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FULL LENGTH MANUSCRIPT

"Shame on Me": Exploring the Role of Self-Stigma in Psychological Outcomes Among Type 2 Diabetes Patients in Hong Kong

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Abstract

Background Studies have suggested that type 2 diabetes mellitus (T2DM) are at risk of self-stigmatization (i.e., internalized sense of shame about having diabetes). Self-stigma has been found to be associated with poorer psychological outcomes among chronic disease patients; relevant studies examining such an association and its psychosocial mechanisms are scarce among Chinese T2DM patients. This study aimed to examine the association between self-stigma and psychological outcomes among T2DM patients in Hong Kong. Self-stigma was hypothesized to be associated with higher psychological distress and lower quality of life (QoL). Such associations were also hypothesized to be mediated by lower perceived social support, lower self-care self-efficacy, plus higher self-perceived burden to significant others.

Methods T2DM patients ($N=206$) recruited from hospitals and clinics in Hong Kong were invited to complete a cross-sectional survey measuring the aforementioned variables.

Results After controlling for covariates, multiple mediation analysis results indicated the indirect effects from self-stigma to psychological distress via increased self-perceived burden ($\beta=0.07$; 95% CI = 0.02, 0.15) and decreased self-care self-efficacy ($\beta=0.05$; 95% CI = 0.01, 0.11) were significant. Moreover, the indirect effect from self-stigma to QoL via decreased self-care self-efficacy was also significant ($\beta=-0.07$; 95% CI = −0.14, −0.02). After considering the mediators, the direct effects from self-stigma to higher psychological distress and lower QoL remained significant (βs = 0.15 and −0.15 respectively, ps < .05).

Conclusions Self-stigma could be linked to poorer psychological outcomes through increased self-perceived burden and decreased self-care self-efficacy among T2DM patients. Targeting those variables when designing interventions might facilitate those patients' psychological adjustments.

Keywords Type 2 diabetes · Psychological distress · Quality of life · Burden · Self-stigma · Self-care self-efficacy

Introduction

Psychological Outcomes Among Type 2 Diabetes Patients

Type 2 diabetes mellitus (T2DM) is prevalent among Hong Kong adults, with a 7.8% overall prevalence of diabetes in 2021, 90% of which were T2DM patients [1]. Diabetes was also the 10th commonest cause of deaths in Hong Kong in 2020, accounting for 1.2% of all registered deaths [2]. Effective management of T2DM requires a person to actively perform daily self-care tasks, including maintaining a healthy diet, engaging in physical activity, monitoring blood glucose, and managing medication. However, individuals with T2DM often experience compromised psychological outcomes due to the frustration of maintaining stable glucose levels and daily self-care tasks, as well as concerns about diabetes-related complications [3]. Studies have found that T2DM

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patients have high rates of depressive and anxiety symptoms, with a pooled prevalence of 37.8% and 28.9%, respectively, among Chinese T2DM patients [4]. Patients with psychological distress or low quality of life are also at higher risk for poorer glycemic control, diabetic complications, and even mortality [5–7]. Therefore, it is crucial to examine factors related to T2DM patients' psychological outcomes.

Self-Stigma in Association with T2DM Patients' Psychological Outcomes

T2DM patients may be at risk of self-stigmatization, which refers to when individuals of a socially devalued group internalize negative stereotypes and prejudice against themselves [8, 9]. The attributional model of self-stigma suggests that patients' inferences about the cause, controllability, and responsibility for their health condition can elicit negative emotions and coping behaviors [10]. Western studies have found that T2DM patients may be associated with negative personal characteristics, such as laziness and irresponsibility [11]; similar beliefs are apparent in Asian cultural contexts [12–14]. T2DM patients commonly feel judged, monitored, and perceived as a burden on the healthcare system, regardless of culture [15]. Internalization of negative stereotypes can increase self-stigma and negative emotions among T2DM patients [16].

Self-stigma can have negative impacts on mental health, including lowered self-esteem, life satisfaction, and overall outcomes, as highlighted in a meta-analysis [17]. Similarly, T2DM-related self-stigma may also have negative consequences for patients' psychological outcomes. For instance, self-stigma was associated with higher diabetes distress among T2DM patients in the USA [18] and depressive/anxiety symptoms among those in Australia [19]. In the Asian context, self-stigma was linked to poorer self-esteem among Japanese T2DM patients [20]. However, T2DM-related self-stigma is still an understudied issue among Hong Kong. To fill the knowledge gap, we aimed to examine the association between self-stigma and psychological outcomes among T2DM patients in Hong Kong.

Potential Mediators Between Self-Stigma and T2DM Patients' Psychological Outcomes

Although the potential negative impact of self-stigma on psychological outcomes among diabetes patients is recognized, studies examining the mechanisms linking self-stigma and psychological outcomes are limited. The modified labeling theory has suggested that self-stigma functions as a filtering lens, coloring stigmatized individuals' way of thinking and interpretation of their daily experiences [8, 21, 22]. Self-stigmatized individuals may underestimate their abilities and feel undeserving of respect or value from others because of their illness [13, 23]. We hypothesized that self-stigma was associated with negative interpretations of social relationships (e.g., perceiving a lack of available social support network), ability to cope with the disease (e.g., self-care self-efficacy), and the implications of the disease for the family (e.g., self-perceived burden), which in turn would be associated with poorer psychological outcomes. Therefore, we aimed to examine the mediating roles of perceived social support, diabetes self-care self-efficacy, and self-perceived burden in the association between self-stigma and psychological outcomes.

Perceived Social Support as a Potential Mediator

Studies have generally suggested associations between self-stigma and lower perceived social support among individuals with various health conditions, including those with HIV/AIDS [24], burn injuries [25], and T2DM [26]. A qualitative study in Japan found that internalized stigma could affect social participation among T2DM patients who used social avoidance as an adjustment strategy, fearing rejection due to low self-confidence and self-worth [13]. These patients tended to focus solely on their treatments and reduce social participation. However, a recent study in Ghana found no significant association between self-stigma and perceived social support among T2DM patients [27], and how self-stigma might be associated with perceived social support among local T2DM patients in Hong Kong is unclear. On the other hand, a recent review of 22 articles among T2DM patients demonstrated the facilitating role of perceived social support in psychological outcomes, such as fewer depressive symptoms and distress [28]. Based on these findings, we expected that the relationship between self-stigma and poorer psychological outcomes might be mediated by reduced perceived social support among T2DM in Hong Kong.

Self-Perceived Burden as a Potential Mediator

Self-perceived burden is a potential mediator between self-stigma and psychological outcomes. It refers to patients' empathic concern about the negative impact of their disease and care needs on their caregivers and family members, as well as their feelings of guilt, burdensomeness, and distress [29]. Patients with T2DM may struggle to adjust to changes in physical status due to potential diabetes-related complications, resulting in a decreased ability to fulfill family obligations [12]. Self-perceived burden may be particularly applicable to Chinese chronic disease patients due to their interdependent view of self and prioritization of relational goals over personal needs [30]. A recent study found that Chinese T2DM patients commonly worried about burdening their families and bringing troubles due to their diagnosis [31]. When diabetes negatively affects family functioning, patients' inability to

reciprocate may reduce psychological well-being [29]. Therefore, we expected a positive association between self-stigma and self-perceived burden among T2DM patients.

The literature has explored the association between self-perceived burden and psychological outcomes among diabetes patients. Klis and colleagues found that self-perceived burden was associated with poorer mental health among adults with type 1 and type 2 diabetes [32]. Similarly, self-perceived burden has been linked to poorer quality of life [33] among T2DM patients in China. As an indirect evidence, self-perceived burden also mediated the association between self-stigma and quality of life among Chinese American breast cancer survivors [34]. While the associations among self-stigma, self-perceived burden, and psychological outcomes may be disease- and country-specific, this study aimed to examine the mediating role of self-perceived burden in the context of T2DM.

Diabetes-Related Self-Care Self-Efficacy as a Potential Mediator

Self-stigma may also be associated with patients' negative evaluations of their ability to perform self-care behaviors. Self-care self-efficacy, or the extent of a person's confidence in their ability to execute self-care behaviors during their illness journey (e.g., diet, exercise, and medical treatment), has been shown to be associated with individuals' chronic disease adjustments [35]. Self-stigma has been found to be negatively associated with self-care self-efficacy among T2DM patients in the United States [18] and Korea [36]. This is consistent with Bandura's self-efficacy theory [37], which suggests that individuals' beliefs in their ability to perform a task can influence their motivation, behavior, and ultimately, outcomes. Moreover, the link between self-care self-efficacy and psychological outcomes has been supported empirically. For example, self-care self-efficacy was associated with higher psychological symptoms and diabetes-related distress among adults with T2DM in Australia [19] and Japan [38]. However, it is still unclear about the mediating role of self-care self-efficacy between self-stigma and psychological outcomes among T2DM patients in Hong Kong.

Study Aims and Hypotheses

This study aimed to examine the association between self-stigma and psychological outcomes among T2DM patients in Hong Kong, as well as investigating the potential mechanisms that explain such associations. We hypothesized that self-stigma would be associated with higher psychological distress and lower quality of life (Hypothesis 1). The positive association between self-stigma and psychological distress and negative association between self-stigma and quality of life were hypothesized to be mediated by lower levels of perceived social support, diabetes self-care self-efficacy, plus higher self-perceived burden (Hypothesis 2).

Method

Recruitment

This study used a cross-sectional design, using questionnaires for data collection. Patients (1) who were diagnosed with T2DM according to the World Health Organization criteria, (2) aged > 18 years, (3) Hong Kong residents (current holders of Hong Kong ID card), and (4) being able to speak Chinese and understand Chinese were recruited consecutively by diabetes mellitus nurses when they visited the clinic for counseling, annual checks, or blood tests. The exclusion criteria include being illiterate, having severe mental or physical illness(es) that prevented completion of the questionnaire. Similar inclusion and exclusion criteria have been used in a recent scale validation study among T2DM patients in Hong Kong [39].

Patients with diagnosed type II diabetes (T2DM) were recruited consecutively from the Risk Assessment and Management clinic (RAMP-DM) in Lek Yuen Clinic by the research assistant. In Hong Kong, all DM patients receive regular complications screening and counseling by nurse every 1 to 2 years in the RAMP-DM clinic. This recruitment method allowed us to recruit a spectrum of patients. The clinic is chosen because it is one of the largest centers in the hospital cluster to maximize the representativeness of the sample. Similar recruitment strategies have also been used in other clinical research projects on T2DM patients of comparable sample sizes [40].

Prospective participants were briefed about the study and asked to read the consent form prior to the survey. The consent form reminded participants that their participation was voluntary. To allow flexibilities for the participants and to reduce disturbances to other patients in the clinic settings, the consented participants were invited to provide a preferred timeslot so that the research assistants could contact them again to conduct the survey on the phone. Prior to the commencement of the study, the questionnaire was pilot-tested with 10 participants fitting our eligibility criteria to ensure the items were comprehensive to our target population. Those pilot testing participants were not counted in the total sample size and included in the final data analysis. The study was conducted from June 2021 to June 2022. As the compensation for participants' time, those completed the survey were given a supermarket voucher (worth HK$50). The questionnaire approximately took about 25 min to complete. The research protocol was granted approval from the Clinical Research Ethics Committee of the first author's institution before commencement of the study (Protocol ref no. CREC 2019.398).

Measurements

Psychological Distress The 4-item Patient Health Questionnaire-4 (PHQ-4) was used to measure the participants' experience of psychological symptoms over the past 2 weeks. On a 4-point Likert scale (0 as not at all, 3 as nearly every day), a higher sum score from the item responses indicated a higher level of psychological distress (e.g., "feeling down, depressed or hopeless"). The PHQ-4 has been commonly used as an indicator of psychological distress among general populations in Hong Kong [41], China [42], the USA [43], and T2DM patients in Indonesia [44]. It demonstrated satisfactory reliability and validity in those populations. The Cronbach's alpha was 0.88 in this sample.

Quality of Life The 5-item World Health Organization-5 Well-Being index (WHO-5) was used to measure participants' general quality of life [45]. The WHO-5 consists of five simple and non-invasive questions tapping into the subjective well-being of the respondents. With a range of score from 0 to 100, a higher score indicates a higher level of quality of life. A review has demonstrated that the WHO-5 has excellent validity, reliability, and high applicability across study fields [45], including T2DM patients [46, 47]. A Chinese version has been validated in general population Hong Kong [48]. The Cronbach's alpha was 0.89 in this sample.

Self-Stigma The 9-item Self-Stigma Scale [49] was used to measure participant's self-stigma as a diabetes patients in three dimensions (affective, behavioral, and cognitive dimensions). On a 4-point Likert scale (1 as strongly disagree, 4 as strongly agree), participants were asked to their level of agreement with the statements (e.g., "I am inferior to others because I am a diabetes patient"). A higher overall mean score indicated a stronger sense of self-stigma. The scale was reliable and valid among concealable populations (e.g., mental health consumers) in Hong Kong [49]. The Cronbach's alpha was 0.90 in this sample.

Self-Perceived Burden A 4-item version of the Self-Perceived Burden Scale was used to measure the frequency of which diabetes patients perceived they caused burden to their significant others due to diabetes [34]. Participants were asked to rate on a 4-point Likert scale (1 as *none of the time*, 4 as *most of the time*), and the item responses were averaged. The scale has been shown to be reliable and valid among Chinese patients with chronic diseases (e.g., cancer) [34]. The Cronbach's alpha was 0.94 in this sample.

Perceived Social Support The 12-item Medical Outcomes Study Social Support Survey (MOS-SSS) was used to measure participants' level of perceived social support from their family, friends, and important others [50]. On a 5-point Likert scale (1 as *none of the time*, 5 as *all of the time*), a higher overall mean score from all items represented higher perceived social support from their family, friends, and important others. This scale was reliable and valid among chronic illness patients in Hong Kong [50]. The Cronbach's alpha was 0.94 in this sample.

Self-Care Self-Efficacy The 20-item Diabetes Management Self-efficacy Scale [51] was used to measure participants' level of confidence to perform different aspects of diabetes self-management behaviors (including nutrition, physical exercise, medical treatment, and blood sugar/feet check). On a 11-point Likert scale (0 as cannot do at all, 10 as certainly can do), a higher overall mean score from all items (e.g., "I am able to choose the correct foods") represents a higher level of self-efficacy towards diabetes management. It has been validated among T2DM patients, showing satisfactory reliability and validity [51, 52]. The Cronbach's alpha was 0.87 in this sample.

Socio-demographic and Disease-Related Variables Participants' socio-demographic and disease-related variables (e.g., age, gender, income level, marital status, body mass index, duration of having diabetes, treatment modalities) were also measured.

Analytic Plan

The descriptive statistics and Pearson correlation coefficients among the variables of interest (including self-stigma, perceived social support, self-perceived burden, self-care self-efficacy, psychological distress, quality of life, and potential covariates) were computed. Internal consistencies of the scales were indicated by their corresponding Cronbach's alphas. To test the mediation hypotheses, we used multiple mediation models with SPSS PROCESS Macro, which estimate the magnitude of the overall effect and specific indirect effects [53]. We fitted a multiple mediation model (Model 4 of SPSS PROCESS Macro) [54] to examine whether the associations between self-stigma (independent variable) and psychological distress/quality of life (dependent variables) were mediated by self-perceived burden, perceived social support, and diabetes self-care self-efficacy (mediators). The model estimated three specific indirect effects from self-stigma to the outcome variables (i.e., psychological distress and quality of life): (1) the indirect paths via self-perceived burden; (2) via perceived social support; and (3) via diabetes self-care self-efficacy. To estimate these effects, we conducted analyses with 10,000 bootstrapping resamples to produce the 95% confidence intervals (CIs) of these effects. A mediation effect is considered significant when the 95% CIs from the bootstrapping estimates do not contain zero. We also entered demographic and

disease-related variables which were significantly associated with the independent/mediating/dependent variables as covariates into the mediation model. The analyses were conducted using SPSS 27.0.

Sample Size Planning

We estimated a medium effect size (in Cohen's $f^2 = 0.15$) for the association between independent and dependent variables based on prior studies exploring these associations among T2DM patients [18, 38]. To plan the sample size, we used G*Power 3.1.2 and determined that a minimum of 173 participants was needed to detect the expected effect size at a power of 0.95 and a significant level of 0.05 in a regression-based mediation analysis. Our sample size of 206 participants was sufficient to achieve this statistical power. This sample size planning method has been applied in other studies using SPSS process macro for mediation analysis [e.g., 55].

Results

Participants' Characteristics and Disease-Related Variables

Among 250 T2DM patients approached in the hospitals, 206 consented individuals were eligible and completed the survey on the phone, yielding a participation rate of 82.4%. The sample had a mean age of 65.3 years (SD = 9.25). Majority of the participants were married (67.5%), below college level of education (86.9%), and reporting a monthly family income less than HK$30,000 (59.7%). On average, they have been living with T2DM for 9.92 years (SD = 9.38). Most of them (80.1%) had comorbid chronic illnesses (e.g., hypertension). Regarding diabetes treatments, 96.1% and 8.7% have been taking oral medications and insulin injection, respectively (Table 1).

Correlations Among Background Variables, Psychosocial Variables, and Psychological Outcomes

Self-stigma was significantly associated with higher psychological distress and self-perceived burden (*r*s ranged from 0.34 to 0.36, *p*s < 0.001), as well as lower levels of quality of life and diabetes self-care self-efficacy (*r*s ranged from −0.31 to −0.23, *p*s < 0.001) (Hypothesis 1). However, contrary to our expectations, self-stigma was not significantly associated with perceived social support, and self-perceived burden was not associated with quality of life (*p*s > 0.05) (Table 2). We also examined the bivariate correlations between sociodemographic and disease-related variables and the independent, mediator, and dependent variables

Table 1 Characteristics of the participants ($N = 206$)

	Frequency (%)/mean (*SD*)
Demographic variables	
Age	65.3 years (9.25)
Male gender	98 (47.6%)
Marital status	
Married	139 (67.5%)
Single/ Separated / Divorced/ Widowed	61 (29.6%)
Refused to answer	6 (2.9%)
Highest education level	
Below high school	65 (31.6%)
High school	114 (55.3%)
College or above	22 (10.7%)
Refused to answer	5 (2.5%)
Annual household income (in HKD)	
HK$10,000 or less	75 (36.4%)
HK$10,001–HK$30,000	48 (23.3%)
HK$30,001–HK$50,000	18 (8.7%)
HK$50,001 or more	19 (9.2%)
Refused to answer	46 (22.3%)
Having a religious affiliation	62 (30.1%)
Body mass index	24.55 (3.84)
Diabetes-related variables	
Years since diabetes diagnosis	9.92 years (9.38)
5 years or less	77 (37.4%)
5–10 years	48 (23.3%)
11–15 years	16 (7.8%)
15–20 years	24 (11.7%)
More than 20 years	19 (9.2%)
Missing	22 (10.7%)
Comorbid with other illnesses	165 (80.1%)
Comorbid conditions[a]	
Hypertension	128 (77.6%)
High cholesterol	46 (27.9%)
Arthritis	7 (4.2%)
Mental health problems	7 (4.2%)
Cardiovascular disease	6 (3.6%)
Cancer	4 (2.4%)
Eye disease	4 (2.4%)
Stroke	4 (2.4%)
Prostate diseases	4 (2.4%)
Others	9 (5.5%)
Treatments undergone[b]	
Oral medication for diabetes	198 (96.1%)
Insulin injection	18 (8.7%)

SD standard deviation

[a]Participants might select more than one type of chronic illness; the total percentage did not add up to 100%

[b]Participants might select more than one type of treatments; the total percentage did not add up to 100%

Table 2 Descriptive statistics and correlations among major variables ($N = 206$)

	1	2	3	4	5	6	7	8	9	10
1. Psychological distress	–									
2. Quality of life	−.22**	–								
3. Age	−.32***	.13	–							
4. Comorbidity status[a]	.10	−.17*	.12	–						
5. Marital status[a]	.04	−.02	−.03	.02	–					
6. Body mass index	.10	.14	−.06	.18*	−.16*	–				
7. Self-stigma	.34***	−.23**	−.07	.22**	.08	.07	–			
8. Self-perceived burden	.37***	.00	−.14	.16*	.06	.16*	.36***	–		
9. Perceived social support	−.31***	.29**	.05	−.08	.22*	.02	−.06	−.06	–	
10. Diabetes self-care self-efficacy	−.40***	.28**	.20**	−.15*	.10	−.19*	−.31***	−.30***	.22**	–
Mean	1.39	49.63	65.29	0.80	0.67	24.55	1.95	1.64	4.99	7.47
Standard deviation	2.51	28.84	9.25	0.40	0.47	3.84	0.56	1.08	1.38	1.56
Cronbach's alpha	.88	.89	N/A	N/A	N/A	N/A	.90	.94	.94	.87

Asterisks indicate significant levels: *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$

[a]Comorbidity: yes (1), no (0); marital status: currently married (1), not currently married (0)

to identify potential covariates. Among the background variables, age was correlated with lower psychological distress ($r = -0.32$, $p < 0.001$) and higher self-care self-efficacy ($r = -0.20$, $p < 0.01$), while having other comorbid health conditions was correlated with lower quality of life and self-care self-efficacy (rs from −0.17 to −0.15, $ps < 0.05$) and higher self-stigma ($r = 0.22$, $p < 0.01$). Body mass index (BMI) was correlated with higher self-perceived burden and lower self-care self-efficacy ($rs = 0.16$, $p < 0.05$ and −0.19, $p < 0.01$ respectively); being married was correlated with higher perceived social support ($r = 0.22$, $p < 0.01$) (Table 2). Therefore, we considered age, comorbidity status, body mass index, and being married as covariates in subsequent analyses. Other demographic and diabetes-related characteristics (e.g., education, income, time since diabetes diagnosis) were not significantly associated with the independent, mediator, and dependent variables ($ps > 0.05$, data not tabulated).

Multiple Mediation Analysis

After controlling for the covariates (i.e., age, BMI, marital status, and comorbidity status), the multiple mediation model results indicated that the indirect effects from self-stigma to psychological distress via increased self-perceived burden ($\beta = 0.07$; 95% CI = 0.02, 0.15) and via decreased self-care self-efficacy ($\beta = 0.05$; 95% CI = 0.01, 0.11) were significant. However, the indirect effect via perceived social support ($\beta = 0.01$; 95% CI = −0.04, 0.07) was not significant. On the other hand, the indirect effect from self-stigma to quality of life via self-care self-efficacy (β = -0.07; 95% CI = −0.14, −0.02) was significant, supporting the presence of a mediation effect. However, the indirect effects via self-perceived burden ($\beta = 0.03$; 95% CI = −0.02, 0.10) and perceived social support ($\beta = -0.01$; 95% CI = −0.05, 0.03) were not significant (Fig. 1) (Hypothesis 2). After considering the covariates and mediators, the direct effects from self-stigma to higher psychological distress and lower quality of life remained significant (βs = 0.15 and −0.15 respectively, $ps < 0.05$) (Hypothesis 1). The mediation model explained 38.4% and 24.4% of variances in psychological distress and quality of life respectively (Fig. 1).

Discussion

Our study found that self-stigma was associated with higher psychological distress and poorer quality of life among T2DM patients in Hong Kong, which is consistent with studies conducted among T2DM patients in the USA [18] and Australia [19]. This suggests that the internalization of negative stereotypes and perceptions about being a T2DM patient is a culturally universal phenomenon that can be detrimental to psychological outcomes. In addition, this study specifically contributed to the literature by examining the different psychosocial mechanisms linking self-stigma to psychological outcomes.

The Mediating Roles of Self-Care Self-Efficacy and Self-Perceived Burden

Our study found that diabetes self-care self-efficacy significantly mediated the association between self-stigma and two indicators of psychological outcomes (poorer quality of life and higher psychological distress), extending prior findings that separately linked self-stigma to lower self-care self-efficacy among T2DM patients in

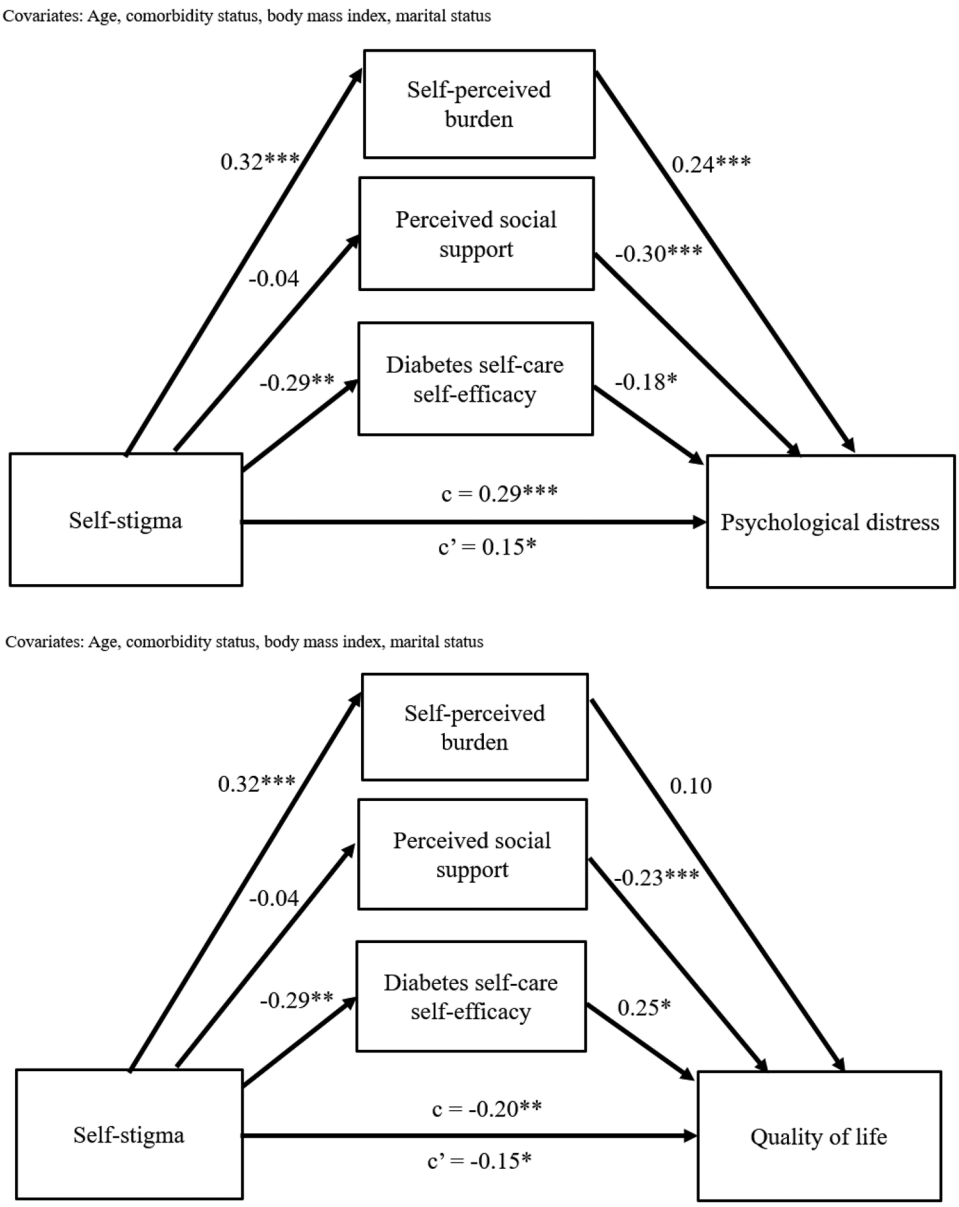

Fig. 1 Multiple mediation models exploring the mediating roles of self-perceived burden, perceived social support, and diabetes self-care self-efficacy in the association between self-stigma and psychological outcomes among T2DM patients in Hong Kong. Standardized path coefficients are presented. Asterisks indicate the significant levels, *$p < .05$, **$p < .01$, ***$p < .001$. c represents total effect from self-stigma to outcome; c' represents direct effect from self-stigma to outcome after considering the indirect effects by the mediators

the USA (Puhl et al., 2020) and self-care self-efficacy to quality of life among T2DM patients in Indonesia [56]. Given that self-care self-efficacy has a strong emphasis on the behavioral aspect, future studies should investigate whether the mediation pathways apply to the prediction of diabetes self-management behaviors.

Self-perceived burden also significantly mediated the association between self-stigma and psychological distress, indicating that negative self-perception among T2DM patients was related to feelings of burdensomeness to their caregivers and poorer psychological outcomes. A similar phenomenon is apparent in the context of other chronic illnesses, such as breast cancer survivors [34]. A study in Taiwan found that self-stigma was associated with higher role strain (i.e., conflicts in meeting multiple roles and expectations), which in turn associated with higher diabetes distress among T2DM patients [57]. These findings suggest that diabetes might enhance people's self-perceived burden due to their challenges in fulfilling their family obligations.

However, we did not find a significant association between self-perceived burden and quality of life in our sample, and therefore, the mediating role of self-perceived burden was not supported, despite self-stigma being associated with self-perceived burden. Prior research suggests the presence of other diabetes-related complications, such as retinopathy, neuropathy, or cardiovascular disease, which can impact patients' psychological outcomes independent of their self-perceived burden [31]. Unfortunately, we did not measure participants' diabetes-specific complications, which did not allow us to test the hypotheses in this study. Alternatively, we conducted additional

analyses on how self-reported comorbid conditions were associated with participants' psychological distress and quality of life. We did found significant correlations between having comorbid conditions (versus not having those conditions) and poorer quality of life, self-stigma, self-perceived burden, and lower self-care self-efficacy. The mediational findings, however, were largely identical with and without the statistical control for comorbidity status and other covariates. It might imply that having comorbid conditions (in addition to T2DM) did not significantly change the relationships among the variables in the mediational model. On the other hand, psychological distress and quality of life represent different aspects of people's psychological outcomes. Our findings seemed to suggest that the impact of self-perceived burden may be stronger on increasing negative feelings rather than decreasing pleasant feelings among T2DM patients in Hong Kong. More research is needed to understand the roles of self-perceived burden and other diabetes-related complications in different facets of outcomes among T2DM patients.

Perceived Social Support Did Not Mediate Between Self-Stigma and Psychological Outcomes

Contrary to our expectations based on studies of other disease populations [24, 25, 58], but similar to a study of T2DM patients in Ghana [27], we did not find a significant association between self-stigma and perceived social support among T2DM patients. Our participants reported a generally high level of perceived social support, which may reduce the potential negative contribution of self-stigma on the perceived supportiveness of their social environment. Given that Chinese individuals tend to view chronic illnesses of family members as a family issue [59], perceived social support seemed not to differ significantly based on participants' self-stigma. This also partially explained the absence of mediation of perceived social support between self-stigma and health outcomes. It is worth noting that varied aspects of stigma may contribute to T2DM patients' psychological outcomes differently. For instance, in a study in China [26], a combination of internal and external stigma was found to be associated with lower perceived social support and quality of life among T2DM patients, but the roles of specific types of stigma on social support and quality of life were not reported. Among T2DM patients in Switzerland, perceived stigma, rather than experienced stigma, was significantly associated with lower perceived social support [60]. The independent and joint contributions of different stigma indicators are still unclear in the literature. It would be important for future research to further elucidate how specific aspects of stigma affect T2DM patients' well-being. Additionally, researchers have started to examine how satisfaction with social support is associated with psychological outcomes among T2DM patients. For example, Bowen and colleagues found that satisfaction with social support was a stronger predictor of quality of life than perceived social support among African American T2DM patients [61]. As an extension of this study, it would be valuable to explore how social support satisfaction may be associated with self-stigma and T2DM patients' psychological outcomes.

Limitations

This study is subject to several limitations. First, the findings were based on data from a cross-sectional survey, which cannot elucidate causal relationships among the variables. Future studies should investigate the longitudinal relationships among self-stigma, potential mediators, and psychological outcomes. Second, given the scarcity of studies specifically for Chinese T2DM patients, the measurement scales may not be fully validated in this population. However, these scales demonstrated satisfactory psychometric properties. Replication of the findings using other commonly used measures (e.g., Diabetes Distress Scale, Problem Areas in Diabetes scale) is recommended. Third, this study recruited a non-random sample of T2DM patients in Hong Kong through public hospitals and clinics, which may be subject to self-selection bias. However, recruiting local diabetes patients through public hospitals and clinics is a common practice in empirical studies [39], supporting its empirical acceptability for testing novel hypotheses like the current study. Future studies may consider alternative ways to recruit eligible participants (e.g., using community and online support groups), which may enhance sample representativeness. Fourth, given that self-perceived burden and diabetes self-care self-efficacy did not fully mediate the associations between self-stigma and psychological outcomes, other mediators may be at play. A recent study found that acceptance action (i.e., the psychological flexibility to accept undesirable thoughts/feelings and pursue goals in the presence of these potentially difficult illness experiences) also significantly mediated the association between diabetes self-stigma and quality of life among T2DM patients in Korea [62]. Future research could examine how different processes impact various aspects of well-being (e.g., positive changes due to their diagnosis, i.e., posttraumatic growth) among T2DM patients. Fifth, we did not measure participants' diabetes-specific complications in this study, which may limit our understanding of how these complications affect psychological outcomes among T2DM patients. To capture the potential role of diabetes-related complications in self-perceived burden, self-efficacy, and psychological outcomes, future studies may consider measuring diabetes-specific complications.

Implications

This study revealed potential mechanisms explaining the relationship between self-stigma and psychological outcomes among T2DM patients in Hong Kong. Our findings suggest that interventions targeting self-stigma, self-perceived burden, and self-care self-efficacy may improve T2DM patients' psychological outcomes. Psychosocial interventions that incorporate education and sharing sessions have been found to be helpful in reducing internalized stigma among people with stigmatizing conditions (Mittal et al., 2012). Specific to interventions targeting T2DM patients' self-stigma, a pilot psychoeducational self-stigma reduction program (including correcting misunderstandings about diabetes, exercises for self-acceptance and illness acceptance, behavioral goal settings, coping skills training) for patients with T2DM has been developed and found to reduce self-stigma and self-efficacy among 17 Japanese T2D patients in large effect sizes [63]. To reduce patients' self-perceived burden, involvement of family members in interventions may also be important. For example, a family-based psychoeducation intervention (having T2DM patients and their family members clarifying family roles, discussing illness adjustment challenges and perceptions of burdensomeness) has been found to reduce self-perceived burden and improve psychological well-being among older T2DM patients in China [64]. Future research could explore different combinations of intervention strategies that target self-stigma, alleviate patients' perception of burdensomeness, and enhance self-care self-efficacy among T2DM patients.

Conclusion

Self-stigma was found to be associated with higher psychological distress and poorer quality of life among T2DM patients in Hong Kong. Our findings suggest recommendations for future self-stigma reduction programs and other potentially effective intervention strategies to promote T2DM patients' adjustments to their condition. These may include alleviating patients' perception of burdensomeness and enhancing self-care self-efficacy.

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Data Availability The dataset is available from the corresponding author on reasonable request only. The dataset is not publicly available as it contains information that could compromise the privacy of the participants.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Research Involving Human Participants and/or Animals This article contains a study with human participants. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Competing Interests The authors declare no competing interests.

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