The Effect of Literacy Level on Health Related-Quality of Life, Self-Efficacy and Self-Management Behaviors in Diabetic Patients

Alireza Shahab Jahanlou[1] and Nader Alishan Karami[2]

[1] *Health Education Unit, Cardiovascular Research Center, Hormozgan University of Medical Sciences, Hormozgan, Iran*

[2] *Department of Health Information Management, Hormozgan University of Medical Sciences, Hormozgan, Iran*

Abstract- Illiteracy in studies on quality of life (QOL) and self-efficacy (SE) of diabetic patients has been ignored. Illiteracy and diabetes have high rates in developing countries. The aim of this study was to identify the effect of literacy level on health outcomes. To achieve this, we studied health outcomes such as SE, self-management behaviors and Health-Related Quality of Life (HRQOL) in diabetic patients. A cross-sectional study was carried out in an Iranian urban federally-funded diabetes clinic (with 1400 diabetes patients) in Bandar Abbas, a city located in south of Iran. 256 Non Insulin Dependent Diabetic Mellitus patients were chosen during June, July and August 2007. Patients were grouped as illiterates, low-literates and literates. SE and QOL were measured by standard questionnaires. HbA1C was measured by calorimetric method. Data was collected with interview. Data analysis was carried out with one way ANOVA Post Hoc, and bivariate analysis method. Literacy level among the three groups from the view points of age, physical domain, psychological domain, environmental domain and SE were significant. There was no significant difference for the level of HbA1C among three groups. Literacy level does not have any effects on glycemic control. There is a strong relationship between self-efficacy and QOL domains.

Introduction

Literacy is defined as a functional and context-specific skill that includes oral skills (listening and speaking) and print-based skills (reading and writing) (1).
Studying the relationship between literacy and health is important for three reasons: to understand better the real etiology of poor health outcomes; to identify a potential clinical marker of patients at risk for poor outcomes; and to inform the development of interventions (2).

Research over the past decade has demonstrated an association between literacy and health-related knowledge, self-management behaviors, self-reported health, rates of hospitalization, and control of diabetes. However, research to date has not elucidated the relationship between literacy and worse health outcomes (3).

A review on articles published within last decade showed nine studies measured the relationship between reading ability and knowledge of health outcomes (Table 1). Seven of them found a positive and significant relationship between reading ability and participants' knowledge of health outcomes (4-10). One article did not find a statistically significant positive relationship (11); and one was clearly underpowered (12). Finally, Hahn recommends research is needed to better clarify the relationship between literacy and patient-reported health outcomes (13).

Health-Related Quality of Life (HRQOL) is an important outcome in clinical trials and health care interventions (14). People with chronic diseases, such as type 2 diabetes, have to face many problems which may have impacts on their HRQOL (15). Evidence about the relationship between literacy and patient-reported outcomes such as HRQOL and perceived health status is limited (13).

Corresponding Author: Alireza Shahab Jahanlou
Health Education unit, Cardiovascular Research Center, Hormozgan University of Medical Sciences, Hormozgan, Iran
Tel: +98 917 1613857, Fax: +98 761 333500, E-mail: jahanlu@gmail.com, jahanlu@modares.ac.ir

Table 1. Published studies evaluating the relationship between literacy and health outcomes

Knowledge	Outcome	Literacy Relationship
Davis *et al.*	Knowledge about mammography	Correlation between literacy and low knowledge r -.2 (*P*<0.001)
Lindau *et al.*	Acceptable knowledge of cervical cancer screening	HL OR, 2.25 [1.1 to 4.8]
Miller *et al.*	HIV medication knowledge	Correlated with literacy, r = .31 (*P* = 0.005)
Moon *et al.*	Parental knowledge about child health care	No relationship
Spandorfer *et al.*	Comprehension of emergency department discharge instructions	LL less knowledge
Arnold *et al.*	Knowledge about smoking	LL less knowledge
Williams *et al.*	Knowledge about asthma	LL less knowledge
Williams *et al.*	Knowledge of hypertension , Knowledge of diabetes	LL less knowledge LL less knowledge
Wilson and McLemore	Knowledge of self-care after orthopedic surgery	No relationship

LL, lower literacy; HL, higher literacy; OR, odds ratio

Self-efficacy (SE) predicts self-management behaviors and outcomes for patients with diabetes and a number of other chronic illnesses. Sarkar *et al.* (16) and Gerber (17) found no relationship between SE and literacy among patients with diabetes; however, they showed SE was related to self-reported diabetes related behaviors across literacy level.

Improved glycemic control (HbA1c <7%) reduces the risk of diabetic complications and mortality (18). Schillinger and colleagues demonstrated that poor glycemic control was more common in patients with low literacy (19). However, Rothman and colleagues reported diabetes-related knowledge is not often strongly associated with glycemic control (20).

It is estimated that 2% of the Iranian population suffering from diabetes and prevalence of diagnosed diabetes for those over the age of 30 years has been estimated to be 7.3% (21). Moreover, illiteracy level in Iran is also estimated to be around 23% (22).To identify the effect of literacy level on health outcomes, we studied health outcomes such as SE and HRQOL in diabetic patients. Results from this study can help future interventions to improve diabetes outcomes among patients with different literacy levels.

Patients and Methods

This research, granted by Vice Chancellor for Research, was evaluated by ethics committee in Hormozgan University of Medical Sciences. A cross-sectional study was carried out in an urban federally-funded diabetes clinic (with around 1400 diabetes patients) in Bandar Abbas, a city located in south of Iran. We estimated

sample of patients by the use of previous research (23) with α=0.05 & β=0.2.

256 Non Insulin Dependent Diabetic Mellitus (NIDDM) patients were chosen during June, July and August of 2007. All the cases were diagnosed as diabetic patients for at least one year before the study. First, patients were visited by an internist (with special interest in diabetes mellitus), and then the questionnaires were filled out at the time of interview.

Based on literacy level, patients were classified into three groups: 1) Illiterates, 2) Low-literates(less than 7 years schooling) and 3) Literates (more than 7 years schooling) (3).

Using a 15-item questionnaire, data was collected through face to face interviews. The treatment behaviors addressed included: adherence to treatment regimen (1 item), self-monitoring blood glucose (3 items), and compliance with dietary regimen (2 items), exercise (2 items), foot care (3 items), weight monitoring (2 items), smoking cessation (1 item) and how to treat hypoglycemia (1 item).

HRQOL was measured by means of World Health Organization Quality of Life–BREF (WHOQOL-BREF) questionnaire including 26 items. Individual items are rated on a 5-point Likert scale where 1 indicates low negative perceptions and 5 indicate high positive perceptions. The questionnaire has four broad domains namely: 1) Physical, 2) Psychological, 3) Social Relations and 4) Environmental domains (24). In each domain, raw scores were transformed to a 100-point scale (25), where lower scores imply lower QOL. This questionnaire was shown to be reliable before study. Cronbach (alpha) coefficients for the QOL subscales

ranged from 0.86 to 0.89. The alpha coefficient for the overall QOL score in this study was 0.88.

SE was measured by the use of a self-efficacy questionnaire (SEQ) (26). The SEQ was a 29-item instrument that measured participants' confidence. The SEQ was adapted and validated to be used in this study. Participants rated each SEQ item according to their perceived ability to perform the behavior on a ranging scale from 1 (strongly disagree) to 4 (strongly agree). The range of total score was from 29-116. We transformed the score to a 100-point scale with a higher score representing higher self-efficacy. Cronbach (alpha) coefficients for the SE items ranged from 0.81 to 0.90. The alpha coefficient for the overall SE score was 0.85.

Metabolic control was assessed by measuring glycated hemoglobin (HbA1c). HbA1c was measured by a colorimetric method. According to this method in diabetic patients HBA1c<7 is good control, 7 - 9 is fair control, and >9 is bad control.

Data analysis based on literacy level was carried out with one way ANOVA Post Hoc (Test-Tukey), and bivariate analysis method. The level of clinical significance was defined as $P<0.05$.

Results

67.5% of patients were female and 32.5% were male. The mean age was 49.15 ± 9.5 years (min: 27 max: 72). From the view point of literacy, there were (42.1%) illiterates, 39% low literates and 19% literate. 96% married; 70% had overweight with body mass index (BMI) of more than 25. The duration of diabetes range was 6.33 ± 5.12 years (min: 1, max: 30). 4.8% used to control the disease only by diet, 81.5% by oral anti-diabetics and diet (OAD), and 13.7% by insulin and diet.

Statistical analysis showed that foot-caring and weight-control are less in illiterates in comparison with the other groups and both of them are significant (Table 2).

Table 2. Behavior of patients in relation to management of their diseases

Behavior	Total patients		Illiterate		>7 years schooling		≤7 years schooling		P
	n	%	n	%	n	%	n	%	
Smoking									
No	214	83.5	88	81.4	84	84	42	87.5	0.46
Yes	42	16.5	20	18.6	16	16	6	12.5	
Exercise									
Always	138	53.9	53	49	53	53	32	66.68	0.372
Seldom	30	11.71	12	11.11	10	10	8	16.66	
Never	88	34.39	43	39.89	37	37	8	16.66	
Foot care									
Yes	94	36.71	27	25	44	44	23	48	0.044*
No	162	63.29	81	75	56	56	25	52	
Weight monitoring									
No	137	53.35	78	72.2	49	49	10	20.83	0.000*
Yes	119	46.65	30	27.8	51	51	38	79.17	
Self-monitoring blood Glucose									
Yes	72	28.13	34	31.48	30	30	8	16.66	0.38
No	184	71.87	74	68.52	70	70	40	83.34	
Compliance with dietary Regimen									
Always	137	53.35	55	50.92	56	56	26	54.16	0.90
Seldom	83	32.42	34	31.48	33	33	16	33.33	
Never	36	14.23	19	17.61	11	11	6	12.51	
Adherence to treatment Regimen									
Always	203	79.29	84	77.77	85	85	34	70.83	0.64
Often	31	12.1	13	12.03	10	10	8	16.66	
Never	22	8.61	11	10.2	5	5	6	12.51	
Total	256	100	108	100	100	100	48	100	

* it is significant

Table 3. Comparison of the means of HRQOL between illiterate, less than 7 years, at least 7 years schooling

Scales	illiterate		>7 years schooling		≤7 years schooling		P
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD	
Age	108	52 ± 8.71	100	46.5 ± 8.98	48	48.2 ± 11.48	0.013
SE	108	58.39 ± 16.8	100	68.8 ± 13.9	48	72.36 ± 13.16	0.000
Physical Domain	108	57.76 ± 15.59	100	64.38 ± 9.12	48	68.44 ± 10.02	0.002
Environment Domain	108	56.26 ± 17.46	100	64.41 ± 11.23	48	64.54 ± 13.85	0.017
psychological domain	108	58.44 ± 17.2	100	67.46 ± 10.38	48	66.08 ± 11.66	0.006

Data analysis based on literacy level among the three groups showed age, physical domain, psychological domain, environmental domain and self-efficacy statistically significant (Table 3).

There was no significant difference for the level of HbA1C among three groups. Only 30% of the total patients reached HbA1c less than 7%. (Table 4).

In the illiterate group, relationship between age and self-efficacy (r=0.322 *P*<0.024), age and social domain (r=0.321 *P*<0.03), Self-efficacy and physical domain (r=0.627 *P*<0.0001), self-efficacy and psychological domain (r= 0.626 *P*<0.0001), self-efficacy and social domain (r=0.657 *P*<0.0001), self-efficacy and environmental domain (r=0.708 *P*<0.0001), and self-

efficacy and total HRQOL (r=0.427 *P*<0.008) were significant.

In literate group, relation between psychological domain and HbA1c (r=0.464 *P*<0.03), and psychological domain and self-efficacy (r=0.466 *P*<0.025) were significant.

Comparison of the means of Physical domain, Psychological domain, Environmental domain and Self-efficacy based on literacy level showed positive relationship between these variables and literacy level (Figure 1).

We could not find any statistically significant difference among three groups for the other variables.

Table 4. Comparison of the number and percentage of each group based on HbA1c level

Scales	illiterate		>7 years schooling		≤7 years schooling		P
	n	%	n	%	n	%	
HbA1c<7	30	27.6	29	29	19	39.6	0.82
7≥ HbA1c<9	30	27.6	38	38	13	27	0.68
HbA1c > 9	48	44.8	33	33	16	33.4	0.31
Total	108	100	100	100	48	100	
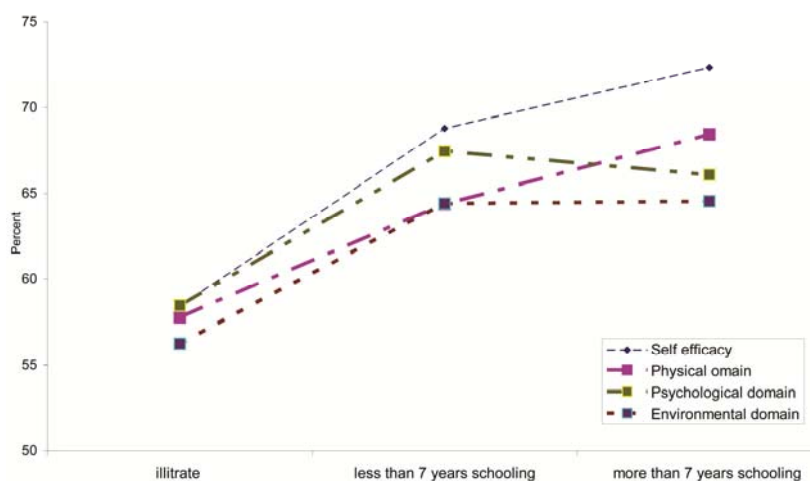
Figure 1. Comparison of the means of physical domain, psychological domain, environmental domain and self-efficacy based on literacy level in diabetic patients

Discussion

The guidelines for management of DM recommend intensive control of blood sugar reaching target of HbA1c less than 7%. This is associated with reduced morbidity and mortality (27). In our study only 30% of the total patients met this target and it is worrying. Like some studies, we could not find any differences in metabolic control based on literacy level (3, 10, 20); while it is not supported by another study (28).

We did not find any relationship between literacy level and glycemic control while Schillinger *et al.* (19) and Fisher (28) observed a moderate inverse relationship. The difference between our findings and their findings may be due to covering illiterate patients in this study. We selected illiterate, low literate and literate patients, while they selected only low literate and high literate patients.

Two recent studies found no relationship between SE and literacy among patients with diabetes (16, 17). But we found illiterate patients were less self-efficient than literate patients. The difference between our study and the two afore-mentioned studies may be due to including illiterate patients in our study.

Like Darren *et al.* (3) our study showed that literacy level was related to physical, psychological, environmental domains, and it was not related to total QOL.

There are lots of researches focusing on relationship between glycemic control and HRQOL in people suffering from diabetes. Some studies suggest a link between HRQOL and metabolic control. They generally suggest that better glycemic control is associated with better HRQOL (29). Whereas, others find no association between glycemic control and HRQOL (30). Trief *et al.* used three different questionnaires in diabetic patients and found no relationship between HRQOL and HbA1c (31); and also Tumer *et al.* in 2004 did not find any relationship between WHOHRQOL-26 or SF-36 domains and HbA1c (32).

We found a strong relationship between SE and HRQOL. We remind that SE is an important area for diabetes interventions but targeting only SE is unlikely to reduce literacy-related disparities (3). Therefore, SE may be a relevant determinant of self-management behaviors among populations with limited health literacy (16).

This study was a cross-sectional research; it is possible that some of the variables we examined would be related to longitudinal outcomes such as changes in HbA1c.

According to the findings of this study, literacy level does not have a role in glycemic control, but it affects SE and QOL.

Future studies may evaluate other treatment variables that may help to explain the pathways toward good diabetes outcomes. Further research is needed to develop a literacy sensitive instrument that takes into consideration the knowledge variations and the specific needs for diabetics. Research is also needed to develop measurement techniques for low literate populations and to evaluate potential literacy-related measurement bias (13).

Acknowledgements

References

1. Katz MG, Jacobson TA, Veledar E, Kripalani S. Patient literacy and question-asking behavior during the medical encounter: a mixed-methods analysis. J Gen Intern Med 2007;22(6):782-6. Epub 2007 Apr 12.

2. Dewalt DA, Berkman ND, Sheridan S, Lohr KN, Pignone MP. Literacy and health outcomes: a systematic review of the literature. J Gen Intern Med 2004;19(12):1228-39.

3. DeWalt DA, Boone RS, Pignone MP. Literacy and its relationship with self-efficacy, trust, and participation in medical decision making. Am J Health Behav 2007;31 Suppl 1:S27-35.

4. Davis TC, Arnold C, Berkel HJ, Nandy I, Jackson RH, Glass J. Knowledge and attitude on screening mammography among low-literate, low-income women. Cancer 1996;78(9):1912-20.

5. Lindau ST, Tomori C, Lyons T, Langseth L, Bennett CL, Garcia P. The association of health literacy with cervical cancer prevention knowledge and health behaviors in a multiethnic cohort of women. Am J Obstet Gynecol 2002;186(5):938-43.

6. Miller LG, Liu H, Hays RD, Golin CE, Ye Z, Beck CK, Kaplan AH, Wenger NS. Knowledge of antiretroviral regimen dosing and adherence: a longitudinal study. Clin Infect Dis 2003;36(4):514-8. Epub 2003 Jan 30.

7. Spandorfer JM, Karras DJ, Hughes LA, Caputo C. Comprehension of discharge instructions by patients in an urban emergency department. Ann Emerg Med 1995;25(1):71-4.

8. Arnold CL, Davis TC, Berkel HJ, Jackson RH, Nandy I, London S. Smoking status, reading level, and knowledge of tobacco effects among low-income pregnant women. Prev Med 2001;32(4):313-20.

9. Williams MV, Baker DW, Parker RM, Nurss JR. Relationship of functional health literacy to patients' knowledge of their chronic disease. A study of patients with hypertension and diabetes. Arch Intern Med 1998;158(2):166-72.

10. Williams MV, Baker DW, Honig EG, Lee TM, Nowlan A. Inadequate literacy is a barrier to asthma knowledge and self-care. Chest 1998;114(4):1008-15.

11. Moon RY, Cheng TL, Patel KM, Baumhaft K, Scheidt PC. Parental literacy level and understanding of medical information. Pediatrics 1998;102(2):e25.

12. Wilson FL, McLemore R. Patient literacy levels: a consideration when designing patient education programs. Rehabil Nurs 1997;22(6):311-7.

13. Hahn EA, Cella D, Dobrez DG, Weiss BD, Du H, Lai JS, Victorson D, Garcia SF. The impact of literacy on health-related quality of life measurement and outcomes in cancer outpatients. Qual Life Res 2007;16(3):495-507. Epub 2006 Nov 8.

14. Fayers PM, Machin D. Quality of life: Assessment, Analysis and Interpretation. New York: John Wiley and Sons Ltd.; 2000. p. 25-30.

15. Hänninen J, Takala J, Keinänen-Kiukaanniemi S. Good continuity of care may improve quality of life in Type 2 diabetes. Diabetes Res Clin Pract 2001;51(1):21-7.

16. Sarkar U, Fisher L, Schillinger D. Is self-efficacy associated with diabetes self-management across race/ethnicity and health literacy? Diabetes Care 2006;29(4):823-9.

17. Gerber BS, Brodsky IG, Lawless KA, Smolin LI, Arozullah AM, Smith EV, Berbaum ML, Heckerling PS, Eiser AR. Implementation and evaluation of a low-literacy diabetes education computer multimedia application. Diabetes Care 2005;28(7):1574-80.

18. Inoue K, Matsumoto M, Kobayashi Y. The combination of fasting plasma glucose and glycosylated hemoglobin predicts type 2 diabetes in Japanese workers. Diabetes Res Clin Pract 2007;77(3):451-8. Epub 2007 Mar 7.

19. Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C, Palacios J, Sullivan GD, Bindman AB. Association of health literacy with diabetes outcomes. JAMA 2002;288(4):475-82.

20. Rothman RL, Malone R, Bryant B, Shintani AK, Crigler B, Dewalt DA, Dittus RS, Weinberger M, Pignone MP. A randomized trial of a primary care-based disease management program to improve cardiovascular risk factors and glycated hemoglobin levels in patients with diabetes. Am J Med 2005;118(3):276-84.

21. Aghamollaei T, Eftekhar H, Shojaeizadeh D, Mohammad K, Nakhjavani M, Ghofranipour F. Behavior, metabolic control and health-related quality of life in diabetic patients at bandar abbas diabetic clinic. Iranian J Publ Health 2003;32(3):54-9.

22. World Health Organization (WHO). WHO country cooperation strategy at a glance [Online]. 2006 [cited 2011 Apr 1]. Available from: URL:http://www.who.int/countryfocus/cooperation_strategy/ccs_irn_en.pdf

23. Aghamolaei T, Eftekhar H, Mohammad K, Nakhjavani M, Shojaeizadeh D, Ghofranipour F, Safa O. Effects of a health education program on behavior, hbA1c and health-related quality of life in diabetic patients. Acta Med Iran 2005;43(2):89-94.

24. The WHOQOL Group. Development of the World Health Organization WHOQOL-BREF quality of life assessment. Psychol Med 1998;28(3):551-8.

25. World Health Organization (WHO). Introduction, administration, scoring and generic version of the assessment [Online]. 2006 Dec [cited 2011 Apr 1]; Available from: URL:http://www.who.int/mental_health/media/en/76.pdf

26. Glasgow RE, Toobert DJ, Riddle M. Diabetes-specific social learning variables and self-care behaviors among persons with type II diabetes. Health Psychol 1989; 8:285-303.

27. Qari FA. Glycemic and good target control among diabetics at a university and Erfan private hospital. Turkish J Endocrinol Metab 2005;2:49-54.

28. Fisher E. Low literacy levels in adults: implications for patient education. J Contin Educ Nurs 1999;30(2):56-61.

29. Rubin RR, Peyrot M. Quality of life and diabetes. Diabetes Metab Res Rev 1999;15(3):205-18.

30. Hoey H, Aanstoot HJ, Chiarelli F, Daneman D, Danne T, Dorchy H, Fitzgerald M, Garandeau P, Greene S, Holl R, et al. Good metabolic control is associated with better quality of life in 2,101 adolescents with type 1 diabetes. Diabetes Care 2001;24(11):1923-8.

31. Trief PM, Wade MJ, Britton KD, Weinstock RS. A prospective analysis of marital relationship factors and quality of life in diabetes. Diabetes Care 2002;25(7):1154-8.

32. Pala T, Eser E, Ozmen B, Aydemir O, Boyvoda S. The determinants of quality of life including treatment satisfaction in patients with type two diabetes mellitus: are different generic Qol instruments sensitive to the same determinants? Turkish J Endocrinol Metab 2004;8(3):91-9.