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Limited health literacy is associated with poorer clinical outcomes in elderly with type 2 diabetes mellitus

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ABSTRACT

BACKGROUND
Diabetes mellitus is a significant global public health concern. Poor knowledge of disease and healthcare utilization is associated with poor health outcomes, leading to increasing burden of diabetes in many developing countries. The present study aimed to assess diabetes health literacy and clinical outcomes in elderly patients registered to the home health agency.

METHODS
A cross-sectional study was conducted in the city of Çorum, Turkey, with 160 type 2 diabetic patients of both sexes and aged between 50-91 years. To identify health literacy, the Rapid Estimate of Adult Literacy in Medicine test was administered to the patients. Clinical parameters were based on routine medical examinations by measuring blood pressure levels, glycosylated hemoglobin, and lipoprotein levels. In order to identify the risk of depression, the Beck Depression Scale was used.

RESULTS
Of the patients, 85.0% had limited health literacy. The majority of patients (95.0%) had poor glycemic control and limited health literacy was associated with having high level of HbA1c ($p<0.05$). Adequate health literacy was associated with regular foot care ($p<0.05$). Also patients with limited health literacy were more likely to have depression ($p<0.001$). Limited health literacy increased the risk of poor glycemic control (OR=6.82;95% CI=1.34-9.78) and retinopathy (OR=6.91;95% CI=1.23-9.44).

CONCLUSION
Limited health literacy is consistently associated with poorer diabetes clinical outcomes in elderly type 2 diabetes melltius Contents of diabetes education should be arranged according to patients' health literacy level which requires visual and auditory teaching materials for patients with limited health literacy.

Keywords: Health literacy; diabetes mellitus; outcomes; home health agency

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INTRODUCTION

Health literacy is a broad concept that includes abilities for reading, understanding and navigating health information in the health system to make relevant appropriate decisions.[1] Health literacy plays a vital role in self-management of chronic disease which accounts for 44% of the global burden of disease.[2] Evidence suggests that limited health literacy is a common condition which has considerable impact on chronic conditions such as type 2 diabetes mellitus (DM), asthma, acquired immune deficiency syndrome (AIDS) and hypertension.[3-6] According to the Global Status Report on Non-Communicable Disease, 89 million disability-adjusted life years (DALYS) was attributed to DM with estimated prevalence of 9% in 2014.[7] Patients with diabetes are at increased risk of poor health outcomes (cardiovascular disease, strokes, amputations, blindness, and end-stage renal disease) and poor control of clinical outcomes (e.g., blood pressure, lipoprotein levels, glycemic control).[8-10] Type 2 diabetes is a classic public health problem affecting 6,503,027 Turkish people with 13.7% prevalence.[11] In Turkey, the home health agency is a part of public health services for patients who are in a disadvantageous position due to severe illness. The population of home health care are mostly elderly. Patients with asthma, paralysis, serious respiratory insufficiency, those completely bed-ridden or physically disabled, and those with terminal cancer and severe muscle disease utilize the services in their homes. Diabetic patients with any complications can also utilize these services. Elderly individuals are one of the groups at risk of limited health literacy to implement tasks for disease control individually.[12,13] Aging results in declined cognitive functions and therefore elderly patients feel stressful about managing diabetes tasks. Studies give an impression that elderly patients with diabetes do not appear to be receiving diabetes care at optimum level.[14]

Several studies have reported that low health literacy is related to negative health outcomes such as poor health status [15] and inadequate disease management.[16] Evidence examining the link between low health literacy and glycemic outcomes are mixed. Some studies have demonstrated links between higher levels of health literacy and better glycemic control, while others have failed to demonstrate an association.[17,18] The distinguishing aspect of the present study is that participants were taking regular home care services.

The two hypotheses of this study are that patients with diabetes have limited health literacy and that these patients would be less likely to control clinical outcomes such as glycosylated hemoglobin (A1c), blood pressure and low density lipoprotein (LDL) level. The present study aimed to assess health literacy and clinical outcomes in elderly type 2 diabetic patients registered to the home health agency.

METHODS

Research design

This cross-sectional study was conducted between February-March 2019 in the city of Çorum in Turkey.

Study subjects

Patients were recruited from the home health agency. In Çorum city, 1670 patients utilize this service and 187 diabetic patients were included in the study. The calculated minimum sample size was 156 patients, based on the prevalence of DM in Turkey of 13.7%.[11] Among those diabetic patients, 27 were excluded because of illiteracy, hearing impairment, psychotic disorder, dementia, blindness, aphasia, end-stage cancer and renal disease (these conditions may be a barrier to accurately measure health literacy). A total of 160 type 2 diabetic patients of both sexes and aged between 50-91 were enrolled in the study.

Patients were orally administered a questionnaire form regarding self-reported socio-demographic information (age, educational level, monthly income, marital status, self-reported

health, smoking status, history of hypertension) and self-management behaviors (measuring blood glucose, adherence to diet and treatment, foot care). Information on diabetes condition (current treatment, complications) was collected from the patients' files.

MEASUREMENTS

Health literacy

To identify health literacy, the patients were then administered the Rapid Estimate of Adult Literacy in Medicine (REALM) test, which is a widely acknowledged test and is a practical way of measuring reading, pronunciation and comprehension of terms. It was developed by Davis et al.[19] and converted into and validated as the Turkish version by Özdemir et al.[20] The test scoring is based on individual responses and correct responses take "1" point. Health literacy level is structured according to total score (0-66) as follows: inadequate (0-44), marginal (45-60), adequate (61-66). In this study, health literacy was grouped in two levels as adequate and limited (marginal and inadequate) health literacy.

Depression

In order to identify the risk of depression and level of depressive symptoms, the Beck Depression Scale, including 21 self-assessment items, was used. [21] The scale was developed by Beck [21] and validated as the Turkish version. [22] Each item takes a score between 0-3 and the total score range is 0-63. The depression score was categorized into d"16 and e"17.

Clinical measurements

Following the questionnaire, systolic and diastolic blood pressure levels were measured. Then, the process of collecting clinical parameters was carried out for routine medical examinations by home health nurses. Blood samples were obtained to measure HbA1c and low density lipoprotein (LDL) levels. After testing, measurement values were obtained from online-laboratory systems. Poor glycemic control was defined as HbA1c >7%.

Statistical analysis

Data management and analysis were performed using SPSS 17.0. For categorical variables, Fisher's exact test was used. Multivariate logistic regression was used to predict the clinical outcomes of limited health literacy. A $p<0.05$ value was accepted as significant.

Ethical approval

The procedures of this study were performed in accordance with the Helsinki Principles and approved by the Hitit University Non-interventional Research Ethics Committee (under no. 2019-198). Informed consent was obtained from all individual participants included in the study.

RESULTS

A total of 160 elderly diabetic patients participated in this study with a mean age of 65.6 (SD:12.6) years. Of those, 47.5% were women and 52.5% were men. In the study group, 88.1% had primary education or lower. Table 1 shows patient characteristics according to health literacy level. Of the patients, 85.0% had limited (20.6% marginal, 64.4% inadequate), and 15.0% had adequate health literacy. There were no differences in patients' gender, marital status, perceived health, smoking status, duration of diabetes, treatments, history of hypertension (HTN), LDL, blood pressure levels and macrovascular complications according to health literacy level ($p>0.05$). Limited health literacy was significantly associated with being older, having less education, and lower income ($p<0.05$). The majority of patients (95.0%) had poor glycemic control (HbA1c>7). Limited health literacy was associated with a high level of HbA1c ($p<0.05$). Conversely, adequate health literacy was associated with regular foot care ($p<0.05$). Approximately three in four patients

Table 1. General features of the subjects by health literacy

	All n=160 (100.0%)	Limited n=136 (85.0%)	Adequate n=24 (15.0%)	p*
Age, mean (SD), years	65.6 (12.6)	66.7 (12.7)	59.5 (10.9)	**0.014**
Sex				
Female	76 (47.5)	64 (47.1)	12 (50.0)	0.790
Male	84 (52.5)	72 (52.9)	12 (50.0)	
Education				**0.000**
Primary and below	141(88.1)	128 (94.1)	13 (54.2)	
Secondary and over	19 (11.9)	8 (5.9)	11 (45.8)	
Marital status				0.156
Married	114 (71.3)	94 (69.1)	20 (83.3)	
Not married	46 (28.8)	42 (30.9)	4 (16.7)	
Income				**0.025**
≤$500	32 (20.0)	23 (16.9)	9 (37.5)	
>500	128 (80.0)	113 (83.1)	15 (62.5)	
Perceived health				0.576
Good	28 (17.5)	22 (16.2)	6 (25.0)	
Moderate	45 (28.1)	39 (28.7)	6 (25.0)	
Poor	87 (54.4)	75 (55.1)	12 (50.0)	
Smoking status				0.287
Current	33 (20.6)	27 (19.9)	6 (25.0)	
Former	36 (22.5)	28 (20.6)	8 (33.3)	
None	91 (56.9)	81 (59.6)	10 (41.7)	
Duration of diabetes (mean years)	12.4 (8.8)	12.8 (8.8)	9.7 (8.9)	0.052
Treatments for diabetes				0.483
Only oral hypoglycemic	77 (48.1)	68 (50.0)	9 (37.5)	
Only insulin regimen	37 (23.1)	31 (22.8)	6 (25.0)	
Insulin and oral hypoglycemic	46 (28.8)	37 (27.2)	9 (37.5)	
Self-management behaviors				
Adherence to diet	58 (36.3)	51 (37.5)	7 (29.2)	0.167
Adherence to treatment	104 (65.0)	92 (67.6)	12 (50.0)	0.059
Regular foot care	94 (58.8)	73 (53.7)	21 (87.5)	**0.008**
Reported history of HTN	43 (26.9)	38(27.9)	5 (20.8)	0.469
Clinical outcomes				
HbA1c, mean (SD)	8.7 (3.1)	8.9 (3.2)	7.3 (1.8)	**0.016**
LDL cholesterol, mean (SD)	113.3 (43.4)	114.1 (39.8)	109 (61.0)	0.334
Systolic blood pressure, mean (SD)	126.5 (19.3)	126.3 (20.0)	127.9 (15.0)	0.645
Diastolic blood pressure, mean (SD)	75.1 (11.8)	74.5 (12.2)	74.8 (8.5)	0.320
Microvascular complication				
Retinopathy	52 (32.5)	50 (36.8)	2 (8.3)	**0.006**
Nephropathy	20 (12.5)	18(13.2)	2 (8.3)	0.503
Neuropathy	65 (40.6)	57 (41.9)	8 (33.3)	0.430
Macrovascular complication				
Cerebrovascular disease	47 (29.4)	40 (29.4)	7 (29.2)	0.981
Coronary artery disease	11 (6.9)	10 (7.4)	1 (4.2)	0.486
BDS				
Depression score ≥17	119 (74.4)	119 (87.5)	0 (0.0)	**0.000**
Depression score ≤16	41 (25.6)	17 (12.5)	24 (100.0	

*Fisher's Exact test was used for categorical variables; the Kruskal-Wallis test was used for continuous variables. Abbreviations: Hypertension (HTN), Glycated hemoglobin (A1C); Low Density Lipoprotein (LDL); Beck Depression Scale (BDS)

had depression and the mean score for depression was 30.7 (SD:16.8). Patients with limited health literacy were more likely to have depression ($p<0.001$).

Table 2 shows associations between clinical outcomes and limited health literacy. Limited health literacy was 6.82 times significantly higher in patients with poor glycemic control

Table 2. Analysis of multiple binary logistic regression between several risk factors and limited health literacy

	Limited health literacy		
	aOR	**CL**	**p**
Poor glycemic control (HbA1c >7%)	6.82	1.34-9.78	**0.017**
Retinopathy	6.91	1.23-9.44	**0.019**
Nephropathy	1.63	0.17-3.31	0.576
Neuropathy	1.12	0.38-3.56	0.820

aOR : adjusted OR for age and sex

(HbA1c>7%) and 6.91 times significantly higher in patients with retinopathy (OR=6.82;95% CI=1.34-9.78 and OR=6.91;95% CI=1.23-9.44, respectively) (Table 2). There was no signiûcant association between limited health literacy and other diabetes complications.

DISCUSSION

As mentioned in the reviewed literature, a chain of evidence links health literacy and diabetes care.[23-25] This is the first study reporting the effect of limited health literacy on poor clinical outcomes in Turkish diabetic home health care patients. In the current study, the majority of diabetic patients (85%) had limited health literacy. The results of this study are consistent with international studies.[26,27]

Socioeconomic factors (such as aging, education, income, etc.) have a dominant role in the maintenance of adequate health literacy. Prior studies have noted the problem of limited health with advanced age, less education and low income.[28,29] The current study supports the previous studies, in that 94.1% of patients with less education and 83.1% of patients with low income had limited health literacy. These factors can contribute to high rates of poor health literacy, severe complications and poor clinical outcomes in diabetic patients.

Diabetes complications remain a major challenge despite current clinical success. Patients have to suffer from multiple complications especially foot ulcers, vision and renal problems. Maintaining relevant food hygiene and adhering to medical treatment and diet are at the heart of quality self-management of diabetes care. However, self-management behaviors in chronic disease vary depending on patients' health literacy skills.[30-32] This study demonstrated that regular foot care was more common in patients with adequate health literacy. Glycosylated hemoglobin is an leading clinical indicator of diabetic complications.[33] Many guidelines for diabetes recommend a target HbA1c level of less than 7%.[34-36] However, studies reported that diabetic patients with limited health literacy have poorer glycemic control and higher levels of retinopathy than have those with adequate health literacy level.[37] One important and similar finding is that poor glycemic control and retinopathy was more frequent in patients with limited health literacy. Among clinical outcomes HbA1c and retinopathy had a significant correlation with limited health literacy.

Depression is an obvious accompanying psychiatric problem in patients with diabetes.[38,39] In the present study depression was more common in diabetic patients with limited health literacy. Depression can be an aggravating circumstance for adverse outcomes which also may dash patients' hopes and restrict diabetes care.

One of the limitations of this study was that it included only home care patients. Health literacy should be seen as an important component of health education in preventing complications and sequelae in diabetic patients and low health literacy skills should not be ignored in patients receiving home care. The first step of home care services for diabetes should be to increase patients' health literacy skills.

CONCLUSIONS

Patients with limited health literacy had poorer glycemic control and foot care, also had more retinopathy and higher depression scores. Using health literacy measurements in the home care system will be better to give a new direction and to strengthen diabetes care.

CONFLICT OF INTEREST

None

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CONTRIBUTORS

GY designed this study. RC carried out the data analyses and reported the initial findings. GY contributed to the discussion and conclusion. Both authors have read and approved the final manuscript.

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