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Stigma in Type 2 Diabetes: A Study from Southern India

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Abstract

"Diabetes stigma" refers to a psychological disturbance in an individual who is diagnosed with diabetes. This condition has been studied primarily in subjects with type 1 diabetes whereas research on the stigma associated with type 2 diabetes is scarce, particularly in India. Against this backdrop, the present study focuses on understanding demographic variations in the experience of diabetes stigma. It also examines the association between diabetes stigma and physical activity, stressors as well as the length of diagnosis. This study further explores the predictors of stigma among demographic variables, diabetes duration and life style variables (physical exercise and stressors). 333 subjects with type 2 diabetes mellitus presenting to a tertiary care diabetes and endocrine centre in southern India were recruited (196 men, 137 women age range 25 - 78 years). They were evaluated using the Diabetes Stigma Assessment Scale-2 (DSAS-2) to assess diabetes stigma, along with structured interviews that collected demographic, clinical and lifestyle related information. ANOVA and t-test results showed that the tested demographic variables (age, gender, occupation, level of education and income), clinical and life style variables (diabetes duration, number of stressors and exercise) had significant influence on the experience of diabetes stigma. When these associations were tested using two separate multiple regression models, only age was found to be a significant predictor of stigma in terms of the total stigma experience and its subdomains namely the perception of being treated differently by others, self-stigma and blame and judgment by others. Interestingly, participants' gender did not differentiate significantly in their experience of stigma. Similarly, all the three tested clinical and life style variables emerged as significant predictors of various domains of diabetes stigma. Diabetes stigma is closely linked with age and clinical features, life style factors such as duration of diabetes, number of stressors being experienced and physical exercise.

Keywords

Diabetes Stigma, Self-Stigma, Psychological Effects, Demographic, Life Style Factors, Stress, Distress

1. Introduction

Diabetes mellitus is best approached as a biopsychosocial phenomenon, considering the many lifestyle changes involved in its management [1]. Globally, and in developing countries such as India in particular, diabetes presents a number of psychological and social difficulties that should be successfully managed alongside medical therapy. Disregarding these and focusing only on clinical parameters leads to suboptimal control and resultant complications. Earlier, we documented a number of gender-based differences in people with diabetes in the Indian context: these were related to quality of life, well-being, distress, psychological adjustment to diabetes, depression and social support [2] [3]. Type 2 diabetes is viewed as a lifestyle condition, and individuals are held accountable for inadequate management.

1.1. Stigma in Lifestyle Diseases

The general attitude towards people with lifestyle disorders is influenced by stigma, which frequently has its roots in historical contexts that define societal acceptance and exclusion [4]. Stigmatisation can result from societal perceptions of health and body image, especially when it comes to lifestyle choices and weight. Weight stigma is exacerbated by thin-ideal internalisation, which encourages unfavourable comparisons [5]. Stigmatisation frequently takes place in social circles, where people with lifestyle disorders may be perceived negatively by others [6]. Stigma is exacerbated by misconceptions on the controllability of illnesses. For example, blame and discrimination may result from a general belief that lifestyle disorders are exclusively the consequence of human choices [6]. On the other hand, some contend that social pressure to modify their lifestyle can actually motivate people with stigma to lead better lives. This viewpoint, however, ignores the negative social and psychological effects of stigma, which can impair general health outcomes.

1.2. Stigma in Diabetes

The stigma associated with diabetes significantly impacts psychological well-being and social interactions, ultimately affecting self-management behaviors. Individuals with diabetes often face discrimination and social rejection, leading to internalized shame and distress, which can hinder their ability to manage their condition effectively. Stigma due to diabetes has been defined as the "social burden of living with diabetes" [7]. The concept of stigma was proposed in the early 1960's by Goffman as an "attribute that is deeply discrediting", that reduces a person

from a whole and "usual" person to a "tainted" one defined primarily based on this attribute" [8]. It has since been refined by sociologists and social psychologists to mean any attribute likely to put an individual at odds with societal norms, resulting in negative stereotyping, prejudice, blame, rejection, status loss and discrimination [9]. Link and Phelan expanded the concept of stigma to incorporate four attributes: labelling, negative stereotyping, separation and status loss [10]. This definition is frequently employed in diabetes-related stigma literature [11]. Diabetes stigma now involves experienced or enacted stigma, perceived or felt stigma, anticipated stigma, internalized or self-stigma and intersectional stigma [12]. Stigma has been proposed to be a process, resulting from an aggregate of marking, stereotype, isolation, emotional response, loss of status and discrimination [13].

1.3. Stigma in Type 2 Diabetes

Health behaviours and treatment adherence of patients are greatly impacted by the stigma associated with Type 2 diabetes (T2D). A substantial negative link has been uncovered between diabetes stigma and self-care behaviours [14], with higher stigma being linked with poorer self-care practices. Insulin use and self-monitoring were associated with better self-care, but poor health status and diabetes complications were observed in patients with stigma [14].

Notwithstanding the detrimental effects of stigma, arguments prevail that awareness and education about diabetes can help reduce stigma and improve health outcomes. Addressing these biases is crucial for enhancing the quality of care for individuals with type 2 diabetes.

1.4. Consequences of Stigma

Stigma significantly impacts mental health outcomes and treatment adherence among individuals with chronic illness, creating barriers that aggravate symptoms and hinder access to care. The multifaceted nature of stigma, including public and self-stigma, results in reduced quality of life, by negatively affecting psychological well-being, social well-being, physical well-being and self-care aspects [7] [12].

One important element that contributes to poorer treatment adherence is self-stigma; high levels of self-stigma are associated with weaker drug adherence [14] and poorer self-care practices are associated with high levels of stigma [15], leading to delay or avoidance of necessary health-promoting interventions, thus exacerbating their condition [12]. Stigma is linked to poorer psychological well-being and higher HbA1c levels, suggesting that socioeconomic differences in stigma can lead to worse clinical outcomes [12]. Stigma levels also vary by the intensity of diabetes management; those on more demanding regimens report greater stigma [16]. Higher levels of stigma also correlate with lower resilience and increased distress [17]. Himmelstein and Puhl reported that over half of the participants experienced family discrimination, which was linked to negative consequences such as

resentment and concealment of self-care efforts [18].

Inversely, while stigma is a significant barrier to effective diabetes management, awareness and education can mitigate its effects, contributing towards health outcomes by reducing discrimination and social isolation [12].

1.5. Prevalence of Stigma in Type 2 Diabetes

Many individuals perceive diabetes as a self-inflicted condition, leading to blame and shame, particularly among those having type 2 diabetes [11].

Higher levels of stigma are reported among women compared to males, especially around weight and diabetes, with White women showing a higher prevalence [19].

Stigma is prevalent in healthcare settings, where patients feel judged or discriminated against, exacerbating feelings of shame [19] [20].

The prevalence of diabetes stigma in adults with type 2 diabetes ranges between 12% and 70% [7], with a female preponderance; the latter was attributed to societal and cultural factors. While studies of stigma in diabetes are sparse in the Indian subcontinent, a few have been conducted in type 1 diabetes mellitus [21] [22]. Self-stigma was longitudinally assessed using 4-item Stigma Scale for Chronic Illness (SSCI-4) as part of the INDEPENDENT Study among adults from India having mild to moderate depression symptoms.

1.6. Diabetes Stigma in India

Traditional beliefs give rise to misconceptions about diabetes, attributing it to the failure of the individual or poor lifestyle choices [23]. Language barriers further complicate communication between healthcare providers and patients, impacting the quality of care [24]. Women face additional barriers due to societal norms that prioritize family and marriage prospects over health, bringing about reluctance in seeking treatment [25] [26]. In fulfilling their role as caregivers, women inadvertently neglect self-care. Cultural expectations can lead to women being less likely to receive appropriate diabetes care compared to men [23]. Offering food during social visits is a significant customary gesture and seen as an expression of affection, respect, and social standing. Stigma prevents people from rejecting the offerings and thus adversely affects dietary control in diabetes. Dietary restrictions recommended for diabetes management clash with cultural food practices, making adherence challenging [23] [25].

In this study, we provide a comprehensive account of stigma in subjects with type 2 diabetes. The main objectives are**:**

a) Examining demographic differences with respect to age, gender, education, occupation and income in the experience of diabetes stigma.

b) Understanding the association and predictive value among demographics and diabetes duration, life style variables (physical exercise and stressors) and experiencing diabetes stigma.

c) Identifying whether demographic variables, diabetes duration and life style

variables (physical exercise and stressors) can act as predictors of stigma.

In order to determine the type of stressors and number of stressors experienced by patients with a diabetes diagnosis, a structured interview was conducted and data was entered into a structured form. Stressors considered in this study were daily life stressors such as family stress, occupational stress and financial stress. Generally, coping with a single stressor might be easier, while multiple stressors might be more detrimental to the individual with diabetes. Therefore, "number of stressors" (no stressor, one stressor and more than one stressor) rather than "type of stressors" was taken into consideration in this study. The duration of exercise, categorized into no exercise, exercise lasting up to one hour, and exercise exceeding one hour, was taken into account for this study, with this data included as part of the lifestyle information.

2. Methodology

2.1. Participants and Screening

A cross-sectional design using purposive sampling was chosen to recruit the participants who met the inclusion criteria: a diagnosis of type 2 diabetes, fasting blood glucose ≥ 120 mg/dl, and HBA1c ≥ 7. Eligible adult subjects with type 2 diabetes presenting to a tertiary care endocrine centre from southern India (n: 333; 196 men, 137 women, and age range was 25 - 78 years) who consented to participate in the study were administered the DSAS-2; data on demographic, clinical, and lifestyle-related information was collected. A structured form, developed by the researchers, was used to obtain demographic, clinical and lifestyle-related information. Forms were provided in English and Telugu (the local vernacular language); data were obtained over six months from not more than four subjects in a day.

2.2. Declaration

a) Ethical approval: The study protocol was approved by the Institutional EDRC ethics committee before its commencement. Participants were briefed on the nature of the study, confidentiality and their right to withdraw from the study.

b) Consent to participate: All subjects gave an informed signed consent before providing data.

c) Consent to publish: All subjects gave an informed signed consent for publishing the data.

2.3. Measures

The type 2 Diabetes Stigma Assessment Scale (DSAS-2), a standardized self-report scale developed by Browne *et al.* [27], was used to measure the diabetes stigma. DSAS-2 is a 19-item scale with each item rated on a 5-point Likert scale (1 =strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, and 5 = strongly agree). This tool quantifies the extent and impact of stigma. It is a novel measure of

diabetes specific stigma featuring a simple three-factor structure of stigma encompassing both enacted and self-stigma and can be reduced to a single domain for total score calculation. DSAS-2 is a reliable and valid measure of type 2 diabetes-specific stigma. It gives three separate scores for *Treated Differently* (6 items α = 0.88), *Blame and Judgment* (7 items, α = 0.90), and *Self-stigma* (6 items, α = 0.90) domains and also yields the total stigma score (α = 0.95). DSAS-2 demonstrated strong psychometric properties like satisfactory concurrent, convergent, and discriminant validity to facilitate research in this area. The scale has been translated into Telugu (local language), and the Linguistic validation method has been used. Permission to translate was acquired from the authorized people and organization.

A systematic approach was followed to ensure that the translated scale maintained its validity and reliability. Linguistic validation method included four steps; the first step consisted of a forward translation, where the original tool was translated into the target language by bilingual experts. In the second step, a back-translation was conducted, where the translated version was translated back into the original language to check for incongruities. In the third step a panel of experts reviewed the translated scale for clarity and cultural relevance ensuring that the items were appropriate for the study population. A pilot test was then conducted on a small sample (n = 25) to identify any issues with understanding the content and/or culturally inappropriate words. After revising the identified semantic and grammatical errors, the translated version was used for the study.

2.4. Statistical Analysis

The data was analysed using SPSS version 23. Missing data and data cleaning processes were performed. Initial data analysis was conducted to calculate descriptive statistics and to examine the differences in experiencing diabetes stigma with respect to selected demographic variables. To explore gender differences, independent t tests were conducted and to explore other demographic variables' differences f-tests were conducted. Additionally, to investigate predictors of diabetes stigma, multiple regression analysis was run. Though there were some categorical and continuous variables, to bring uniformity in regression analysis, the continuous variables were converted into categorical variables by creating meaningful categories. and then, assigned dummy coding to all categorical variables in order to conduct regression analysis.

3. Results

3.1. Demographic Details

The demographic information is presented in Table 1. Of 333 subjects, 58.9% (n = 196) were male. Majority of the participants were middle-aged (65.2% n = 219). In terms of education, the largest number of participants had studied up to tenth-grade (37.2%; n = 124). Occupation wise, the largest group was self-employed

(33.9%; n = 113), followed by the homemaker group at 31.3% (n = 105), employees at 27% (n = 90), and the retired group at 7.5% (n = 25). Most of the participants did not have a regular income (Table 1).

Table 1. Sample distribution with respect to select demographic variables.

Socio demographic variable	Description	Frequency & %
Gender	Male	196 (58.9)
	Female	137 (41.1)
Age	Less than 40	59 (17.7)
	41 - 60	219 (65.2)
	61 & above	57 (17.1)
Education	No education	48 (14.4)
	Up to tenth grade	124 (37.2)
	Intermediate & graduation	106 (31.8)
	Postgraduation and above	55 (16.5)
Occupation	Homemaker	105 (31.5)
	Self employed	113 (33.9)
	Employee	90 (27.0)
	Retired	25 (7.5)
Annual income (Indian rupees)	No income	117 (35.1)
	Up to three lakhs	103 (30.9)
	Up to five lakhs	35 (10.5)
	More than five lakhs	78 (23.4)

3.2. Gender Differences in Diabetes Stigma

The differences in diabetes stigma from socio demographic variables are presented in Table 2.

Table 2. Gender differences in diabetes stigma.

Domain	Gender	N	Mean	S. D	T value
Treated differently	Male	196	11.56	4.11	−1.23
	Female	137	12.15	4.38	
Blame and judgement	Male	196	12.45	3.57	−0.376
	Female	137	12.61	3.66	
Self-stigma	Male	196	9.76	4.16	−1.06
	Female	137	10.23	3.85	
Total	Male	196	33.77	9.46	−1.16
	Female	137	34.99	9.35	

*$p \leq 0.05$, **$p \leq 0.01$.

Diabetes stigma was found to significantly affect individuals with type 2 diabetes, with gender playing a crucial role in the experience and impact of this stigma. Table 2 shows gender differences of diabetes stigma between males and females on the three domains of diabetes stigma and total stigma. Mean score of men on *treated differently* domain was (11.56) which was slightly lower than that of women (mean score of 12.15). On the domain *blame and judgement*, the mean score for males was (12.45), which was slightly lower than the females' mean (12.16). On the domain of *self-stigma* and total stigma, the slight difference in mean score between male (9.76) and female (10.23) was not significant (Males scored 33.77 on total stigma, whereas women scored 34.99). However, the difference in mean scores suggests that female participants experienced higher stigma than males with a small effect size (Cohen's d: 0.129).

3.3. Age Differences in Diabetes Stigma

Age differences in diabetes stigma are shown in Table 3.

Table 3. Age differences in diabetes stigma.

Domain	Age (in years)	N	Mean	S. D	F value
Treated differently	<40	59	12.69	4.59	2.41
	41 - 60	217	11.77	4.18	
	61 &>	57	10.98	3.88	
Blame and judgement	<40	59	13.66	4.13	5.68**
	41 - 60	217	12.49	3.58	
	61 &>	57	11.44	2.70	
Self-stigma	<40	59	11.44	5.32	10.57**
	41 - 60	217	10.04	3.77	
	61 &>	57	8.11	2.62	
Total	<40	59	37.80	11.69	9.04**
	41 - 60	217	34.29	8.96	
	61 &>	59	30.53	6.90	

*$p \leq 0.05$, **$p \leq 0.01$.

Table 3 shows the mean differences on the three domains and total stigma with respect to the three age groups: <40, 41 - 60, 61 & > respectively. All three age groups reported statistically significant differences on the total stigma and *blame and judgement* and *self-stigma* domains. Among these three age groups, the <40 years age group reported the highest mean scores. This group scored high mean on the total stigma (11.69), *blame and judgement* (13.66) and *self-stigma* domains (11.44). 41 - 60-year-olds scored higher on total stigma (34.29), and *blame and judgement* (12.49) and *self-stigma* domains (10.04) compared to 61 and above age

olds. Among three age groups, the 61 and above age group scored the lowest mean scores on total stigma (6.90), *blame and judgement* (11.44) and *self-stigma* domains (8.11). The lower the age, the higher the stigma experience.

3.4. Differences in Diabetes Stigma with Respect to Education

Table 4 shows differences in diabetes stigma in relation to education.

Table 4. Differences in diabetes stigma with respect to education.

Domain	Education	N	Mean	S.D	F value
Treated differently	No education	48	13.15	3.64	2.84*
	Up to 10th	124	12.03	4.53	
	Intermediate & graduation	106	11.30	4.05	
	Post-graduation & others	55	11.05	4.11	
Blame and judgement	No education	48	11.88	3.43	0.65
	Up to 10th	124	12.59	3.61	
	Intermediate & graduation	106	12.74	3.61	
	Post-graduation & others	55	12.49	3.74	
Self-stigma	No education	48	10.73	3.58	1.63
	Up to 10th	124	10.06	4.21	
	Intermediate & graduation	106	9.31	3.94	
	Post-graduation & others	55	10.27	4.12	
Total	No education	48	35.75	8.36	0.854
	Up to 10th	124	34.69	9.85	
	Intermediate & graduation	106	33.35	9.05	
	Post-graduation & others	55	33.82	10.00	

*p ≤ 0.05, **p ≤ 0.01.

The mean differences among four levels of education groups were as follows: all education groups scored a significant mean difference on the domain *treated differently*. Individuals who were not educated scored the highest mean score 13.15 among all groups on this domain. Up to 10th grade, the group scored a high mean of 12.03; the intermediate and graduation group scored 11.03, and the post-graduate & others group scored 11.05, which was the lowest mean score among all four groups on the domain *treated differently*. Though it was not statistically significant, on total stigma, the no education group scored the highest mean among the four groups on total stigma.

3.5. Differences in the Experience of Diabetes Stigma with Respect to Occupation

Table 5 shows differences in diabetes stigma with respect to occupation.

Table 5. Differences in the experience of diabetes stigma with respect to occupation.

Domain	Occupation	N	Mean	S.D	F value
Treated differently	Home maker	105	12.19	4.28	3.66**
	Self employed	113	12.46	4.08	
	Employee	90	10.94	4.29	
	Retired	25	10.24	3.75	
Blame and judgement	Home maker	105	12.43	3.44	1.62
	Self employed	113	12.78	3.72	
	Employee	90	12.69	3.75	
	Retired	25	11.08	2.98	
Self-stigma	Home maker	105	10.03	3.70	3.31*
	Self employed	113	9.94	4.14	
	Employee	90	10.52	4.43	
	Retired	25	7.68	2.59	
Total	Home maker	105	34.65	8.63	3.07*
	Self employed	113	35.18	9.39	
	Employee	90	34.16	10.32	
	Retired	25	29.00	8.03	

*$p \leq 0.05$, **$p \leq 0.01$.

The homemaker group includes females who are only involved in household chores. Self-employed groups include business people or entrepreneurs. Table 5 shows the differences among the groups in experiencing diabetes stigma. There is a statistically significant difference among four groups on total stigma. Among the four groups, the self-employed group scored the highest mean (35.18), followed by the homemaker group (34.65) and the self-employed group (35.18), and the retired group scored the lowest mean (29.00). On the domain *treated differently*, the four groups showed statistically significant differences. The self-employed group showed the highest mean scores (12.46), followed by the homemaker group (12.19), the employee group (10.94), and the retired group (10.24). On the domain of *self-stigma*, employee group scored the highest mean (10.52), the homemaker group scored (10.03), the self-employed group scored (9.94), and the retired group scored the lowest scores (7.68).

3.6. Differences in the Experience of Diabetes Stigma with Respect to Income

Table 6 shows differences in diabetes stigma with respect to income.

Table 6. Differences in the experience of diabetes stigma with respect to income.

Domain	Income (per annum)	N	Mean	S.D	F value
Treated differently	No income	117	12.09	4.22	2.94*
	Up to 3 lakhs	103	12.45	4.11	

Continued

Treated differently	>3 to 5 lakhs	35	11.37	3.88	2.94*
	>5 lakhs	78	10.69	4.39	
Blame and judgement	No income	117	12.37	3.45	0.40
	Up to 3 lakhs	103	12.73	3.81	
	>3 to 5 lakhs	35	12.89	3.78	
	>5 lakhs	78	12.29	3.50	
Self-stigma	No income	117	9.95	3.66	0.002
	Up to 3 lakhs	103	9.94	4.03	
	>3 to 5 lakhs	35	9.4	3.66	
	>5 lakhs	78	9.99	4.76	
Total	No income	117	34.41	8.70	0.77
	Up to 3 lakhs	103	35.12	9.73	
	>3 to 5 lakhs	35	34.20	8.98	
	>5 lakhs	78	32.97	10.24	

*p ≤ 0.05, **p ≤ 0.01.

Although no significant differences were noted in other domains, the domain *treated differently*, revealed a significant difference among four groups in experiencing stigma. Up to 3 lakhs group scored the highest mean (12.45), followed by the no income group (12.09), the >3 to 5 lakhs group scored (11.37), and the >5 lakhs group scored the lowest mean (10.69).

3.7. Association of Diabetes Stigma with Respect to Demographics

The association of diabetes stigma from socio demographic variables and clinical and lifestyle variables is shown in Table 7.

Table 7. Association of diabetes stigma with respect to demographics.

	DSAS-2 total		*DSAS-2 domain 1*		*DSAA-2 domain 2*		*DSAS-2 domain 3*	
SES variables	Coefficient (95% CI)	P value	Coefficient (95% CI)	P value	Coefficient (95% CI)	P value	Coefficient (95% CI)	P value
Age	−0.22 (−5.33, −1.81)	0.001**	−0.108 (−1.56, 0.02)	0.05*	−0.17 (−1.76, −0.40)	0.005**	−0.25 (−2.46, −0.96)	0.001**
Education	−0.06 (−1.85, −0.93)	0.35	−0.10 (−1.04, 0.09)	0.10	0.06 (−0.24, 0.72)	0.32	−0.80 (−0.90, 0.16)	0.18
Occupation	−0.01 (−1.78, 1.47)	0.85	−0.81 (−1.04, 0.43)	0.41	−0.01 (0.68, −0.52)	0.87	0.04 (−0.49, 0.89)	0.56
Income	−0.01 (−1.34, 1.2)	0.93	0.99 (−0.87, 0.28)	0.31	−0.01 (−0.53, 0.46)	0.88	0.07 (−0.27, 0.82)	0.32

*p ≤ 0.05, **p ≤ 0.01.

3.8. Clinical and Lifestyle Variables

Table 8 shows the association of diabetes stigma with respect to clinical and lifestyle variables.

Table 8. Clinical and lifestyle variables.

Duration of diabetes	−0.18 (−2.69, −0.74)	0.001	−0.04 (−0.61, 0.28)	0.47	−0.27 (−1.35, −0.61)	0.001**	−0.14 (−0.98, −0.14)	0.01**
Exercise	−0.13 (−2.94, −0.33)	0.01**	−0.13 (−1.36, −0.16)	0.01**	−0.04 (−0.71, 0.28)	0.39	−0.12 (−1.22, −0.10)	0.02
No. of stressors	0.11 (0.17, 3.38)	0.05*	0.08 (−0.15, 1.13)	0.12	0.02 (−0.47, 0.75)	0.65	0.16 (0.37, 1.75)	0.005**

*$p \leq 0.05$, **$p \leq 0.01$.

DSAS-2 Total

DSAS-2 domain 1-*Treated differently*

DSAS-2 domain 2-*Blame and judgement*

DSAS-2 domain 3-*Self stigma*

R^2 value-0.44-DSAS-2 total and demographics

R^2 value-0.31-DSAS-2 domain 1-*Treated differently*

R^2 value-0.22-DSAS-2 domain 2-*Blame and judgement*

R^2 value-0.55-DSAS-2 domain 3-*Self stigma*

R^2 value-0.70-DSAS-2 total and clinical & lifestyle variables

R^2 value-0.23-DSAS-2 domain 1-*Treated differently*

R^2 value-0.77-DSAS-2 domain 2-*Blame and judgement*

R^2 value-0.65-DSAS-2 domain 3-*Self stigma*

The three age groups (less than 40 years, 41 - 60 years and above 60 years) had significant differences in total diabetes stigma ($F = 9.04$, $p \leq 0.01$), blame and judgment ($F = 5.68$, $p \leq 0.01$) and self-stigma ($F = 10.57$, $p \leq 0.01$). The four educational groups (no education, up to 10th grade, intermediate and graduation and post-graduation) had significant difference on only *treated differently* subscale of *diabetes stigma* scale ($F = 2.84$, $p \leq 0.05$), with no-education group reporting higher scores. Significant differences were observed among the four occupation groups on various subscales of the stigma scale. The four occupation groups (homemaker, self-employed, employee and retired) had significant differences in *treated differently* ($F = 3.66$, $p \leq 0.01$), *self-stigma* ($F = 3.31$, $p \leq 0.05$) and on *total stigma* ($F = 3.07$, $p \leq 0.05$).

Further analysis was conducted to see how the selected clinical and lifestyle variables (diabetes duration, physical exercise and number of stressors being experienced) were related to diabetes stigma and its subscales. Diabetes duration was significantly related to the experience of diabetes stigma. The four diabetes duration groups (less than one year, 1 to <5 years, 5 to 10 years and more than 10 years)

had significant differences on total diabetes stigma (F = 5.95, p ≤ 0.01), *blame and judgment* (F = 12.21, p ≤ 0.01) and *self-stigma* (F = 3.19, p ≤ 0.01). It was the participants with the least diabetes duration (*i.e.* less than one year) who reported experiencing higher levels of scores on these dimensions. The three exercise groups (no exercise, up to 1 hour and more than 1 hour) differed significantly on the domain *treated differently* (F = 4.0, p ≤ 0.05), self-stigma (F = 4.69, p ≤ 0.01) and total stigma (F = 5.30, p ≤ 0.01). Also, number of stressors currently being experienced by the participants, were found to be related to the experience of stigma among the participants. The three groups (no stressors, one stressor and more than one stressor) had significant differences on *self-stigma* (F = 5.45, p ≤ 0.01) and total stigma (F = 3.0, p ≤ 0.05). Among the three, more than one stressor group reported experiencing more *self-stigma* and *total stigma.*

3.9. Diabetes Stigma and Associated Factors

Two separate multiple regression analyses were run to predict which of the demographic/clinical/life style variable(s) most contribute to the variance observed in diabetes stigma scores. We removed gender from further logistic analysis as it did not show any significant association. Of all the four demographic variables used in the model (age, education, occupation and income), only age significantly predicted the score on the total diabetes stigma ($\beta = -0.22$, p ≤ 0.001), treated differently ($\beta = -0.11$, p ≤ 0.05), self–stigma ($\beta = -0.17$, p ≤ 0.05) and blame and judgment ($\beta = -0.22$, p ≤ 0.001). It was observed that the demographics had a moderate association with *total stigma* and causing approximately 44% of the variance in the experience of stigma.

Multiple regression analysis with selected clinical and selected lifestyle variables as predictor variables showed that total diabetes stigma was significantly predicted by all the three variables: diabetes duration ($\beta = -0.18$, p ≤ 0.001), exercise ($\beta = -0.13$, p ≤ 0.01), and number of stressors ($\beta = 0.11$, p ≤ 0.05). Scores on *blame and judgment* were significantly predicted by diabetes duration ($\beta = -0.14$, p ≤ 0.01), exercise ($\beta = -0.12$, p ≤ 0.05) and number of stressors ($\beta = 0.16$, p ≤ 0.005). Scores on *treated differently* were significantly associated with only exercise ($\beta = -0.13$, p ≤ 0.01), and scores on *self-stigma* were significantly associated with only diabetes duration ($\beta = -0.27$, p ≤ 0.001). About 70% of the variance in the experience of stigma can be explained by the duration of diabetes, exercise, and stressors. This suggests a strong, significant association between predictors (duration of diabetes, exercise, and stressors) and the outcome (diabetes stigma).

To ensure that the predictor variables are not highly correlated, we checked collinearity to find Variance Inflation Factor (VIF). The VIF' values for demographics were on age (1.002), education (1.351), occupation (1.181) and income (1.536). The VIF values for clinical and lifestyle variables were on duration of diabetes (1.019), exercise (1.020), and number of stressors (1.004). The values for VIF indicated that there was no correlation between a given predictor variable and any other predictor variables in the model. It was found that none of the VIF

values for the predictor variable were greater than 5 indicating that multicollinearity was not a problem in this regression model.

4. Discussion

Using the DSAS-2 instrument to measure diabetes stigma in a southern Indian population, our study demonstrated that diabetes stigma exists across age groups, without any gender difference. The results of our study aligned with prior studies in the area, with the exception that type 2 diabetes patients above 50 years of age [28] experienced significantly higher diabetes stigma. The same study found that problematic stigma affected 24.71% of patients, highlighting the impact of age on stigma perception in this population**.** The primary components underlying diabetes stigma were perceived stigma and self-stigma. Those under the age of forty obtained high scores on the domains of *blame and judgment*, *self-stigma*, and *total stigma* ratings. During clinical observations, individuals in this age range stated concerns about future marriage prospects (among the unmarried) or that they might be perceived as weak and sexually less potent by their partner due to diabetes (among the married).

The considerable disparity between the no-education group and diabetes stigma could be attributed to a lack of awareness of the disease and unfavourable expectations about how they might be treated for having diabetes, as a manifestation of perceived stigma. Earlier studies showed that higher level of education was linked with perceived diabetes stigma and non-disclosure of their diabetes [29] [30]. In our sample, reported stigma was associated with low education levels, similar to the observations of Kato *et al.* [31]. Studies show that individuals with lower education levels report higher stigma related to diabetes, including feelings of *blame and judgement* from others [28]. Higher education levels are associated with better self-care behaviours, which are negatively impacted by stigma [14].

Diabetes stigma with respect to occupational differences shows that employees experience more *self-stigma* when compared to other occupational groups. Approximately 12% of employed type 2 diabetes patients reported experiencing stigma, which correlated with higher hospitalization rates, indicating poorer health outcomes [17]. According to a Danish study 6% of people with type 2 diabetes experienced discrimination at work, due to their diabetes status [32]. The differences in the experience of diabetes-specific stigma related to occupation suggests that those with an active social life face greater diabetes stigma, whereas those who are retired (aged) are less socialized and have a higher acceptance of their illness.

The impact of income on diabetes stigma could be related to poor self-esteem and a lack of resources that prevent sufficient awareness regarding the disease and the pursuit of relevant care. Patients with lower income, education, and employment status exhibited significantly higher stigma scores, indicating a clear link between socioeconomic factors, adverse psychosocial outcomes, including food insecurity and depressive symptoms, and stigma perception [28] [33]. A study

found that participants with type 1 diabetes from lower household income backgrounds reported higher stigma scores compared to those with higher incomes. However, specific data on income differences influencing stigma perception in type 2 diabetes individuals was not explained. Income differences could influence the perception of diabetes stigma, with lower-income individuals experiencing higher levels of stigma due to societal attitudes, limited access to healthcare, and increased vulnerability to negative stereotypes associated with diabetes [34].

Our study does not mirror these findings. We show that the four income groups (no income, up to 3 lakhs, 3 to 5 lakhs and above 5 lakhs) had significant differences only on the *treated differently* domain of DSAS 2 ($F = 2.94$, $p \leq 0.05$). The no-income group could have underlying low self-esteem which may have in turn led to an amplification of the feeling that they were *treated differently* by others due to their diabetes condition. It is interesting to note that no significant differences were observed between the male and the female participants on any of the diabetes stigma sub-scales and on *total stigma*. This does not align with an earlier report where women with type 2 diabetes reported more frequent experiences of weight stigma and diabetes-related stigma than men.

4.1. Duration of Diabetes and Diabetes Stigma

As the duration of diabetes increases, so does the experience of stigma, which in turn exacerbates mental health issues such as depression and anxiety. Individuals with longer diabetes duration often report higher levels of stigma, which can manifest as social rejection and internalized shame [35]. The scarcity of research shows the need to investigate the relationship between duration of diabetes and diabetes stigma.

In relation to the duration of diabetes persons with a recent diagnosis (less than one year) feel stigmatized about type 2 diabetes, as they may blame themselves for their disease, and perceive that others are judging them adversely for having type 2 diabetes. The low scores on the domains of blame and judgment, as well as self-stigma, among individuals who have been suffering for more than 10 years show that they may not feel as much stigma in revealing that they have diabetes since, as they get older, people may ascribe the diagnosis to their age and accept it.

4.2. Physical Exercise and Diabetes Stigma

Physical exercise plays a significant role in moderating stigma associated with type 2 diabetes by promoting physical health, enhancing self-efficacy, and fostering social engagement. Regular physical activity not only improves glycaemic control but also empowers individuals to take charge of their health, which can counteract negative perceptions surrounding diabetes. Regular exercise enhances insulin sensitivity and blood glucose management, which can lead to better health outcomes [36]. Exercise promotes a sense of achievement and control over one's health, which can combat feelings of shame and inadequacy often associated with diabetes [23]. Group exercise programs can create supportive communities, ameliorating isolation and help individuals feel more accepted [37]. Skilled education about the ben-

efits of exercise can challenge misconceptions about diabetes, reducing stigma through informed discussions [23]

The association between physical exercise and diabetes stigma in individuals with type 2 diabetes is complex, as both weight related self-stigma and diabetes stigma can significantly impact health behaviors, including exercise. Higher levels of weight related self-stigma correlate with lower levels of physical activity and poorer dietary self-care among adults with type 2 diabetes [38]. Stigmatization can lead to negative self-perception and reduced motivation, which in turn affects physical activity levels. High levels of diabetes-related stigma correlate with lower adherence to exercise regimens, as individuals may feel judged or marginalized [14].

The present study findings reveal that the no-exercise group had high stigma scores while the exercise group had low stigma scores on the domains of being *treated differently*, *self-stigma*, and overall stigma. Although existing diabetes studies have not directly examined the impact of exercise on diabetes stigma, exercise is seen to generally help individuals feel good, which may lead to enhanced self-perceptions, less stigmatization, and a greater perceived ability to manage their condition by following a healthy lifestyle.

4.3. Daily Life Stressors and Diabetes Stigma

Individuals deal with everyday life stressors like family stress, work related stress, financial stress and sometimes all of these at once. These daily life stressors can precipitate a negative impact on the individual's perception of diabetes. Family stress can aggravate diabetes stigma, showing that familial relationships and support systems influence the perception of stigma, and thereby their ability to manage their disease. There is little research exploring the association between life stressors and stigma.

We explored the association between daily life stressors (family stress, occupational stress and financial stress) and diabetes stigma.

The variations in the experience of diabetes specific stigma in relation to the number of stressors experienced shows that stress affects the perception and experience of stigma and may have a negative impact on seeking support and self-disclosure about the disease. We are not aware of studies of diabetes investigating the relationship between stressors and diabetes specific stigma. Studies in other chronic health conditions showed that functional limitations and stressors are associated with stigma across chronic health conditions. In adults with type 1 diabetes, exposure to stressors was shown to provide a greater sense of mastery over the stressor which may be associated with less stigma [11].

Multivariate regression analysis showed that age is the most significant predictor of diabetes stigma. The other demographic variables are not significant predictors. The younger age group reported both experienced stigma and self-stigma. They may also witness their family members or friends reminding them of their dietary and other lifestyle changes to be implemented. All three tested lifestyle

variables (duration of diabetes, number of stressors and duration of exercise) emerged as significant predictors of various domains of diabetes specific stigma. This reinforces the view of type 2 diabetes as a lifestyle disease.

Total diabetes stigma was significantly predicted by all three clinical and lifestyle variables. Similarly, scores on *blame and judgment* were significantly predicted by diabetes duration, exercise and number of stressors ($\beta = 0.16$, $p \leq 0.005$). Scores on *treated differently* were significantly associated with only exercise and scores on *self-stigma* were significantly associated with only diabetes duration.

4.4. Limitations of the Study

As our research is cross sectional it cannot measure change and cannot establish cause and effect relationship. Underrepresentation of females might cause biased results and difficulty in generalization.

The responses were self-reported subjective experiences as in most psychological studies, and might affect the result. Marital status was not taken into consideration for this study because the majority of our study population is married, and very few participants are single. However, this might be investigated in future studies to determine how family support and unmarried individuals perceptions and disclosures of diabetes influences perception and disclosure of diabetes based on marital status.

5. Conclusion and Future Directions

Our study showed that young age without formal education hailing from low-income families experienced more diabetes stigma. There was also a strong association of stigma with shorter duration of diabetes, sedentary lifestyle and having higher number of stressors. The resources for health-promoting behaviours might not be accessible to these people. The association between socioeconomic factors and stigma experience shows that policies aiding subjects with diabetes can support lower income patients to gain access to the resources.

Stigma stems from cultural attitudes and misconceptions about diabetes, resulting in poorer compliance especially when combined with psychological stressors.

This study adds to the diabetes stigma literature in type 2 diabetes from a sample from southern India. The broad areas of stigma were related to perceived stigma and self-stigma. Identification is the first step towards prevention of stigma in type 2 diabetes mellitus. An international consensus statement published in 2024 paved a roadmap to end diabetes stigma and discrimination globally [12]. Our study adds to the growing international evidence to reach the goal; several problems must be overcome including insufficient funding by global agencies and performing longitudinal studies to identify drivers of stigma as well as facilitators to prevent it [12]. Lifestyle variables are closely linked with the various domains of diabetes stigma. The findings can be replicated in other geographical regions, and by including more variables that may influence diabetes stigma.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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