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ORIGINAL RESEARCH

Exploring the Self-Efficacy of Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Assessment Focusing on a Low-Income, Less-Educated Community of Quetta City, Pakistan

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Purpose: Self-efficacy is an individual's belief in their ability to perform a specific task or achieve a desired outcome successfully. Self-efficacy plays a significant role in developing health sensibility in chronic patients. Within this context, low income and lack of education are important social determinants of health, overwhelmingly affecting overall well-being and health outcomes. We therefore conducted this study to establish the self-efficacy profile and identify the predictors of self-efficacy in a low-income, less-educated cohort of diabetes patients in Quetta city, Pakistan.

Patients and Methods: A cross-sectional study was conducted among established Type 2 Diabetes patients approaching Sandeman Provincial Hospital, Quetta, from January 2024 to December 2024. In addition to the demographics, the validated Urdu version of the Diabetes Management Self-Efficacy Scale (DMSES) was used to assess diabetes patients' self-efficacy in managing Type 2 Diabetes Mellitus (T2DM). Self-efficacy was measured as proposed by the developers. The chi-square test identified the relationships, and significant associations were interpreted through Cramér's phi where applicable. Binary logistic linear regression was used to highlight the predictors of self-efficacy. For all analyses, $p<0.05$ was considered significant.

Results: In this study, 6951 patients were enrolled. Three thousand and eighty-seven (44.5%) patients were above 47 years of age, and males (58%) dominated the cohort. Fine thousand one hundred and forty-three (74%) patients had uncontrolled blood glucose levels (> 199 mg/dl), while 81.5% had HbA1c values > 6.5%. Poor self-efficacy was reported for the entire scale and the five domains of the DMSES (≤ 10). Six out of the twelve (income, education, duration of disease, treatment module, fasting blood sugar, and HbA1c) independent variables were significantly associated with self-efficacy, with a φc of ≤ 0.495. The strongest predictor of self-efficacy reported by the regression model was education, with an odds ratio of 2.250, indicating an increase in self-efficacy to 2.250 times while controlling for all other factors in the model.

Conclusion: The overall self-efficacy of our study population was low. Income, education, duration of disease, treatment module, fasting blood glucose, and HbA1c were significantly associated with self-efficacy. Our results underscore the importance of education as a predictor of self-efficacy among T2DM patients. Enhancing self-efficacy through improved education must be taken into consideration in diabetes management plans.

Keywords: self-efficacy, diabetes, low-income, less-educated, Pakistan

Introduction

Diabetes is a global public health concern and is approaching epidemic proportions. This disease is a serious burden to healthcare systems and adversely affects the socio-economic development of nations.[1] Globally, 537 million adults (20–79 years) are reported to have diabetes, and this number is predicted to be 643 million by 2030 and 783 million by

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2045, provided that no intervention is offered or adopted.[2] While significant progress has been made in promoting population health and extending life expectancy in recent decades, diabetes still has the second greatest negative effect on reducing global health-adjusted life expectancy worldwide.[3]

Within this context, diabetes is highly prevalent in developing countries, and the International Diabetes Federation (IDF) reported that 3 in 4 adults with diabetes live in low- and middle-income countries.[2] In line with what is being discussed, the IDF projected that >19 million adults in Pakistan had diabetes, with a prevalence of 26.7%.[4] This prevalence is 148% higher than that previously reported in 2019.[5] As per the claims of the Health Policy Watch, Pakistan has the world's highest diabetes prevalence, and the country still lacks a focus on preventing the disease.[6] Notably, 8.5 million of these 19 million patients are undiagnosed and hence are at risk of developing unexpected micro- and macrovascular complications.[5] The increased prevalence of diabetes results in intensified healthcare costs to societies and places undue stress on suffering families, hence adversely affecting the overall quality of life of individuals, families, and communities.[4]

In addition to the negative effects of diabetes on multiple body organs, the disease also affects major aspects of life (social, mental, and financial). Consequently, treatment efficacy and diabetes-related management depend equally on conventional treatment, acceptance of healthy behaviours, and lifestyle modifications.[7] In summary, diabetic patients are responsible for adequate control and long-term management of their disease.[8,9] Although debatable, we strongly believe that among all the factors contributing to diabetes management, self-efficacy plays an important role in the success of the control and management of diabetes.[10,11] Self-efficacy is an important framework capable of predicting patients' perceptions of and behaviour toward self-care in diabetes treatment. It must be explored frequently in clinical and nonclinical settings.[7,12]

The concept of self-efficacy or self-efficacy theory was proposed by Albert Bandura in 1977. According to Bandura, self-efficacy is an individual's belief in capabilities and abilities to control their functioning.[13] The theory explains that people subsequently act only when their belief in doing the task is established. Until then, they tend to avoid change because of the fear of failure.[13] In short, self-efficacy is the main predictor of behavior change, and a high level of behavioral change is correlated with high efficacy.[13] Since the introduction of self-efficacy in literature, this concept has been frequently employed in the social and medical sciences.[14,15] The relationship between self-efficacy and the self-management of chronic diseases is well-established.[16–19] Increased self-efficacy levels in diabetic patients were linked to glycemic control in a study reported in Iran.[7] Furthermore, in a multicenter study from Thailand, Hurst et al concluded that enhancing patients' self-efficacy can substantially improve diabetes self-management and blood glucose control.[20] Another study from five countries reported that self-efficacy was closely associated with self-regulation and inversely related to anxiety and depression.[21]

The importance of self-efficacy in effective diabetes self-management has been extensively reported and is mutually accepted.[22–24] In addition, we believe that self-efficacy is an appropriate framework for understanding and predicting the behavior and commitments of patients to self-care in the management of diabetes that too is supported by literature.[25,26] To further strengthen this belief, the research team conducted a thorough literature review focusing on self-efficacy and related variables among diabetes patients. A study from Iran highlighted that promoting the role of self-efficacy in diabetes management is an effective strategy for enhancing resilience and decreasing diabetes-related distress.[26] Self-efficacy in diabetes management was again reported as the single most important determinant of disease control by Amer et al.[27] Jiang et al, conducted a secondary analysis using data from a multicenter randomized controlled trial and concluded that enhancing the self-efficacy of diabetes patients directly influenced improvements in self-management behaviors.[28] Another study from South Korea identified self-efficacy as an important factor for improving self-care in patients with diabetes. The study further recommended systematic programs for enhancing self-efficacy among diabetes patients.[29]

Correlating self-efficacy and diabetic patients in Pakistan, the "Diabetes Conversation Map" proposed by Qasim et al highlighted that an improvement in self-efficacy of diabetes patients can result in improved outcomes.[30] Another study conducted in Karachi city, Pakistan, concluded that self-efficacy was significantly related to glycemic control in patients with diabetes.[31] Few other studies have focused on self-efficacy as part of interventions, but primary self-efficacy assessments have not been identified. Nonetheless, all mentioned studies were reported from metropolitan areas of

Pakistan with relatively high incomes and educational backgrounds. Today, it is known that non-communicable diseases such as diabetes are frequently reported by communities with poor or underlying socio-economic structures;[32–34] hence, community dwellers of such societies are reported to face major issues in managing their disease. This is true when parallel management, such as self-management, lifestyle modifications, and blood glucose monitoring, is considered.[35,36] Our literature review identified sparse information on self-efficacy for treating Type 2 Diabetes Mellitus (T2DM) in a community with a low sociodemographic background in Pakistan. Given the importance of self-efficacy in diabetes management and the paucity of information in mind, the current study was conducted. This study aimed to establish a self-efficacy profile and identify the predictors of self-efficacy in patients with T2DM belonging to a low-income and less-educated community in Quetta city, Pakistan. Parallel to this assessment, the current study is also expected to provide a blueprint for healthcare practitioners, diabetes educators, and policymakers to rethink their approaches while addressing issues related to diabetes management. As self-efficacy has broad implications across various domains of treatment and management, it influences the patients' overall well-being.[16] Once broadly understood, self-efficacy can help healthcare practitioners and collaborative care personnel develop tailored interventions, personal development programs, and goal-setting strategies for patients with diabetes.[24] This will ensure treatment adherence, self-management behaviors, and overall health outcomes.

Materials and Methods

Study Settings

We conducted this study at the Sandeman Provincial Hospital (SPH), Quetta. Quetta is the provincial capital and largest city in Balochistan Province. It is the only city in the province offering necessities such as health services, education, business, and trade. Therefore, Quetta city is the epicenter for people around Balochistan, especially while they cater to their healthcare services.

Patients with T2DM visit the General Medicine Outpatient Department of SPH for consultation and were contacted for data collection. The reason for selecting this institute was obvious for many reasons. Established in 1939, SPH is the largest public health institute in Quetta city and is used by most population.[37] Furthermore, SPH is a tertiary care and teaching hospital with minimal consultation fees. The institute is located in the city center; hence, approaching it is easy, thus making it the most accessible healthcare institute in the province.[37]

Study Design and Sampling

This was a questionnaire-based, cross-sectional analysis. We aimed to generate a good representative sample of diabetic patients, so we adopted a time-based sampling technique.[38] Data was collected for one year (from January 2024 until December 2024). A non-probability sampling method (convenience sampling) was used, and all T2DM patients visiting SPH for their routine calculations were targeted for data collection.

Inclusion and Exclusion Criteria

Patients with a confirmed diagnosis of T2DM for the last six months attending the general medicine ward of SPH were approached by the first author. Respondents who needed aid in understanding the research tool, were not willing to take part, had mental disorders, or were immigrants from other countries were excluded from the study.

Study Instrument

The Diabetes Management Self-Efficacy Scale (DMSES) was used to assess the self-efficacy of patients with diabetes. Developed by Bijl et al in 1999, the DMSES is a 20-item questionnaire that measures an individual's efficacy in diabetes self-management activities.[39] All items are rated on a 5-point Likert scale from strongly disagree to strongly agree. The scale is further divided into five subscales: the specific nutrition factor, general nutrition factor, blood glucose control factor, physical activity and weight control factor, and medical control factor. The DMSES uses a numerical scale, with higher scores indicating greater levels of self-efficacy.[39] The DMSES, as reported by Lee et al, is the most appropriate tool for assessing self-efficacy in diabetes patients and has shown promising results in practice and research.[40]

Additionally, being validated in many languages and environments, the DMSES is the choice of instrument for researchers all over the world.[40]

We used the Urdu version of DMSES (U-DMSES) for the current study. Riaz et al validated the DMSES in Urdu (the national language of Pakistan) and concluded that the translated version was psychometrically accepted in areas where Urdu is a communal communication.[41] Permission to use the U-DMSES was obtained via Email communication. Nevertheless, we conducted a pilot study with 30 patients to ensure reliability and validity ($\alpha = 0.87$, participants' views on the U-DMSES were considered, and no reservation was observed). The DMSES was rated as acceptable, as the patients in the pilot study showed no concern or confusion.

Study Variables

The study included ten demographic variables: age, gender, income, education, marital status, residency, occupation, duration of diabetes, treatment module, and family history of diabetes. Two biochemical parameters were also assessed. Glycosylated haemoglobin (HbA1c) was analysed with Siemens Healthineers DCA® Analyzers using Siemens DCA systems Haemoglobin A1c reagent kit.[42] Fasting blood glucose was assessed by using A6 Semi-Automatic Biochemistry Analyzer.[43] The variables were later compared with the five factors of self-efficacy (specific nutrition factor, general nutrition factor, blood glucose control factor, physical activity and weight control factor, and medical control factor).

Statistical Analysis

The data was coded and analyzed via SPSS v 26.[44] The Kolmogorov–Smirnov test was used for normality assessment, and nonparametric tests were used accordingly. Frequencies and percentages were used to explain the demographic variables. Self-efficacy was measured as proposed by the developers.[39] The chi-square test examined the significant associations, and the associations were further interpreted through Cramér's phi. Binary logistic linear regression was later used to highlight the predictors of self-efficacy. For all analyses, $p<0.05$ was considered significant.

Results

Summary of Demographic Information

From January–December 2024, 8254 T2DM patients were approached. Out of 8254 patients, 1303 did not meet the inclusion criteria, and data were available from 6951 patients.

As presented in Table 1, most of the respondents (44.4%) were above 47 years of age, and males dominated the cohort (58%). In terms of education, 43.2% had secondary education, and 54.1% were married. One hundred forty-six

Table 1 Demographic and Disease-Related Characteristics of the Study Respondents (n = 6951)

Characteristics	Frequency	Percentage
Age in years (45.89±6.80)		
28–37	1113	16.0
38–47	2751	39.6
> 47	3087	44.4
Gender		
Male	4032	58.0
Female	2919	42.0
Income in Pakistan Rupees		
Nil	1995	28.7
< 20,000	3276	47.1
> 20,000	1680	24.2

(*Continued*)

Table 1 (Continued).

Characteristics	Frequency	Percentage
Education		
None	2583	37.1
Primary	1365	19.6
Secondary	3003	43.2
Marital status		
Married	3759	54.1
Single	3192	45.9
Residence		
Urban	2373	34.1
Rural	4578	65.9
Occupation		
None	1554	22.3
Govt employee	1764	25.3
Private employee	2247	32.3
Business	1386	19.9
Duration of Type 2 Diabetes Mellitus		
1–5 years	6111	63.4
> 5 years	840	36.6
Treatment module		
OHA*	1470	55.2
Insulin	3885	28.7
Both	1596	16.1
Family history of Type 2 Diabetes Mellitus		
Yes	4200	71.3
No	2751	28.7

Notes: 1 USD = 280 Pakistan Rupees; *Oral hypoglycemic agents.

had a rural residency, and 47.1% earned Pakistan Rupees < 20,000 (< 72 US$)0 per month. Nearly 36% had a history of diabetes for more than 5 years, 55.2% were using oral hypoglycemic agents, and 71.3% had a family history of T2DM.

Blood Glucose and Glycated Hemoglobin Profile

The blood glucose profile is presented in Table 2. A random blood glucose test revealed that 5143 (74.0%) patients had uncontrolled blood glucose levels. Only 1258 (18.1%) had controlled blood glucose levels, whereas 7.9% had impaired tolerance.

Table 2 Blood Glucose and Glycated Hemoglobin Profiles (n = 6951)

Random Blood Glucose*	Frequency	Percentage	Status
< 140 mg/dl	1258	18.1	**Normal**
140–199 mg/dl	549	7.9	**Impaired tolerance**
> 199 mg/dl	5143	74.0	**Diabetic**
Glycated hemoglobin*	**Frequency**	**Percentage**	**Status**
< 5.7%	735	10.6	**Normal**
5.7–6.5%	546	7.8	**Prediabetic**
> 6.5%	5670	81.5	**Diabetic**

Notes: *Interpretation is based on criteria established by the American Diabetes Association and the International Diabetes Federation.

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In addition to fasting blood glucose, HbA1c, a surrogate marker of diabetes, was also considered. As expected from the results of random testing, 10.6% had normal values of HbA1c, whereas 81.5% had HbA1c values greater than 6.5% and hence had continuously higher and uncontrolled blood glucose.

Assessment of Self-Efficacy in Patients with Diabetes

The mean self-efficacy value for the total scale was 9.25 (standard deviation 3.85). As proposed by the authors, higher values represent improved self-efficacy and vice versa.[39] Based on the observed mean values, poor self-efficacy toward T2DM was reported among the current study participants. The domain-wise assessment of self-efficacy is subsequently discussed.

Diabetes Self-Efficacy (Specific Nutritional Factor)

The responses to diabetes self-efficacy (a specific nutritional factor) are presented in Table 3. In accordance with the scoring criteria of developers,[39] poor self-efficacy was observed among all the items. The respondents were relatively unable to follow a healthy eating plan away from home, both ceremonies and parties and when under stress.

Diabetes Self-Efficacy (a General Nutritional Factor)

Although moderate self-efficacy was reported for two items of the DMSES, the respondents had problems choosing different foods and maintaining a healthy eating plan, as shown in Table 4. Overall, low self-efficacy among the study participants was again reported for general nutritional factors.

Diabetes Self-Efficacy (Blood Glucose Control Factor)

Low self-efficacy was observed when the respondents were asked about their blood glucose levels when needed. This was followed by low self-efficacy in decreasing blood glucose levels when the levels were too high and vice versa. In terms of medicine management during illness, poor self-efficacy was again observed (Table 5).

Table 3 Diabetes Self-Efficacy (Specific Nutritional Factor)

Items in DSMES	Mean ± SD	Cutt-Off Values
I am able to choose different foods and maintain my eating plan when I am away from home.	4.58 ± 2.33	0–10 = Poor self-efficacy
I am able to follow a healthy eating plan during traditional ceremonies.	4.01 ± 2.10	11–15 = Moderate self-efficacy
I am able to choose different foods and maintain a healthy eating plan when I am eating at a party.	5.12 ± 2.95	>15 = High self-efficacy
I am able to maintain my eating plan when I am feeling stressed or anxious.	4.25 ± 2.05	
I am able to follow a healthy eating plan when I am away from home.	6.45 ± 3.05	

Table 4 Diabetes Self-Efficacy (General Nutrition Factor)

Items in DSMES	Mean ± SD	Cut Off Values
I am able to choose the foods that are best for my health.	11.15 ± 4.50	0–10 = Poor self-efficacy
When doing more physical activity, I am able to adjust my eating plan.	7.45 ± 3.85	11–15 = Moderate self-efficacy
I am able to maintain my eating plan when I am ill.	8.65 ± 3.85	>15 = High self-efficacy
I am able to follow a healthy eating plan most of the time.	10.50±3.75	
I am able to choose different foods and maintain a healthy eating plan.	8.90 ± 2.50	

Table 5 Diabetes Self-Efficacy (Blood Glucose Control Factor)

Items in DSMES	Mean ± SD	Cut Off Values
I am able to check my blood sugar if necessary.	5.25 ± 1.65	0–10 = Poor self-efficacy
I am able to decrease my blood sugar when the sugar level is too high (eg, eat different foods).	4.50 ± 2.15	11–15 = Moderate self-efficacy
I am able to increase my blood sugar when the sugar level is too low (eg, eat different foods).	7.65 ± 3.25	>15 = High self-efficacy
I am able to maintain my medication when I am ill.	8.45 ± 3.50	

Diabetes Self-Efficacy (Physical Activity and Weight Control Factor)

While controlling and maintaining body weight and physical exercise, poor self-efficacy was reported among the study respondents. However, the respondents stated that they are involved in physical activity if advised by their physicians. Moderate self-efficacy was reported for this item, as shown in Table 6.

Diabetes Self-Efficacy (Medical Control Factor)

The respondents in the current study reported poor self-efficacy in taking the medications as prescribed. However, moderate self-efficacy was reported when patients were asked about regularly visiting their physicians, as shown in Table 7.

Associations Between Demographic Variables and Self-Efficacy

The chi-square test was used to identify associations between demographic variables and the domain of the DMSES. Income, education, duration of T2DM, treatment module, random blood glucose, and HbA1c were significantly associated with all five domains of self-efficacy, with moderate correlations (Φc = 0.354–0.495). In addition, no significant associations were reported among other demographic variables and self-efficacy (Table 8).

Table 6 Diabetes Self-Efficacy (Physical Activity and Weight Control Factor)

Items in DSMES	Mean ± SD	Cut Off Values
I am able to control my body weight and maintain it within the ideal weight range.	8.35 ± 3.50	0–10 = Poor self-efficacy
I am able to do enough physical activity (eg, walking, aerobic exercise, and stretching exercises).	8.94 ± 4.05	11–15 = Moderate self-efficacy
I am able to do more physical activity if the doctor advises me to do so.	12.25 ± 4.85	>15 = High self-efficacy

Table 7 Diabetes Self-Efficacy (Medical Control Factor)

Items in DSMES	Mean ± SD	Cut Off Values
I am able to examine both of my feet (eg, for cuts or blisters).	8.40 ± 4.12	0–10 = Poor self-efficacy
I am able to take my medication as prescribed.	7.65 ± 3.01	11–15 = Moderate self-efficacy
I am able to visit my doctor four times a year to monitor my diabetes.	13.07 ± 6.45	>15 = High self-efficacy

Table 8 Association Between Demographic Variables and Self-Efficacy Domains

Characteristics	P value*				
	Specific Nutrition Factor	General Nutrition Factor	Blood Glucose Control Factor	Physical Activity and Weight Control Factor	Medical Control Factor
Age	0.145	0.258	0.399	0.147	0.544
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A
Gender	0.088	0.149	0.577	0.366	0.545
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A

(*Continued*)

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Table 8 (Continued).

Characteristics	P value*				
	Specific Nutrition Factor	**General Nutrition Factor**	**Blood Glucose Control Factor**	**Physical Activity and Weight Control Factor**	**Medical Control Factor**
Income	**0.004****	**0.009****	**<0.001****	**<0.001****	**<0.001****
	Φc = 0.452[!]	**Φc = 0.320[!]**	**Φc = 0.400[!]**	**Φc = 0.388[!]**	**Φc = 0.390[!]**
Education	**0.001****	**0.005****	**0.001****	**0.001****	**0.002****
	Φc = 0.354[!]	**Φc = 0.445[!]**	**Φc = 0.480[!]**	**Φc = 390[!]**	**Φc = 0.400[!]**
Marital status	0.256	0.127	0.257	0.077	0.448
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A
Residence	0.330	0.450	0.072	0.885	0.288
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A
Occupation	0.344	0.412	0.557	0.668	0.214
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A
Duration	**0.001****	**0.001****	**0.002****	**0.004****	**0.001****
	Φc = 0.380[!]	**Φc = 0.410[!]**	**Φc = 0.400[!]**	**Φc = 0.420[!]**	**Φc = 0.495[!]**
Treatment module	**0.004****	**0.002****	**0.024****	**0.012****	**0.001****
	Φc = 0.425[!]	**Φc = 0.430[!]**	**Φc = 0.480[!]**	**Φc = 0.420[!]**	**Φc = 0.430[!]**
Family history	0.078	0.225	0.310	0.078	0.992
	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A	Φc = N/A
Fasting blood sugar	**0.001****	**0.004****	**0.001****	**0.003****	**0.004****
	Φc = 0.400[!]	**Φc = 0.415[!]**	**Φc = 0.398[!]**	**Φc = 0.410[!]**	**Φc = 0.325[!]**
HbA1c	**0.005****	**0.002****	**0.007****	**0.001****	**0.001****
	Φc = 0.395[!]	**Φc = 0.405[!]**	**Φc = 0.410[!]**	**Φc = 0.390[!]**	**Φc = 0.405[!]**

Notes: *Chi square test. **Significant relationship (p<0.05). Φc = Phi/Cremer's V; N/A = Not applicable. [!]Interpretation of Φc (0.1–0.3: weak association; 0.3–0.5: moderate association; > 0.5: strong association).

Predictors of Self-Efficacy

Binary logistic regression was performed to assess the impact of independent factors on self-efficacy. The model contained ten independent variables. The full model containing all the predictors was statistically significant ($p < 0.001$), indicating that the model was able to distinguish between respondents who had good self-efficacy and those who had poor self-efficacy. The model explained between 30.5% (Cox and Snell R square) and 45.8% (Nagelkerke R squared) of the variance in self-efficacy and correctly classified 65% of the cases. The strongest predictor of self-efficacy was education, with an odds ratio of 2.250. This indicated that respondents' improved education can increase self-efficacy by 2.250 times when all other factors are controlled for in the model.

Discussion

According to Zhu et al, patients with high self-efficacy have an increased ability to manage chronic diseases. Additionally, high-ranked self-efficacy also develops a sense of control over their lives.[45] Accordingly, Chirico et al,

in their meta-analytic review, concluded that highly efficacious people demonstrate less anxiety and better adjustment in stressful situations.[46] Promisingly, self-efficacy for patients with chronic conditions can improve with new interventions that confirm efficient disease management.[19] Therefore, based on the available literature and the importance of self-efficacy, we believe that it would be imperative to assess the self-efficacy of patients with diabetes in a resource-deprived setting and to recommend possible solutions for improving self-efficacy levels.

Poor self-efficacy among diabetes patients was reported in the current study, and mixed results are observed in literature. Inadequate self-efficacy in diabetes patients was reported in various studies around the globe.[27,47–49] On the contrary, acceptable self-efficacy among diabetes patients was also observed.[50–52] Possible reasons for these differences in self-efficacy levels among diabetes patients are linked to various factors, including socio-demographic characteristics, diabetes-related factors, individual characteristics, and tools used to assess self-efficacy.[53] Consequently, it is not wise to link the self-efficacy of diabetes patients with a single factor, and it must be reviewed extensively while conducting studies of such a nature. Continuing with our arguments, several variables (income, education, duration of T2DM, treatment module, random blood glucose, and HbA1c) were significantly associated with self-efficacy in the current study. These associations are in line with what is reported in other studies. Azar et al, in a study from Iran, reported that education and income were significantly associated with self-efficacy in a diabetic cohort.[54] Ojewale et al from Southwestern Nigeria again reported a significant association between education and self-efficacy.[51] Similarly, disease duration was significantly associated with self-efficacy in a study reported from the Netherlands.[55] Where education and income were significantly associated with self-efficacy, a study in Nepal reported no association between self-efficacy and duration of disease.[56] A possible reason for this conflicting result is linked to the diverse group of people and the duration of the disease when compared to the present study. In line with our study results, self-efficacy was significantly correlated with random blood glucose and HbA1c.[22,57–59]

Correlating self-efficacy in diabetes patients of Pakistan, assessments of self-efficacy, the related components, and predictive relationship are not yet reported. This attribute of the current study hereby makes it the pioneer study of the country. Within this context, Tanveer and Batool assessed the predictive relationship between self-efficacy and quality of life using the General Self-Efficacy Scale (GEFS) and the WHOQoL-Brief Health and Lifestyle Questionnaire, respectively.[60] The authors reported a significant positive correlation between the two variables; however, independent assessments of self-efficacy and its components were not performed. The authors reported only mean values of self-efficacy (27.46) that predicted poor self-efficacy (based on GEFS scoring criteria) among elderly individuals in Pakistan, which is comparable to the results of the current study.[60] Similarly, Bilal and Kausar investigated the effects of temporal decisions and diabetes management self-efficacy on medication adherence. However, although significant correlations were observed, the authors failed to provide data on independent domains of self-efficacy.[61] Finally, the same was observed in a study reported from Islamabad, where the authors failed to provide individualized data on self-efficacy and its domains.[62] In conclusion, we performed an extensive literature review and were unable to find studies reporting self-efficacy, its domains, and predictors from Pakistan.

The binary logistic regression highlighted education as a significant predictor of self-efficacy. The results of the current study are comparable to those reported from other parts of the world. A study conducted in Taiwan indicated that a senior high school level or above education was a significant predictor of self-efficacy; however, the study focused primarily on self-efficacy in administering insulin and did not measure overall self-efficacy.[63] Lee et al, in 2016, concluded that education was related to self-efficacy and that an additional point increase in education was linked with a 0.45-point increase in self-efficacy.[64] Similarly, where moderate self-efficacy was reported among chronic patients in Iran, age, education, and income were reported to be significant predictors of self-efficacy.[65] Another study from Nigeria again rated educational level as a predictor of self-efficacy and concluded that high self-efficacy in individuals with diabetes results in better glucose control.[51] Higher self-efficacy scores were once again associated with male sex, younger age, and higher education.[66] In conclusion, the relationship between education and self-efficacy has been well-developed in literature and supports the current study's findings.

While the impact of education on health is well documented, the explanation for this impact is poorly understood.[67] Nevertheless, the relationship between education and health is complicated and depends on multiple factors.[68] Health determinants such as self-efficacy and preventive measures are strongly linked with education, promoting self-care,

positive choices, and overall well-being.[69] Compared with the educational status of the Pakistani population, the Ministry of Federal Education and Professional Training reported an adult literacy rate of 62.3% in 2021, with an estimated 60 million being illiterate in the country.[70] Additionally, the Pakistan Institute of Development Economics stated that, compared with its neighboring countries, Pakistan has failed to improve key educational indicators such as literacy rates, enrolment ratios, and expenditures on education.[71] Possible reasons for these shortfalls are related to the shortage of schools (for every 13 primary schools, there is only one middle school), the unavailability of teachers (approximately 50% of primary schools in Balochistan Province have only one teacher), and poor expenditures on education (2.4% of GDP) by the authorities. Under such drastic conditions, it is apparent that the general population, as well as patients, are least knowledgeable about prophylactic measures, adoption of healthy lifestyles, and self-management of diseases that eventually shape self-efficacy. This is also apparent from our results, where poor self-efficacy was observed while a healthy eating plan was chosen, blood glucose was checked, and the prescribed medications were taken.

Keeping the statistics regarding the educational status of the Pakistani population in mind, it would be unwise to imagine that the educational conditions would improve soon. Nevertheless, it would be radical to sit idle and wait for an improvement in educational status and, hence, an improvement in self-efficacy. To take immediate holistic measures, we propose improving the health literacy of the diabetic population by incorporating the postulates of the health belief model (HBM). Our proposal for incorporating HBM to improve health literacy is reasonably upfront and holds significant merits. This incorporation has already provided productive results from studies of the same nature[72–74] but has yet to be reported from Pakistan. However, the cultural pertinence and ability to address complex health behaviors influenced by environmental factors must be considered before incorporating the model. Despite these limitations, HBM-based educational packages have significantly improved patient outcomes, supporting our proposal.[75] In summary, a possible solution for improving self-efficacy among diabetes patients is the introduction of diabetes self-management education and support (DSMES) in the healthcare system of Pakistan based on the HBM. Patients learn how to take best care of themselves through this integrated model. The program will also help with disease management and self-efficacy, empowering patients while dealing with chronic diseases such as T2DM.[76] Ernawati et al, in their systematic literature review on diabetes self-management education (DSME), concluded that in addition to self-care, DSME also improved the clinical status and quality of life of T2DM patients.[77] A systematic review of DSME interventions reported from the Asian Western Pacific region also mentioned the use of DSME to improve clinical and psychosocial outcomes.[78] However, the HBM-based DSMES program has not been reported in Pakistani healthcare settings, and the reasons are multifactorial. Within this context, Ansari et al highlighted that healthcare professionals must play their part in developing self-management skills and emphasizing patients' understanding of the disease and its challenges and associated complications.[79] We completely agree with the findings of Ansari et al, as it is high time for healthcare professionals to start involving diabetes patients in self-management through a model-based approach. Diabetes requires lifelong management and behavioral modifications along with self-management. Additionally, diabetic patients require assistance building self-efficacy, which is possible only by involving physicians, pharmacists, and nurses in a collaborative care model. With diabetes approaching alarming proportions in Pakistan and with poor educational backgrounds, an appropriate solution for improving self-efficacy is to involve patients in decision-making and self-management of T2DM. This will assist patients in developing an optimistic view of life and facilitate them in adjusting to the disease effectively and efficiently.

Limitations

The study reports data from a low-income, less-educated community attending a public healthcare institute in Quetta city, Pakistan. Generalizing these results to the entire low-income, less educated diabetic population of the country is irrational. Likewise, self-efficacy was assessed through a patient-reported measure, and actual practices (for example, checking blood glucose, management of foot care, etc) were missed out because of several research-related constraints. To overcome these limitations, we recommend a comprehensive study focusing on public and private healthcare institutions with an exclusive emphasis on on-hand activities and demonstrations related to self-efficacy in diabetes management.

Conclusion

The overall self-efficacy of our study population was low. Significant associations between self-efficacy and various variables were observed; educational status was identified as a predictor of self-efficacy among those. Enhancing self-efficacy through enhanced education must be considered in diabetes management plans. The present study's findings also provide a theoretical basis for governments, public health agencies, and healthcare professionals to develop effective educational-based policies and interventions to improve self-efficacy, which will result in improved disease management.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Declarations

This study was carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Department of Pharmacy, University of Balochistan, Quetta, approved the study [FoP&HS/IRB/45/22]. All participants provided written informed consent to participate in the study and written informed consent for this publication.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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