ORIGINAL RESEARCH ARTICLE

Diabetes Self-Efficacy and Its Relationship with Self-Care and Glycaemic Control Among Elderly Patients with Type 2 Diabetes Mellitus

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ABSTRACT

Context: Type 2 Diabetes mellitus burden is high in the elderly. Despite effective control measures, complications are aggravated due to lack of self-efficacy. The aim is to assess the role of self-efficacy in influencing self-care and glycaemic control.

Methodology: This was an observational, analytical study among elderly diabetics attending Medicine OPD in a tertiary- hospital. 318 patients were enrolled by interviewing every fifth patient on three randomly chosen days per week. Data collection was done using pretested, validated schedule followed by statistical analysis using bivariate, binary logistic and multiple linear regression analysis.

Results: Mean age was 59.4 ± 6.5 years, 16.9% patients had glycaemic control. Mean self-efficacy and self-care scores were 5.6 ± 3.1 and 2.6 ± 1.7 respectively. Multiple linear regression showed higher self-efficacy scores (b =0.14; 95% CI: 0.11, – 0.16), male gender (b =2.01; 95% CI: 0.29-3.74;), glycaemic control (b=-1.81, 95% CI -0.01, - 1.98) and positive family history (b= 3.34; 95% CI 1.23-3.11), were significantly associated with better self-care. Self-efficacy predicted good glycaemic control (AOR= 0.9, SE=0.01; p=0.03) while hypertensives were 2.88 times more likely to have poor glycaemic control (p<0.05).

Conclusions: Self-efficacy was positively associated with better self-care and glycaemic control among elderly diabetics.

Key-words: elderly, self-efficacy, self-care, Type 2 Diabetes mellitus

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INTRODUCTION

Diabetes mellitus is a chronic public health problem worldwide and a leading cause of mortality due to myocardial infarction, stroke, kidney failure, and other complications like blindness and amputation. Diabetes together with its comorbidities deteriorates a person's quality of life (QoL). India reports 73 million cases of diabetes with overall prevalence of 7·7%. As the proportion of elderly population in the country continues to increase so does the burden of Type 2 Diabetes mellitus (T2DM) which increases to 13.6-19 % above fifty years.[1] T2DM is also costly to health care systems.[2] People with the disease have more outpatient visits, use more medications, have a higher probability of being hospitalized, and are more likely to require emergency and long-term care than people without the disease contributing to high out of pocket expenditure in the context of inadequate health insurance cover which is even more challenging in the elderly.[3]

Pharmacotherapy, lifestyle interventions and self-management are the key strategies in effective disease control that also improve functional fitness in elderly patients.[4,5] Elderly patients with diabetes are recommended to engage in self-management of their disease which improves disease control and reduces complications.[6] Basic to successful self-management of any disease is a sense of self-efficacy, or a sense of assurance in one's capabilities to perform self-management skills. Achieving high levels of self-efficacy is a key factor in successful chronic disease self-management as required for effective blood glucose control and prevention of complications in Diabetes.[7] Despite ongoing national programmes, treatment and self-care guidelines, glycaemic control of diabetic patients in India is poor with a mean HbA1c of 9.05 that is 2.0% higher than recommended.[8]

Studies evaluating the role of self-efficacy and self-care behaviour for disease control among elderly diabetic patients are lacking in eastern India. In this background the present study was conducted with the objectives -1) to assess the levels of self-efficacy and self-care behaviour in disease management among elderly patients with T2DM and 2) to find the relationship between self-efficacy and other risk factors influencing self-care behaviour and glycaemic control. Findings from this study may provide evidence for program managers to deliver interventions targeted towards improving self-care practices of elderly diabetics in disease management and address the patient-level challenges for better disease control.

METHODOLOGY

Study design and study participants: An institution based, analytical, observational study with cross-sectional design was conducted among T2DM patients attending the General Medicine OPD of a tertiary level health care facility in Bankura. The study was conducted for six months from January 2022 to June 2022.

Patients aged above 50 years who were diagnosed with T2DM and on treatment for at least last one year and residents in that area for at least 5 years were included. While those who refused to give their written informed consent, lack of a fasting, post prandial blood sugar or HbA1c report in last three months, cancers, severely ill patients or requiring hospitalization in the previous one month were excluded.

Sample size and sampling technique: Using the formula, $n = Z^2PQ/L^2$, (assuming 95% CI, absolute error of 5%, prevalence of self-care practices in diabetics at 19.5% and adjusting for a nonresponse rate of 20%, the sample size was estimated as 290.[9] Final sample size obtained in this study was 318 patients which was considered for data analysis. Considering an average daily attendance of 25 elderly diabetic patients in Medicine OPD; every 5th diabetic patient fulfilling the eligibility criteria were approached on three randomly chosen days of a week for the entire duration of data collection.

Data collection: After full explanation of the study purpose, risks, benefits, confidentiality, right to withdraw at any time etc. in the local language and obtaining their written informed consent, the patients fulfilling the eligibility criteria were interviewed using study tools which included pre-designed, pre-tested, structured, interviewer-administered schedule.

Study tool*:* The schedule was divided into three parts as follows: Part I) comprised of socio-demographic variables e.g., age, gender, education, occupation, socioeconomic status and other possible risk factors like smoking status, family history, medical comorbidities etc. Part II) consisted of the 15-item Diabetes Management Self-Efficacy Scale (DMSES UK) incorporating an 11-point scale with higher scores indicating greater levels of self-efficacy.[10] Part III) comprised of questions assessing self-care practices based on the 10 item Summary of Diabetes Self-Care Activities (SDSCA) scale with items assessing diabetes regimen on general diet, specific diet, exercise, blood-glucose testing, foot care, and smoking; with responses for each item ranging from 0 to 7 with higher scores suggesting better self-management.[11] Reverse coding was done for negatively framed questions. The two scales were suitably modified, translated in the local language, Bengali and validated by experts.

Data Analysis: Data were checked for completion, duplication or validity. Categorical data were expressed in frequency and percentage. Mann-Whitney U test and Kruskal Wallis test were done to compare the self-efficacy and self-care activity score between variables. To test the correlation between scores, Spearman's rank correlation was done. Multiple linear regression was done to identify the risk factors as-

sociated with diabetes self-care and binary logistic regression was used to assess predictors of glycaemic control. Statistical significance level was set at p-value of < 0.05 and 95 % confidence intervals (CI). Data analysis was done using IBM SPSS Trial ver 22.

Outcome measures: Diabetes self-care practices was the primary out-come variable. Secondary out-come included glycaemic control. Good glycaemic control was taken as a value of HbA1c ≥7.0 % and < 7.5% or Fasting blood glucose between 90–150 mg/dl. For elderly patients having 3 or more comorbidities good glycaemic control was set at HbA1c between ≥7.5% and <8.0% or Fasting blood glucose between 100–150 mg/dl. Other values were considered as poor control. Independent variables measured were socio-demographic characteristics like age, gender, income (using Modified B G Prasad scale and updated by consumer price index), addiction history, comorbidities, self-efficacy etc.[12]

RESULTS

Exploration of the sociodemographic variables showed the mean and median age of the study subjects were 59.4 ± 6.5 years and 58.0 years (IQR = 9) respectively. Majority of subjects (52.8%) belonged to 50-60 years age group. Almost two-third of the subjects were male. Major portion of the subjects belonged to Class IV and V according to Modified B G Prasad's SES classification, while 63.5% were earning members at the time of interview. Addictions included alcohol consumption and smoking in 36.8% and 68.9 % of the study participants respectively.

Table1. Baseline sociodemographic characteristics of elderly diabetic patients and their relationship with self-efficacy (DMSES score). (N=318)

Variables	Frequency (%)	Mean ± SD	Median	p value
Age group				
50-60 years	168 (52.8)	87.1 ± 29.1	89	0.02
≥ 60 years	150 (47.2)	79.6 ± 28.2	80	
Gender				
Male	207 (65.1)	86.2 ± 28.9	87	0.03
Female	111 (34.9)	78.5 ± 28.0	80	
Earning member				
No	116 (36.5)	77.2 ± 28.1	79.5	<0.001
Yes	202 (63.5)	87.2 ± 28.6	88.5	
Income (BG Prasad Mar '23)				
Class I	9 (2.8)	109.5 ± 18.8	112	<0.001
Class II	17 (5.4)	100.6 ± 25.3	105	
Class III	56 (17.6)	83.6 ± 26.7	83	
Class IV	129 (40.6)	81.4 ± 27.3	79	
Class V	107 (33.6)	81.1 ± 31.2	86	
Marital status				
Single	15 (4.7)	99.9 ± 19.1	101	0.07
Married	267 (84.0)	83.5 ± 29.0	84	
Separated/divorced	3 (0.9)	72.3 ± 53.0	71	
Widowed	33 (10.4)	77.3 ± 26.5	82	
Family history of diabetes				
Present	47 (14.8)	77.3 ± 24.2	78	0.07
Absent	271 (85.2)	84.6 ± 29.4	86	
Smoking habit				
Non-smoker	99 (31.1)	70.7 ± 21.8	72	<0.001
Smoker	219 (68.9)	89.3 ± 29.8	95	
History of alcohol consumption:				
Present	117 (36.8)	90.3 ± 29.2	95	<0.001
Absent	201 (63.2)	79.6 ± 28.0	82	
Duration of diabetes				
1-5 years	185 (58.2)	79.3 ± 29.3	82	<0.001
6-10 years	93 (29.2)	83.0 ± 26.4	89	
10 years or more	40 (12.6)	104.1± 23.1	114	
BMI category				
CED*	9 (2.8)	86.1 ± 28.0	88	<0.001
Normal	127 (39.9)	92.1 ± 25.7	95	
Pre-obese	55 (17.4)	81.2 ± 28.4	82	
Obese	127 (39.9)	75.7 ± 29.9	76	
Current blood pressure status				
Hypotensive	2 (0.6)	56.5 ± 38.8	56.5	0.02
Normotensive	24 (7.5)	80.6 ± 37.6	83	
Pre-hypertensive	122 (38.4)	89.0 ± 29.6	93	
Hypertensive	170 (53.5)	80.3 ± 26.2	79	

*CED – Chronic Energy deficiency

Table 2: Multiple linear regression showing factors predicting diabetes self-care

Predictors	Unstandardized coefficient B	Lower CI	Upper CI	T value	P Value
Constant	13.91	6.03	21.81	3.47	< .001
DMSES total	0.13	0.11	0.2	9.71	**< .001**
Age group					
60 years & above – 50-60 years	1.04	-0.45	2.53	1.37	0.17
Gender					
Male – Female	2.01	0.29	3.74	2.29	**0.02**
Socio-economic Status					
Class II – Class I	0.07	-5.18	5.32	0.02	0.97
Class III – Class I	-0.32	-5.00	4.35	-0.13	0.89
Class IV – Class I	-0.36	-4.91	4.17	-0.16	0.87
Class V – Class I	-0.61	-5.22	3.99	-0.26	0.79
Marital status					
Married – Single	1.24	-2.13	4.61	0.72	0.47
Separated – Single	-2.01	-9.96	5.93	-0.49	0.61
Widowed – Single	1.98	-2.10	6.07	0.95	0.34
Alcohol Addiction					
Yes – No	0.07	-1.62	1.47	0.09	0.92
Diabetes Mellitus Duration					
6-10 years – 1-5 years	-0.79	-2.38	0.81	-0.97	0.33
More than 10 years – 1-5 years	0.18	-2.21	2.58	0.15	0.87
Glycemic control					
Good – Poor	1.81	3.61	0.01	1.97	**0.04**
BMI					
CED – Normal	-4.17	-8.63	0.29	-1.84	0.06
Pre-obese – Normal	-0.13	-2.18	1.92	-0.12	0.90
Obese – Normal	0.87	-0.80	2.54	1.02	0.30
Blood Pressure					
Hypotensive – Normotensive	-2.24	-12.06	7.57	-0.45	0.65
Pre-hypertensive – Normotensive	2.37	-0.45	5.21	1.65	0.10
Hypertensive – Normotensive	1.04	-1.72	3.81	0.74	0.45
Family history of Diabetes					
Yes – No	3.34	5.46	1.23	3.11	**0.002**

Almost 14.8% subjects had family history of diabetes, while 12.6% subjects had diabetes for more than 10 years. As many as 80.1 % participants had poor glycaemic control at the time of study, based on their HbA1C or FBS or PPBS level. Estimated 17.4% and 39.9% subjects were pre-obese and obese respectively, while 38.4% and 53.5% were pre-hypertensive and hypertensive respectively at the time of the study (Table 1)

The mean DMSES score was 5.6 $\pm$ 3.1 while the mean self-care score was 2.6 $\pm$ 1.7. The DMSES score and Self-care activity score was found to have moderately positive correlation that was statistically significant (Spearman's Rho = 0.52, N = 318, p < 0.001).

Significant differences in DMSES scores were observed in different age-groups, genders, earning status, socio-economic status, smoking, family history of diabetes, duration of diabetes, BMI category and blood pressure at the time of interview. (Table 1)

Univariate analysis showed significant differences in Self-care activity scores in relation to gender, earning status, alcohol consumption, smoking habit, family history of diabetes, duration of diabetes and blood pressure at the time of interview.

Diabetic patients had the highest self-efficacy score in medication compliance and lowest for self-monitoring of blood sugar. The least self-care scores were regarding regular inspection of foot and blood glucose testing while highest score was found for specific dietary intake.

Multiple linear regression analysis showed significant linear relationship between self-care score and self-efficacy score (p< 0.001). Diabetic patients having a unit more in self-efficacy level had 0.14 units higher self-care level (95% CI: 0.11, 0.16). Elderly male diabetic patients and those having family h/o diabetes reported significantly better self-care levels than their counterparts (p<0.05). Good glycaemic control was also significantly (p =0.04) related with higher self-care score. (Table 2).

R for the regression model was significant, *F* (21, 296) = 8.61, with *p* <0.001. Adjusted *R*2 of 0.335 indicated that this model accounted for about 33.5 % of the variance in diabetes self-care score. The final regression equation was *Diabetes Self-care = 8.67 + 0.14(DMSE) + 2.02(gender) + 1.81(glycaemic control) + 3.34 (family h/o).* Diabetes self-efficacy was also a significant predictor (p=0.03) of good glycaemic control among elderly diabetics. Diabetic patients with hypertension were 2.88 times more likely to have poor glycaemic control. Obese diabetics however had significantly better glycaemic control (p=0.02). (Table 3). Overall, the model fit measures showed χ^2=25.5, p <0.05. This model accounted for about 12.2 % (Naegelkerke R^2) of the variance in predicting glycaemic control.

Table 3: Binary logistic regression showing factors predicting poor glycaemic control

Variables	Estimate B	SE	Z	p	Exp B
Intercept	3.09	1.36	2.25	0.02	22.08
DMSES total	-0.01	0.00	-2.18	**0.02**	0.98
Age group					
60 years and above – 50-60 years	-0.08	0.30	-0.28	0.77	0.91
Gender					
Male – Female	-0.61	0.34	-1.80	0.07	0.54
Socio-economic Status					
Class II – Class I	-0.59	1.12	-0.52	0.59	0.55
Class III – Class I	-0.01	1.03	-0.01	0.99	0.98
Class IV – Class I	-1.00	0.98	-1.01	0.31	0.36
Class V – Class I	-0.46	1.01	-0.46	0.64	0.62
Diabetes Mellitus Duration					
6-10 years – 1-5 years	0.38	0.34	1.11	0.26	1.47
More than 10 years – 1-5 years	0.85	0.52	1.62	0.10	2.34
BMI					
CED – Normal	0.63	1.28	0.49	0.62	1.88
Pre-obese – Normal	-0.45	0.44	-1.02	0.30	0.63
Obese – Normal	-0.85	0.36	-2.36	**0.01**	0.42
Blood Pressure					
Hypotensive – Normotensive	-1.90	1.81	-1.04	0.29	0.14
Pre-hypertensive – Normotensive	0.57	0.52	1.09	0.27	1.77
Hypertensive – Normotensive	1.05	0.51	2.04	**0.04**	2.87

Discussion

Lifestyle modifications along with pharmacotherapy are the cornerstones in control of Diabetes. Effective self-management of diabetes can curb its progress and delay onset of complications.[13] The findings of this study reveal that levels of self-efficacy and self-care in diabetes management among elderly patients was lower than average. Other studies show slightly better levels of self-efficacy although a systematic review found poor self-care among diabetics.[14,15] This highlights the need to undertake interventions to improve self-efficacy and self-care targeting the elderly in this region.

Although the level of self-care among elderly diabetics was poor in this study; yet self-efficacy was found to be a significant predictor and was positively associated with both self-care and glycaemic control. This was in agreement with findings from other studies.[16] Self-management education is not given much priority in patient care in hospitals due to huge patient load and lack of physician time. Patients do not follow self-management recommendations due to life-long care and compliance to treatment is poor. Lack of self-efficacy can impair disease self -management. As a result, glycaemic control is often suboptimal. Evidence suggests that improving self-efficacy may be more effective than merely imparting knowledge about the disease.[7] Interventional studies to improve self-efficacy through therapeutic patient education among diabetics have shown positive outcomes in improving glycaemic control and self-care.[17,18]

Females reported poorer self-care levels compared to males so they need special attention from health care providers. This finding was consistent with the study conducted in Ethiopia where females were 2.4 times more likely to have poor self-care practice than males (AOR; 2.40, 95% CI 1.31–4.40).[19] This could be due to lower status of women in society and neglect of their health care needs. Optimum glycaemic control is needed to prevent micro-vascular complications. The findings reveal that poor glycaemic control was present in 80.1% patients which is similar to 76.6% prevalence in India as reported in the TIGHT study.[20] Hypertension was found to be a significant predictor of poor glycaemic control necessitating its treatment. A previous study reported poor self-care was 1.48 times more likely among patients who had disease co-morbidity [AOR = 1.48; 95% CI (0.25, 7.73); $p \leq 0.001$] similar to the present findings.[21] However, obesity was associated with better glycaemic control possibly because such patients were already undergoing dietary restrictions as dietary habit is a common risk factor underlying both the conditions.

The strength of this study is in highlighting the significant association of self-efficacy with self-care and glycaemic control among elderly diabetic patients. However, the study is not without limitations. Firstly, it was a single-hospital based, observational study with cross-sectional design, so it might not be possible to establish causality and findings may not be generalizable to other locations. Also, the study used self-reported measures of self-efficacy and self-care activity scores which might have introduced recall bias and conscious falsification of some data.

Conclusion

Despite these limitations, the present study provides valuable insights into the factors associated with Diabetes self-care and glycaemic control. The results have important implications for the care of elderly patients with diabetes. Patients at higher risk like

females and hypertensives may be specifically targeted and assessment of DMSES score and self-care activity score along with interventions to improve self-efficacy may be incorporated in their routine care regimen to improve their self-management techniques and glycaemic control for better outcomes.

Further research conducted in community settings is needed to confirm the findings of this study and identify other possible barriers and challenges for effective management of Diabetes among the elderly patients.

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Annexure

Table 4: Mean score of each item and Total score on self-efficacy DMSES scale

Items on DMSES scale	Mean score	SD
I am able to check my blood sugar if necessary	3.0	3.6
I am able to correct blood sugar when the sugar level is too high (e.g., eat different foods)	4.8	3.1
I am able to correct my blood sugar when the blood sugar level is too low (e.g., eat different foods)	5.2	3.1
I am able to choose the correct foods	6.7	2.7
I am able to keep my weight under control	5.9	2.8
I am able to examine my feet for cuts	5.7	3.1
I am able to adjust my eating plan when ill	5.7	2.8
I am able to follow a healthy eating pattern most of the time	6.5	2.8
I am able to do more exercise if the doctor advises me to	5.8	3.1
When taking more exercise, I am able to adjust my eating plan	4.9	2.9
I am able to follow a healthy eating pattern when I am away from home	5.5	3.1
I am able to follow a healthy eating pattern during wedding ceremonies or at a party	5.2	3.1
I am able to adjust my eating plan when I am feeling stressed or anxious	4.9	2.9
I am able to take my medication as prescribed	8.2	2.2
I am able to adjust my medication when I am ill	5.6	2.8
Total score	5.6	3.1

Table 5: Mean score of each item and Total score on SDSCA self-care scale

SDSCA scale items	Mean score	SD
General Diet	4.6	1.9
Followed a healthy eating plan in the last week	3.1	2.1
Followed a healthy eating plan (on average per week, over the past month)		
Specific diet	1.4	1.6
Ate five or more servings of fruits and vegetables	5.6	1.6
Ate high-fat foods (reverse scoring item)		
Physical activity	3.7	2.6
Participated in at least 30 min of exercise	2.3	2.4
Participated in specific exercise session		
Tested for blood sugar	1.8	1.9
Tested for blood sugar	0.7	1.3
Tested blood sugar according to the number of times recommended by health care provider		
Foot care	2.4	2.2
Checked feet	0.3	0.7
Inspected the inside of shoes	4.6	1.9
Total score	2.6	1.7