing, and refining similar viewpoints into themes; and (7) returning the formulated themes to the interviewees for validation. All authors agreed with the data analysis results.

Rigor

To ensure the rigor of the study, the four criteria of dependability, credibility, transferability, and confirmability were

adopted as follows:[39] (1) Dependability: The two co-authors who are familiar with Colaizzi's method performed independent analyses of the transcripts. Where their opinions differed, a group discussion was used to compare and examine themes and sub-themes until a consensus was reached. (2) Credibility: The interviewers underwent systematic training in the phenomenological theories and methods, techniques of semi-structured interviews, and the report criteria to achieve a better understanding qualitative research paradigm. In addition, as the interviewers were nurses who delivered direct care to the participants, the high levels of mutual trust contributed to improving the credibility of the acquired data. (3) Transferability: Our results were corroborated by two patients with diabetes at the isolation facilities who did not participate in the study but agreed that the findings were consistent with their own perceived barriers to diabetes self-management. (4) Confirmability: All research data (eg, audio recordings, transcripts, text data) were properly stored to facilitate the future checking and validation of results.

Results

Demographic Characteristics

In this study, 12 participants were interviewed. The participants consisted of 4 men (33.33%) and 8 women (66.67%) aged 50–75 years (mean age: 59.75 ±7.93 years), of whom 11 (91.67%) were married and 1 (8.33%) was divorced. The educational levels of the participants were: bachelor's degree (1 participant, 8.33%), diploma (2 participants, 16.67%), high school (4 participants, 33.33%), middle school (2 participants, 16.67%), elementary school (2 participants, 16.67%), and no formal education (1 participant, 8.33%). The disease duration, duration of medical isolation, and length of the interview of the participants were: 2–20 years (mean: 6.5±5.68 years), 8–14 days (mean: 11.67±1.83 days), and 15–30 minutes (mean: 21.83±4.20 min), respectively. Table 2 shows the demographic information of the participants.

Barriers to Self-Management

Barriers to diabetes self-management were categorized into five themes: inadequate knowledge and behavioral beliefs,

Table 2 Socio-Demographic Characteristics of Participants

Patient No.	Isolation Site	Gender	Age (Years)	Educational Level	Occupation	Marital Status	Disease Duration (Years)	Duration of Isolation (Days)	Length of Interview (Min)
P1	Hongshan District	Female	62	Elementary school	Unemployed	Married	10	11	26
P2	Wuchang District	Male	75	High school	Retired	Married	2	13	24
P3	Dongxihu District	Female	50	Diploma	Retired	Divorced	3	12	18
P4	Hongshan District	Male	53	Bachelor's degree	Enterprise administrator	Married	2	13	18
P5	Qingshan District	Female	71	No formal education	Unemployed	Married	15	10	20
P6	Hongshan District	Female	60	Middle school	Retired	Married	3	11	26
P7	Hongshan District	Female	54	High school	Retired	Married	6	10	22
P8	Huangpi District	Female	63	Elementary school	Farmer	Married	5	11	23
P9	Hongshan District	Male	50	High school	Self-employed	Married	4	8	20
P10	Wuchang District	Female	54	Middle school	Laborer	Married	3	14	30
P11	Wuchang District	Male	63	Diploma	Office worker	Married	5	14	15
P12	Dongxihu District	Female	62	High school	Retired	Married	20	13	20

shortage of resources, suffering from health problems, negative emotions, and lack of support, as indicated in Table 3.

Inadequate Knowledge and Behavioral Beliefs

Respondents in the study were found to have poor knowledge, inadequate self-care behavior and low-level beliefs regarding diabetes self-management. The theme "inadequate knowledge and behavioral beliefs" emerged from all discussions that contained three sub-themes, namely, limited diabetes knowledge, confusion about taking medications, and low adherence to self-monitoring of blood glucose.

Limited Diabetes Knowledge

Most participants (n=11) alluded to the fact that inadequate diabetes knowledge challenged their management of blood glucose. They often asked for help from those around them (eg, daughter or father). They had limited knowledge regarding diet management and physical exercise. Some of them even believed that refraining from sweets and carbohydrate-rich foods or insisting on physical exercise alone could achieve good glycemic control.

One female patient stated, "My knowledge regarding diabetes has been gained from my daughter, who is a nurse. She told me which foods I can or cannot eat." (P6)

Another male participant stated, "My dad also has diabetes. He controls this disease through exercise and obtains good outcomes, so I control my blood glucose by exercising." (P2)

A similar view was expressed by another patient, "I know a little about diabetes. I pay little attention to it in daily life and just engage in exercise to control my glucose." (P9)

Confusion About Taking Medications

All participants voiced their concerns about medication treatment. More than half of the patients were unfamiliar with the use of hypoglycemic agents. They were confused about taking medications, with most uncertainty involving the names, usage and side effects of the medications, which prevented participants from effectively managing their disease.

A female patient expressed unfamiliarity with the usage of hypoglycemic agents:

> I am worried whether I take too much acarbose. I take two tablets with each meal, and I do not know if it is too much … The doctor told me to alternate between metformin and acarbose, which made me confused. (P7)

A male patient stated,

> The hypoglycemic medicines prescribed by the doctor when I was discharged from hospital were different from what I used at home; maybe the effects are the same. I do not know whether these medicines are better or worse than the previous ones, I cannot judge them. (P4)

Low Adherence to Self-Monitoring of Blood Glucose

Among all patients, only one brought test strips and needles to the isolation site. They paid little attention to blood

Table 3 Barriers to Diabetes Self-Management

Themes	Sub-Themes	No. of Responses (N = 12)
Inadequate knowledge and behavioral beliefs	Limited diabetes knowledge Confusion about taking medications Low adherence to self-monitoring of blood glucose	11 7 4
Shortage of resources	Limited space for physical exercise Unavailability of blood glucose monitoring Absence of a diabetic diet Undersupply of hypoglycemic medications	12 11 5 5
Suffering from health problems	Hyperglycemia Physical discomfort Insomnia	8 6 5
Negative emotions	Stigma Dissatisfaction Anxiety	6 4 4
Lack of support	Lack of professional guidance Lack of family support	6 5

glucose monitoring in their daily lives. Some of them often self-perceived their blood glucose levels based on their physical symptoms, or measured blood glucose once every 2 weeks or longer (according to the Guidelines for the Prevention and Control of Diabetes in China, the recommended blood glucose monitoring frequency for patients with diabetes using oral hypoglycemic agents is 3 times per week).[3]

Participant 5 stated,

> I have suffered diabetes for 15 to 16 years . . . when [my blood glucose] fluctuates, my legs feel weak, I feel exhausted and uncomfortable, but I don't know whether my actual blood glucose is high or low. (P5)

Another male patient pointed out that, "I test my blood sugar once every two weeks at home, I usually feel good, I don't need to test [my blood glucose] often." (P4)

Shortage of Resources

Most of the isolation facilities were converted from hotels or high school premises at short notice in response to the demand during the COVID-19 pandemic period. The shortage of resources at these facilities was another issue discussed by all patients. This theme consisted of four subthemes: limited space for exercise, unavailability of blood glucose monitoring, absence of a diabetic diet, and undersupply of hypoglycemic medications.

Limited Space for Exercise

At the isolation sites, the participants were largely confined to their rooms because of social distancing policies. All participants described that they exercised daily but could only do so in their rooms or corridors.

As a male patient's transcripts showed,

> The room is too small. I can only walk back and forth or perform pushups in the room. At home, I exercise for 3 hours every day (approximately 1 hour after each meal). However, I cannot accomplish this level of exercise here, though I try my best. (P9)

Limited space for exercise was also mentioned by a female,

> There is little space for physical exercise. As I cannot go out [of my room], I just walk a few steps whenever I remember to . . . The room is too small . . . At home, I can control (my blood glucose) better by exercise and diet. However, I cannot achieve it here because of the space conditions. (P12)

Unavailability of Blood Glucose Monitoring

Regular blood glucose monitoring is essential for glycemic control in diabetes. Among all interviewees, only one had performed daily blood glucose monitoring; the remaining participants mentioned that they had not monitored their blood glucose at the isolation sites due to the unavailability of blood glucose monitoring.

An elderly female patient stated,

> I have not tested [my blood glucose] at the isolation site . . . the doctor here only measures body temperature every morning . . . I don't know whether [my blood glucose] is high or low. When I feel dizzy, I think [my blood glucose] may be higher at that time. (P5)

A strong desire for blood glucose measurement was expressed by another patient,

> I want to test my blood glucose . . . Because I feel a little dizzy and want to test and control it . . . I have made an appointment [with healthcare providers] . . . but it has not happened until now. (P12)

Absence of a Diabetic Diet

All participants were concerned with diet, which is a crucial tool for managing T2DM.[40,41] In particular, 5 participants clearly expressed that the diet provided at the isolation sites was unsuitable for patients with diabetes.

As stated by Participant 12, "Many food items at the isolation site contain sugar . . . I have no choice but to avoid food items with sugar . . . There is no diabetic diet." (P12)

Another female patient further added,

> The hospital provided a special diet for patients with diabetes. [At the isolation site], everything is the same for everybody. I have no choice but to eat what I can and avoid what I cannot. (P1)

Undersupply of Hypoglycemic Medications

Approximately half of the participants faced issues regarding the shortage of hypoglycemic medications, or medication changes, due to the non-supply of medications at the isolation sites.

One participant mentioned,

> The medicines [hypoglycemic medications] for the last period of the isolation may be insufficient . . . There may be a 1- to 2-day shortage in the supply of medicines [hypoglycemic medications]. (P1)

Another female patient stated, "The medicines prescribed by the hospital are not enough, I don't know if they can last till the end of the isolation period" (P8).

Suffering from Health Problems

The participants described that they experienced hyperglycemia, physical discomfort, and insomnia during the mandatory isolation after contracting COVID-19, which discouraged them from self-managing the diabetes and reduced their motivation to self-manage their diabetes. Suffering from health problems is an important obstacle to adherence to self-management behavior.

Hyperglycemia

Two thirds of the participants stated that their blood glucose levels increased and became difficult to control after contracting COVID-19. The unsteady blood glucose made them feel frustrated and impeded their self-efficacy in their journey of diabetes management.

As described by one participant,

> COVID-19 has affected my blood glucose tremendously. My blood glucose levels have increased significantly, almost above 19 [mmol/L] even before breakfast … The blood glucose is always high and cannot be controlled, it's still above 16 [mmol/L] even after I take my medicine and inject insulin … This situation makes me feel frustrated and unconfident in the diabetes management. (P6)

The elevation of blood glucose after contracting COVID-19 was also mentioned by another female patient. "After getting COVID-19 … My blood glucose was above 20 [mmol/L]. It has never been so high over the last 20-odd years." She continued, "Blood glucose is difficult to control; I can hardly manage it well." (P12)

Physical Discomfort

Of note was that half of interviewees still experienced physical discomfort after COVID-19 treatment and hospital discharge such as tiredness, shortness of breath, aches and pains, or a headache. These physical symptoms prompted them to focus on COVID-19 recovery and treatment while ignoring the self-care of diabetes.

As one participant stated, "I only had mild symptoms [of COVID-19]; however, [after being successfully treated] I still feel uncomfortable all over my body." She went on to say that, "I have to eat well. It [COVID-19] cannot be cured if I do not get enough nutrition, so I have to eat more." (P1)

Another patient also experienced physical discomfort.

> After I was discharged from hospital and lived at the isolation site, I felt the severe abdominal pain … I later took two pills … But I still feel a little pain in my abdomen … I don't dare to exercise due to this discomfort. (P10)

Insomnia

Nearly half of the participants experienced insomnia at the isolation facilities as they were unaccustomed to their isolation environments, subjected to activity constraints, and engaged in fewer social activities. Insomnia led to their fatigue, poor concentration, and tension during the day and disrupted their diabetes management routine. The following examples demonstrated this experience.

> Since I lived in this isolation site, I have only gotten 3 to 4 hours of sleep every night. I just cannot sleep … After taking two sleeping pills, I still can't sleep. I've never taken sleeping pills previously … I feel sleepy and tired during the day … My schedule is out of order. (P9)

> I cannot fall asleep at the isolation site. The more I want to sleep, the less I can fall asleep. This makes me feel very tortured … I have little energy to maintain good diabetes self-care behavior … (P1)

Negative Emotions

High contagious infectivity, potential fatality of COVID-19, loneliness in the isolated room, and difficulties in maintaining blood glucose levels elicited negative emotions in the participants. Three quarters of patients with diabetes expressed unpleasant or unhappy emotions toward COVID-19 and the isolation environment. Such emotions can cloud their judgments and reduce rationality in decision-making on self-management behaviors. Negative emotions as a barrier to self-management, emerging from the transcripts, included three sub-themes: stigma, dissatisfaction, and anxiety.

Stigma

Participants may have perceived stigma for suffering from COVID-19. They feared discrimination from others and avoided full disclosure about their disease to both peers and healthcare workers, thereby influencing the way they view the disease and approach their self-management.

A female patient expressed,

> Getting [COVID-19] seems to be a bad thing. This makes me not dare to contact my classmates and friends … I am

> isolated from others and feel lonely every day. Here I have no thoughts about the diabetes management, just let it go. (P1)

Similarly, another female participant stated,

> I have not told my peers that I am undergoing quarantine inspection here. COVID-19 is a real burden for me … I want to get rid of it soon … My blood sugar can be slowly adjusted. After all, it [diabetes] is a lifelong illness. (P11)

Dissatisfaction

The isolated patients faced various inconveniences at the isolation sites. Some of them complained about the lack of supplies (especially medications) and expressed dissatisfaction with the living conditions and diets provided at the sites. Dissatisfaction affected their activation of diabetes self-care and discouraged their behaviors toward diabetes self-management.

One participant complained, "The isolation site offers nothing just serves for isolation … There's no fruit, no medicine … There are too many difficulties for us to manage diabetes." (P8)

A male participant expressed his dissatisfaction toward the isolation site,

> This place isn't as good as the hospital, the room is really tiny … the (medical) service here (isolation site) isn't so professional compared with the hospital … I just try to control my blood sugar by eating less food. (P9)

Anxiety

Patients with diabetes often felt stressed and worried about the medication, diabetes supplies, and blood sugar levels. A third of the patients expressed that they were somewhat worried or anxious. This emotional distress often brings about negative consequences for diabetes and further affects their self-management behaviors indirectly.

A participant stated,

> I feel very worried about my diseases, especially during the hospitalization period … Now I just want to go home early … I am afraid that my blood sugar is not well controlled at the isolation site. (P6)

Another participant added,

> I also have hypertension and need to take hypolipidemic drugs. However, lately I have always been sweating in my sleep. I am very worried about complications of these diseases … Here, it's not very convenient to manage these diseases. (P1)

Lack of Support

Most patients with diabetes who underwent forced isolation perceived a lack of guidance and support. These patients described their experiences as a struggle to trudge along a difficult path of diabetes self-management, as they were unable to seek help from anyone under the constraints of social isolation. Lack of support as a theme was expressed by most respondents, which had two subthemes: lack of professional guidance, and lack of family support.

Lack of Professional Guidance

Most healthcare providers at isolation facilities had been temporarily extracted from various healthcare departments, who might have had little diabetes knowledge and only took responsibility for COVID-19 prevention and education. The participants expressed the view that they felt helpless with regard to managing their diabetes without professional guidance.

For instance, a participant stated, "Every morning, [healthcare providers] only ask if we feel comfortable and measure our body temperature … blood glucose is not monitored at the isolation site." (P7)

Another patient complained that "The doctors here show little concern for us … the healthcare providers differ from those at the hospital in terms of professional levels." (P6)

Lack of Family Support

The COVID-19 isolation policy prohibits face-to-face visits from family members, which greatly affects the patient's access to family support. In addition, COVID-19 is characterized by familial aggregation, which also reduced the sources and types of family support provided to the participants.

As stated by a divorced female participant,

> During the isolation period, I have made no phone calls to my family and friends … my family members are also staying at the isolation sites, so it is too inconvenient … (P3)

Another participant expressed that she could not get actual assistance from her family members as they could only express their concern over the phone, "The concern from my family is of no use … sometimes they can't even send things to me because non-staff entering the isolation site is forbidden." (P12)

Discussion

This exploratory and descriptive qualitative study reported the barriers to self-management of T2DM patients who had recovered from COVID-19 during medical isolation. Five major themes were identified: inadequate knowledge and behavioral beliefs, shortage of resources, suffering from health problems, negative emotions, and lack of support. Self-management is essential for prognosis and glycemic control in patients with T2DM. Understanding the barriers to self-management will help patients make changes and better manage their diabetes.

Our results showed that limited knowledge regarding DM is a major barrier to diabetes self-management. Participants tended to gain diabetes knowledge from the experiences of people around them. The common assumption was that low educational levels (average below high school) and old age (mean age: 59.75 ±7.93 years) limited their abilities to acquire medical information and seek better healthcare resources. Similarly, studies conducted in Ethiopia[42] and Iraq[43] have indicated that a lack of appropriate information/knowledge hinders self-management among patients with diabetes. A study by Ji et al showed that diabetes knowledge is positively correlated with overall self-management behavior.[23] Specifically, the higher the level of knowledge on diabetes, the better the self-management behavior of patients with diabetes.[44] Additionally, most patients also expressed their confusion about taking medication. Low education and lack of diabetes knowledge might provide a possible explanation for this. Previous studies have indicated that difficulties and frustrations in taking medications prevented diabetes patients from effectively self-managing.[45] In addition, low adherence to self-monitoring of blood glucose posed another barrier to diabetes self-management, which was consistent with the findings of Tewahido et al[42] and Mikhael et al.[43] This is more commonly associated with the patients' economic position, fear of needles, the erroneous belief that blood glucose will remain normal with timely medicating, physical activity, and dietary modifications. A study by Ji et al[21] also demonstrated that blood glucose monitoring was the lowest priority of patients with diabetes when compared to medications, diet, and physical activity. The results of this study emphasized the importance of improving self-management knowledge and behavioral beliefs in patients with diabetes. Efforts directed toward practical and person-centered diabetes self-management education and support programs are necessary to improve patients' knowledge and behavioral beliefs and self-management levels.

A shortage of resources was frequently identified as the key factor that inhibited diabetes self-management in this study. Issues such as limited space at the isolation sites, unavailability of blood glucose monitoring resources, absence of a diabetic diet, and undersupply of hypoglycemic medications, were repeatedly mentioned by the participants. For instance, some participants expressed that the standardized diet at the isolation sites led to the inability to perform self-management in accordance with their specified nutrition plans. This finding was consistent with previous findings that residing in a community with limited healthy foods and the absence of safe exercise environments may be an important barrier to diabetes self-care and glycemic control.[46,47] For all participants in this study, the provision of resources needed for diabetes self-management by the isolation facilities was a significant issue. However, as was widely recognized, the locations used for isolation of COVID-19 patients had a unified layout and lacked the facilities conducive to diabetes self-management. This finding suggests that creating a favorable environment for self-management of chronic diseases at the isolation sites, such as the provision of a diabetic diet and blood glucose monitoring as part of a daily health management program, is extremely important for the improvement of the quality of life and health of patients.

Suffering caused by the disease was a great barrier that emerged from the transcripts. This is consistent with the findings of Hu et al,[45] in which patients' physical suffering kept them from properly managing their disease. Moreover, the results of the present study provided additional evidence that COVID-19 may result in elevated blood glucose levels, which was congruent with the findings reported by Ilias et al[48] and Brufsky.[49] Persistently high blood glucose may cause frustration in patients, thereby affecting their passion towards self-management. Five participants in this study stated that they suffered from severe insomnia. In keeping with our findings, Xue et al[50] also reported significant sleep problems (eg, difficulty falling asleep, early awakenings) in the forced isolation population. In addition, poor sleep quality has been found to be significantly associated with decreased adherence to dietary, lower self-care adherence, and poorer diabetes control.[51] Given disease related suffering, it is imperative for healthcare and COVID-19 isolation organizations to develop and implement strategies to deliver continuous care for discharged COVID-19 patients, especially those with diabetes.

Negative emotions were discussed as a psychological barrier to self-management. Half of the participants felt stigmatized, which was mainly manifested as societal rejection; one-third complained about poor service at the isolation sites, and one-third expressed anxiety. Although the public health response to COVID-19 has been essential in preventing and containing the epidemic, it may also have aggravated the stigmatization of patients.[52,53] Forced isolation and the associated measures have disrupted the social lives of patients with diabetes, resulting in them feeling fearful and trapped. Armitage et al[54] reported that social isolation exposes older adults to greater risks of negative emotions such as depression and anxiety. An online study conducted in Italy reported that longer isolation times, combined with smaller physical spaces, led to a deterioration in mental health.[55] Moreover, psychological distress affected the medication adherence and self-management of patients with diabetes.[31] Kato et al[56] found that the non-adherence behaviors of patients with diabetes may be a response to the internalization of stigma. Self-stigma is a negative independent factor that affects the self-care behavior of patients with T2DM.[57] Our results confirmed these findings and suggested that greater emphasis should be placed on the mental health of this vulnerable population, and healthcare and COVID-19 isolation organizations should adopt multifaceted strategies to eliminate potential drivers of negative emotions in isolated patients.

This study revealed that the lack of professional guidance from healthcare providers (eg, self-care measures, maintenance of target blood glucose, monitoring of complications) is a common barrier to diabetes self-management. Healthcare providers play a unique role in delivering person-centered diabetes self-management education, supporting interventions, and assisting patients to undertake protective self-care behaviors.[58] Other qualitative studies have reported similar findings whereby patients with limited resources were particularly challenged when seeking medical services or obtaining care and support.[59,60] Apart from the scarcity of guidance from healthcare providers, the participants also identified the lack of family support as another barrier to diabetes self-management. During the isolation period, it is difficult for diabetes patients to obtain knowledge, care, and material support from their family members, although this support was essential for promoting lifestyle changes and improving self-management behavior in patients with diabetes.[23] Such a result matches the findings of previous studies, which considered family members, friends, and peers of patients with diabetes as primary promoters of self-management.[30,59,61] Similarly, quantitative studies have also indicated that a higher level of social support is associated with better adherence to recommended self-management behaviors.[62–64] In conclusion, there was insufficient support to encourage diabetic self-management of the isolated patients. Such problems may be resolved by establishing electronic blood glucose records and a remote consultation system to provide practicable diabetes self-management education and support, and by enhancing telephonic and internet-based family support.

Limitations

This study had several limitations. First, we obtained data from a small geographical area (Wuhan City) and a small, convenient sample (12 patients with diabetes), which might limit the generalizability of the findings. Second, our analysis was based on interview data. Therefore, it was impossible to explore the differences between the demographic characteristics (such as gender and education level) of the barriers to diabetes self-management. Third, this study explored barriers to diabetes self-management from the patients' perspectives, without considering the experience of healthcare providers and family members. Fourth, qualitative studies have inherent limitations, such as the tendency for subjectivity during data analysis. Future research should collect data from larger samples or adopt a multicenter approach to obtain a broader view of barriers to diabetes self-management.

Conclusions

Our findings provide insight into barriers to diabetes self-management among T2DM patients during isolation following recovery from COVID-19. We found that inadequate knowledge and behavioral beliefs, shortage of resources, suffering from health problems, negative emotions, and lack of support were barriers to self-management among patients with diabetes. Understanding these barriers is beneficial for the formulation of targeted strategies, such as creating favorable isolation environments, strengthening medical and social support, and implementing patient-centered diabetes care, to promote successful self-management. At present, as many countries around the world are still in the critical period of pandemic prevention and control, greater

concern should be paid to patients with diabetes during isolation. In addition, open dialogue among patients, healthcare providers, family members, and policy makers can be established to better support patients' diabetes journey and improve health outcomes.

Abbreviations

COVID-19, Coronavirus Disease 2019; DM, diabetes mellitus; WHO, World Health Organization; China CDC, Chinese Center for Disease Control and Prevention; T2DM, type 2 diabetes mellitus.

Ethics Approval and Informed Consent

This study was approved by the Ethics Committee of Hunan Academy of Traditional Chinese Medicine Affiliated Hospital (Approval No.202003-09). We explained the objective, process, and methods of the study to the participants and obtained verbal informed consent prior to each telephonic interview. Participants were assigned anonymous identification numbers (P1, P2, etc), and personally identifiable information was deleted from the transcripts to protect patient privacy. The interview data were kept strictly confidential, and all audio recordings and transcripts were stored in a password-protected computer. Interviewees were free to withdraw from the study at any time without any reason.

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Disclosure

The authors report no conflicts of interest in this work.

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