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International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Original Article

The effect of health literacy level on health outcomes in patients with diabetes at a type v health centre in Western Jamaica



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ARTICLE INFO

Article history:

Received 24 August 2016

Received in revised form

30 January 2017

Accepted 16 June 2017

Available online 20 June 2017

Keywords:

Diabetes Mellitus

Health literacy

Health outcome

ABSTRACT

Objective: To identify the effects of health literacy levels on health outcomes in patients with diabetes in a type V health center in Western Jamaica.

Method: A correlational survey design with a random sampling technique was used. An 18-item questionnaire and the Newest Vital Sign tool were administered to 88 consenting adults with diabetes to assess their health literacy levels. Their health outcomes were evaluated with docket review. Data were analyzed using SPSS version 18.

Results: The participants were predominantly female (77.3%), aged 51–70 years, married (44%), employed (46%), and diagnosed with diabetes > 10 years (42%). Only 13.6% of the study population was adequately health literate. The health literacy scores for gender were not significant ($P = 0.84$). The health literacy scores of the patients with different ages and educational levels were significant ($P < 0.001$). Pearson's correlations revealed no linear relationship between health literacy scores and health outcome ($r = 0.185$, $P = 0.084$).

Conclusion: Limited health literacy and high likelihood of limited health literacy are predominant in the study population. Age and educational level are significantly associated with health literacy levels. However, these findings suggest no association between health literacy level and diabetic health outcomes.

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1. Introduction

Noncommunicable diseases (NCDs), such as heart disease, stroke, cancer, chronic respiratory diseases, and diabetes, are the leading causes of mortality worldwide. Among these conditions, diabetes is the fourth leading cause of death and is accounted for 1.5 million deaths annually [1]. Diabetes is an increasing health problem internationally and locally, and its projected prevalence and financial burden on healthcare services have increased. In Jamaica, diabetes is the second leading cause of death [2] and is diagnosed in 7.9% of the population [3]. This condition is also costly because of its chronic nature and the severity of its complications, thereby affecting not only the patients with diabetes and their families but also the Jamaican economy and healthcare system.

Health literacy should be promoted because a complex therapeutic regimen is necessary to manage or control diabetes, but

patients with diabetes experience an overwhelming responsibility of navigating healthcare systems and making appropriate health choices. Health literacy is defined as “cognitive and social skills that determine the motivation and ability of individuals to gain access, understand, and use information in a manner that promotes and maintains good health” [4]. Health care has undergone changes as a result of modernization and globalization, and healthcare environments have become increasingly complex. With a high health literacy level, the patients' access to health information and their aptitude to use it effectively are improved, and these patients consequently feel empowered.

The ability to access healthcare systems, engage in self-care, and manage chronic diseases is influenced by an individual's health literacy level [5]. The lack of understanding of health information compromises an individual's ability to make informed health decisions and thus negatively affects their health outcomes. Health outcome refers to the consequences of healthcare actions among patients and the possible results of the presence or absence of interventions [6]. Limited health literacy has been linked to adverse health outcomes, including decreased use of preventive health services, poor disease-specific outcomes for certain chronic

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Peer review under responsibility of Chinese Nursing Association.

conditions, and increased risk of hospitalization and mortality [5]. The health literacy level of patients also serves as a guide for healthcare providers on how to communicate with patients effectively. However, health literacy and its relation to diabetes and outcomes for diabetic patients in Jamaica have yet to be investigated. Therefore, this study aims to determine the relationship between health literacy levels and health outcomes for patients with diabetes in a type V health center in Western Jamaica. Our findings will provide a basis for the planning and implementation of strategies by healthcare providers to improve the health outcomes of patients in Western Jamaica because relevant information should be considered in the development of education and health policies.

2. Methods

2.1. Participants and setting

A single-site study was conducted in a type V health center at a medical clinic. The type V health center serves a population of 50,000 and provides the following services: prenatal care, postnatal care, family planning, immunization, laboratory services, family counseling, nutrition counseling, child guidance, home visiting, HIV/STI counseling, testing and treatment, and curative services. The target population consisted of patients diagnosed with diabetes by a healthcare provider (medical doctor/nurse practitioner) and with a fasting plasma glucose of ≥ 7.0 mmol/L (126 mg/dl) or 2 h plasma glucose ≥ 11.1 mmol/L (200 mg/dl). The included patients visited the medical clinic at least three times between January 2015 and the time of data collection.

2.2. Inclusion criteria

The following inclusion criteria were considered: male/female; age ≥ 18 years and diagnosed with diabetes by a healthcare provider (medical doctor/nurse practitioner); fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dl) or 2 h plasma glucose ≥ 11.1 mmol/L (200 mg/dl); at least three random/fasting blood glucose readings recorded in a patient's docket since January 2015; and ability to speak, read, and write.

2.3. Exclusion criteria

The following exclusion criteria were considered: age < 18 years; patients diagnosed with gestational diabetes; less than three random/fasting blood glucose readings from January 2015 to the time of data collection; and evident or documented cognitive defects because cognitive problems may interfere with accurate health literacy measurement [7].

2.4. Sample size

An average of 144 individuals diagnosed with diabetes visited the type V health center per quarter in 2015 [8], and the calculated sample size for our study was 105. The required sample size was estimated using the Creative Research System (2012) and the Survey System Correction (2012) for finite formula. Of the calculated 105 sample size the research yielded a total of 88 participants in the study (83.8% response rate) as 17 forms were incomplete.

2.5. Procedure

An 18-item questionnaire consisting of demographic, knowledge, and practice of diabetes management questions was self-administered, and the Newest Vital Sign (NVS) tool was given to the participants who satisfied the inclusion criteria. The NVS is an

objective, valid, and reliable screening tool that provides a realistic context that patients can understand. It is also a quick and easy-open access sourced tool that facilitates health literacy level measurement. This tool yields good internal consistency with Cronbach's α of 0.76, and its criterion validity was $r = 0.59$ and $P < 0.001$. The correlation score between the NVS and the Test of Functional Health Literacy in Adults (TOFHLA), which is a widely used tool to measure health literacy levels, was 0.88 [9].

The content and face validity of the 18-item questionnaire were assessed and reviewed by two content experts. This questionnaire consisted of demographic questions and other questions that evaluate an individual's knowledge and practice of diabetes management.

The questionnaire was administered to 12 diabetic patients who represented 10% of the proposed study for pre-testing to determine its reliability. The questionnaire and NVS tool was administered after a written consent was obtained. A Cronbach's α internal consistency coefficient of < 0.78 confirmed the validity of the questionnaire. The questionnaire was slightly adjusted to improve its esthetic appearance.

Upon the completion of the 18-item questionnaire, the participants were given nutritional labels retained throughout the administration of the NVS referring to the label as often as desired. Six questions on the NVS tool were asked by the researchers on the basis of the nutrition label. Upon completion of the tool, the results were scored immediately after the participants were shown appreciation for participating in the study.

A docket review was conducted to note the last three random blood glucose readings of the participants. The blood glucose readings were averaged and then rated as controlled (2 h blood glucose < 11.1 mmol/L/200 mg/dl) or uncontrolled (2 h blood glucose > 11.1 mmol/L/200 mg/dl) based on the WHO criteria and was recorded on a data extraction sheet. The absence or presence of acute and chronic diabetic complications was also noted. The acute complications of diabetes include diabetic ketoacidosis, hyperglycemic, hyperosmolar, nonketotic syndrome, and hypoglycemia. Chronic complications are long-term disorders of the microcirculation and are classified as one of the following three types: macrovascular (coronary artery disease, cerebrovascular disease, hypertension, and peripheral vascular disease), microvascular (retinopathy and nephropathy), and neuropathic (sensorimotor and autonomic dysfunction) [10]. This procedure was performed between January 2015 and the date of the interview and was recorded on the data extraction sheet. Data were collected at the site by the researcher over a 10-week period between April and June 2016.

2.6. Data analysis

Data were analyzed using the SPSS version 18. Descriptive statistics were used to summarize the data. Each demographic variable was descriptively analyzed by calculating the mean (SD), median, and mode of the age and frequency distributions. One-way ANOVA and *t*-test were used to establish a relationship between health literacy levels and demographical factors (age, gender, and educational level). Cross tabulations using Pearson Chi-Square correlation were also utilized to show the relationship between health literacy level and health outcome. Health outcome was determined on the basis of the presence or absence of the acute/chronic complications of diabetes and random blood glucose levels. A health outcome score was developed on the basis of the preceding variables. Each variable was scored as follows: presence of acute diabetic complication (1); absence of acute diabetic complication (0); presence of chronic diabetic complication (1); absence of chronic diabetic complication (0); uncontrolled random blood

glucose level (1); and controlled random blood glucose level (0). The variables were rated, scored, and totaled. The cumulative scores of 2–3, 1, and 0 indicated poor health outcome, fair health outcome, and good health outcome, respectively. $P \leq 0.05$ was considered significant for all inferential statistic tests.

Table 1
Demographic characteristics of the participants (N = 88).

Variables	N (%)
Gender	
Male	20 (22.7)
Female	68 (77.3)
Age (years)	
18-30	0 (0)
31-50	17 (19.3)
51-70	54 (61.4)
>70	17 (19.3)
Mean Age group-51–70, SD 0.625	
Marital Status	
Married	39 (44.3)
Divorced	2 (2.3)
Widowed	12 (13.6)
Separated	2 (2.3)
Single	33 (37.5)
Employment Status	
Employed	40 (45.5)
Unemployed	20 (22.7)
Retired	28 (31.8)
Educational level	
None	0 (0)
Primary	16 (18.2)
All Age/Junior High	34 (38.6)
Secondary	28 (31.8)
Technical/Vocational	8 (9.1)
College/University	2 (2.3)
Years diagnosed with Diabetes	
<1	11 (12.5)
2-5	26 (29.5)
6- 9	14 (15.9)
>10	37 (42.0)

2.7. Ethical consideration

Ethical approval was received from the ethics committee of the University Hospital of the West Indies, the University of the West Indies, the Faculty of Medical Sciences of the University of the West Indies, and the Ministry of Health. Ethical approval was also received from The Western Regional Health Authority Ethics Committee for conducting the pre-test and the research.

Informed consent was obtained from each participant. All of the participants were assured of anonymity and confidentiality and were informed of the purpose, the procedures, risk, benefits, and voluntary participation. This information was reinforced with an information letter outlining the study and an informed consent form signed by each participant.

No personal identifying information was included on the tool or report to ensure confidentiality, and each participant was randomly assigned a study identification number. All efforts were made to provide anonymity, and the participants were informed that the patients' involvement would not affect their care at the clinic.

3. Results

3.1. Demographic characteristics

The participants were predominantly female (77.3%), and the majority was diagnosed with diabetes >10 years (42%). Most of the patients were 51–70 years old (SD 0.625), and the age groups 31–50 years and >70 years were evenly represented (19.3% each). Many of the participants were married (44.3%) and employed (45.5%). Of the 88 participants, 34 (majority) completed junior high school and 2 finished college/university (Table 1).

3.2. Health literacy level

Of the total participants, 59.1% possibly had limited health literacy, 27.3% were highly likely to have limited health literacy, and 13.6% showed adequate health literacy (see Fig. 1).

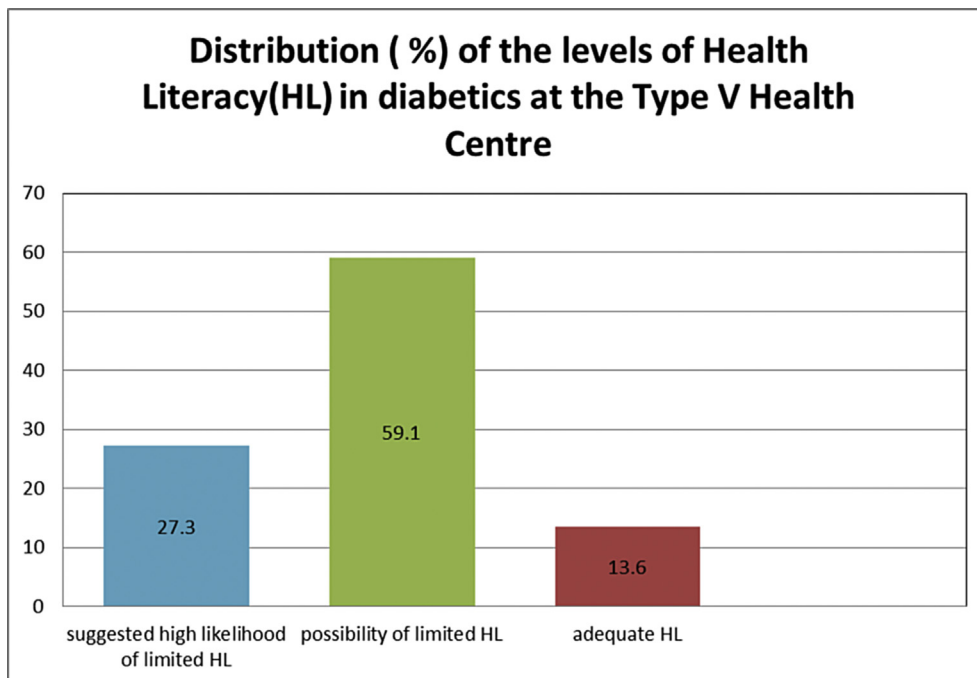


Fig. 1. Distribution (%) of the levels of Health Literacy (HL) in diabetics at the Type V Health center.

Table 2
Relationship between Health Literacy levels and demographic factors (age, gender, educational level).

Demographic Factors	Health literacy Levels			Standard Deviation	P value
	Suggested high likelihood of limited Health literacy (n)	Possibility of limited health literacy(n)	Adequate health literacy(n)		
Age (years)					<0.001
31–50	1	9	9	0.606	
51–70	13	36	5	0.563	
>70	10	7	3	0.507	
Gender					0.084
Male	10	7	3	0.745	
Female	14	45	9	0.581	
Educational level					<0.001
Primary	6	10	0	0.500	
All Age/Junior High	14	19	1	0.551	
Secondary	0	20	8	0.460	
Technical/Vocational	4	2	2	0.886	
College/University	0	1	1	0.707	

3.3. Relationship between health literacy levels and demographic factors (age, gender, and educational level)

Health literacy scores were significantly related to age and educational level ($P \leq 0.05$ or $P < 0.001$). Health literacy scores and gender were not significant ($P = 0.84$; Table 2).

3.4. Correlation of health literacy score and health outcomes score

Pearson's correlations revealed no linear relationship between health literacy scores and health outcomes ($r = 0.185$, $P = 0.084$).

3.5. Comparison of health literacy levels, blood glucose level, and presence of acute/chronic diabetic complications

More than half of the participants ($n = 39$) who possibly had limited health literacy ($n = 26$) and with a high likelihood to have limited health literacy ($n = 13$) had controlled blood glucose levels. The majority of the participants ($n = 40$) who possibly had limited health literacy ($n = 16$) and were highly likely to have limited health literacy ($n = 24$) had no acute diabetic complications and no chronic diabetic complications ($n = 71$). Pearson's correlation (Table 3) indicated that health literacy level was not related to the control of random blood glucose ($r = 0.031$, $P = 0.771$), acute complications ($r = 0.260$, $P = 0.376$), and chronic complications ($r = 0.054$, $P = -0.620$).

4. Discussion

Health literacy was a challenge among the participants. Bourne et al. [11] assessed the health literacy and health-seeking behaviors of Jamaican males aged >55 years and identified that majority of the participants (48.2%) have health literacy deficiency. Diabetic

patients with challenges in health literacy experience a long-term health conflict in obtaining, understanding, and applying health information to enhance their self-management capabilities. Our findings emphasized the need for healthcare providers to identify low health-literate diabetic patients and facilitate adjustments in health communication methods and thus improve the outcome of the required self-management.

Health literacy scores were significantly related to age and completed educational level ($P < 0.001$). This finding is significant in Jamaica, where seniors are accounted for the high prevalence rates of NCDs [12]. This result is consistent with other findings related to age and health literacy. Ashida et al. [13] evaluated the levels of genetic knowledge, health literacy, and beliefs about the causation of health conditions among individuals in different age groups. They found that the health literacy levels of older individuals are lower than those of younger individuals ($P < 0.001$). The decreased physical and mental health and an increased risk of cognitive decline with age can affect a patient's ability to obtain, understand, and apply health information; these observations are consistent with low health literacy among older adults across varied populations [14].

Our study showed that a high educational level corresponds to a high health literacy level and vice versa. This finding is also consistent with the 2012 International Assessment of Adult Competencies, in which a high percentage of adults whose educational levels are below the high school level achieve lower health literacy levels than adults with high levels of education do [15]. Hence, the educational attainment of individuals is important. Baker [16] also stated that educational attainment contributes to the development of individual capacity, which is necessary to deal effectively with health information, healthcare personnel, and health care system.

Our findings indicated a gender imbalance with a male:female ratio of 20:68. This ratio at almost 1:3 is slightly higher than the

Table 3
Cross tabulation of health literacy levels, blood glucose level and the presence of acute/chronic diabetic complications.

Health Literacy Level	Blood Glucose level (n)		Acute DM Complication present(n)		Chronic DM complication present(n)	
	Controlled	Uncontrolled	Yes	No	Yes	No
Suggested high likelihood of limited health literacy	13	11	8	16	0	24
Possibility of limited Health Literacy	26	26	28	24	5	47
Adequate Health Literacy	6	6	9	3	0	12
Pearson's Correlation	0.031		0.260		0.054	
P Value	0.771		0.376		0.620	

national prevalence rate in Jamaica, where 3.2% and 6.3% are diabetic males and females, respectively [12]. The relationship between health literacy scores and gender was not significant ($P = 0.84$) in this research. International views on gender and health literacy levels have been inconsistent. The International Assessment of Adult Competencies (2012) reported high health literacy in females, but other studies have shown no difference in health literacy levels between genders [17].

Pearson's correlation revealed no relationship between health literacy scores and health outcome score ($r = 0.185$, $P = 0.084$). This research did not consider the social, cultural, and religious practices of the participants and did not utilize an intervention-based method, and these limitations could affect the results. These findings suggested no relationship between health literacy level and health outcome, but other studies have yielded inconsistent results. Al Sayah, Majumdar, Williams, Robertson, and Johnson [18] systematically reviewed health literacy levels and health outcomes, including knowledge, behavioral, and clinical outcomes, of diabetic patients. In their review, 24 included studies revealed that the relationship between health literacy and clinical outcomes is inconsistent. They also reviewed 13 studies (12 cross-sectional and 1 longitudinal studies) to identify the relationship between health literacy and glycemic control. Studies adjusted for age, gender, race, education, and treatment regimen have reported that high levels of health literacy were associated with good glycemic control. Other studies have indicated that health literacy is not directly associated with glycemic control. The systematic review found that two studies addressed health literacy and self-reported hypoglycemia. One of these studies suggested that low health literacy is related to the high occurrence of hypoglycemia, but the quality of evidence from the studies is low. Two studies have demonstrated health literacy level and self-reported diabetic complications. One study showed no evidence of the association between health literacy and self-reported complications. The other study identified an association among low health literacy, retinopathy, and stroke.

Our research provided valuable information but exhibited some limitations. Our results could not be used for generalization because of the relatively small sample size with predominantly female participants and the single site nature of the study. Our research was also not based on intervention. As such, the true association between health literacy and diabetic health outcomes could not be determined.

5. Conclusion

The study indicates that the possibly limited health literacy and the high likelihood of limited health literacy are predominant in the diabetic population in the type V health center in Western Jamaica. Moreover, demographic factors, such as age and educational level, are significantly associated with health literacy levels ($P < 0.001$). Our findings emphasized that healthcare providers must identify low health-literate diabetic patients, consider the challenges of the aging population and the undereducated, and adjust health communication methods to improve self-management by diabetic patients. Therefore, healthcare providers must be trained to determine and communicate with individuals of limited health literacy levels.

No relationship was identified between health literacy and health outcome. However, future longitudinal intervention-based

studies would be beneficial to describe the association of health literacy and outcome in detail. As partners in health care, health-care providers should be equipped with the knowledge, practice, and beliefs regarding health literacy, and these characteristics must be evaluated to facilitate the development of optimal health promotional activities for diabetic patients.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

Author contribution

Gordon Singh conceived and designed the study. Aiken supervised the entire study. Gordon Singh collected, analyzed and interpreted the data. Gordon Singh drafted the manuscript. Aiken was involved in manuscript revision. Gordon Singh takes responsibility for the paper as a whole.

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