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Health literacy as a key factor in diet self-care in patients with type 2 diabetes mellitus

La alfabetización en salud como factor clave en el autocuidado de la dieta en personas con diabetes mellitus tipo 2

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Resumen

Introducción: Alfabetización en Salud (AS) es un término que proviene del inglés *health literacy*, se refiere al conjunto de habilidades sociales y cognitivas que determinan la capacidad de una persona para acceder, entender y utilizar la información de forma que le permita mantener un buen estado de salud. **Objetivo:** Determinar la asociación entre AS y las conductas de autocuidado en personas con diabetes mellitus tipo 2. **Materiales y métodos:** Estudio cuantitativo, transversal y analítico llevado a cabo en dos centros de salud de atención primaria de la ciudad de Xalapa, Veracruz, México entre agosto-noviembre de 2016. La AS se midió con el *European Health Literacy Survey* (HLS-EU-Q47) y las conductas de autocuidado con el *Summary of Diabetes Self-care Activities* (SDSCA) de Toobert y Glasgow. Se eligieron 90 personas con diabetes mellitus tipo 2 que acudían a consulta. La participación fue voluntaria y previa firma de consentimiento informado. **Resultados:** El autocuidado de la dieta mostró asociación con la AS en su dimensión de promoción de la salud (p=0,018). **Conclusiones:** La AS se relaciona con las conductas de autocuidado, en específico de la dieta; a medida que aumenta la AS mejora el autocuidado.

Palabras clave: Alfabetización en salud; diabetes mellitus tipo 2; autocuidado; educación en salud. (Fuente: DeCS, Bireme).

Abstract

Introduction: Health literacy refers to the set of social and cognitive skills that define the person's ability to access, understand and utilize information in such a way that a healthy condition can be maintained. **Objective:** To determine the association between AS and self-care behaviors in patients with type 2 diabetes mellitus. **Materials and methods:** A quantitative, cross-sectional and analytical study carried out in two primary health care centers in the city of Xalapa, Veracruz-Mexico, from August to November 2016. The AS was measured through the European Health Literacy Survey (HLS- EU-Q47) and the self-care behaviors were assessed using the Summary of Diabetes Self-care Activities (SDSCA) by Toobert and Glasgow. We chose 90 people with type 2 diabetes mellitus who attended consultation at the health care centers. Although their participation was voluntary, participants were required to sign the informed consent form. **Results:** Diet self- care was associated with AS, in a health promotion context (p=0.018). **Conclusions:** AS is directly related to self-care behaviors, specifically to diet.

Key words: Health literacy; diabetes mellitus, type 2; self-care, health education. (Source: DeCS, Bireme).

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Introduction

Health literacy (HL) refers to "the social and cognitive skills that determine the level of motivation and capacity of a person to access, understand and use information in a way that allows him/her to promote and maintain a good health"[1]. HL is part of health education activities that go beyond simple tasks like transmitting information and developing skills to read brochures and schedule medical appointments successfully[2]. HL is more focused on improving people's access to health information and their ability to use it effectively, i.e., HL is aimed at supporting the empowerment process of people and promoting self-care behaviors to control their health. It has been shown that low levels of HL have become a public health problem since they are highly associated with a lack of knowledge about health-related terms, more extensive use of public health services, and less self-care behaviors[3].

Medical treatment of diabetes absorbs nearly 12% of healthcare expenditures worldwide and its mortality rate still remains high, with five million reported deaths in 2014[4]. In Mexico, one of the main reasons why people aged between 20 – 49 years old seek medical attention is diabetes, and this becomes the first reason in people that are 50 years or older. Diabetes is also the most frequent reason why men and women are hospitalized in Mexico[3].

According to the 2016 National Health and Nutrition Survey (ENSANUT in Spanish), 9.4% of the Mexican adult population was clinically diagnosed with diabetes. Even though 87.7% of them have received some type of medical treatment, only 24.5% reported that the treatment was comprehensive, which leaves 3 out of 4 patients without any appropriate diabetic care[5].

The main recommendation for diabetes control is a change in lifestyle with regular physical activity, adequate amount of sleep, avoidance of smoking, and gradual weight loss through a balanced diet prescribed by a nutritionist[6].

Although treatment of the disease has a multidisciplinary approach and requires self-care commitment of the diabetic patient, the latter has been absent from health promotion campaigns in health institutions because they assume that self-care is an inherent capacity of the patient. In addition, diabetic treatment has prioritized medicalization over nutritional components, physical activity, sleep time, among others[7,8].

According to Dorotea Orem, among the requirements of self-care during diabetes onset and progression are: search and assurance of medical assistance, awareness of effects of the pathological condition, and adherence to prescribed medicine[9]. Daily self-care strategies that are important for disease control include observation of symptoms, attachment to and adjustment of medical guidelines, information search, adjustments in nutritional habits, and physical activity[10].

Recent studies have found a relationship between low levels of HL and a deficient care and control of diabetes[11-13]. Similarly, there is evidence supporting an association between the level of understanding of diabetes with self-care behaviors and their impact on health status[14-16].

In Mexico, most studies trying to identify factors related to self-care in patients with diabetes have been focused on social support, degree of literacy and popular beliefs[10,17]. Nevertheless, there are no studies aimed at analyzing literacy level and how it can affect the patient's understanding of health-related messages (e.g., medical indications, disease information, treatment goals, schedule of appointments, etc.) and self-care behaviors. Consequently, improving literacy is an issue that has been overlooked in the implementation of public health programs focused on diabetes prevention and treatment. Therefore, the objective of this work is to determine the association between HL and self-care behaviors in people with diabetes type 2 mellitus.

Materials and methods

Participants

We conducted a quantitative, cross-sectional, and analytical study in two health care centers in the city of Xalapa, Veracruz, Mexico from August to November 2016. Our inclusion criteria were people older than 18 years of age, diagnosed with type 2 diabetes who were medically controlled. The sample size was of 86 people, taking into account a detectable correlation of 0.297 ($p<0.01$) between self-care behaviors and health literacy as shown in previous studies[11]. A confidence level of 95% and a statistical power of 80% was applied.

Instruments

The Spanish version of the European Health Literacy Survey (HLS-EU-Q47) was used to assess HL, which consists of 47 items to identify 3 dimensions: attention and sanitary health, disease prevention, and health promotion. Each dimension, in turn, includes four capacities: (i) to search and access information, (ii) to understand, (iii) know how to evaluate and judge that information and (iv) know how to apply it[18,19].

This instrument classifies health literacy into four levels: inadequate (0-25), problematic (>25-30), sufficient (>33-42) and excellent (>42-50). In order to calculate the health literacy index, the following values were attributed to the answers: 1 (very difficult), 2 (difficult), 3 (easy) and 4 (very easy). The average of each participant was calculated and the following formula was used:

$$Index= (average - 1) * (50/3)^{[18]}$$

Our sample showed a high reliability at global scale (α = 0.91) and was acceptable for the following dimensions: sanitary attention and health (α = 0.67), disease prevention (α = 0.79), health promotion (α = 0.71), to access (α = 0.83), to understand (α = 0.91), to evaluate (0.66) and to apply (0.64).

Self-care was assessed with the Spanish version of the Summary of Diabetes Self-care Activities (SDSCA) that was developed by Toobert, Mampson and Glasgow. This instrument measures self-care behaviors that patients apply during the last seven days. We used the Spanish version that has 12 items and was validated by Vincent, Pasvogel and Barrera in 2007[20].

A questionnaire about personal data was used for sociodemographic variables, while weight, size, BMI, glycemia, and diabetic complications were obtained from the clinical history. In order to determine glycemic control of participants, we used the glycemia level taken the day of the last consult and they were classified according to the Mexican Official Rule 015. This system identifies a "control-requiring patient" when the fasting glycemic level is 70-130 mg/dl, whereas a value of >130 mg/dl is classified as "patient not requiring control"[8].

Data analysis

Statistical Package for Social Sciences (SPSS) version 23 software was used to analyze data. We described quantitative variables (e.g., age, health literacy, and selfcare) through median and standard deviation, whereas qualitative variables (e.g., gender, education level, marital status, and diabetic complications) were analyzed with frequencies and proportions. Analysis of variance (ANOVA) was performed for all dimensions of health literacy and between groups of education level (no education, primary school, junior high school, high school or above) and age ($\leq$ 50 years, 51-65 years, >65 years), and the Levine test was used to compare variances. In order to identify associations between variables, we conducted Pearson correlation coefficient analysis. Linear regression was performed for predictive variables of diet self-care including dimensions and capabilities of health literacy and age. In the multivariate models, variables that followed a normal distribution and fulfilled the other assumptions were included. For all tests, a *p*-value of less than 0.05 was considered significant.

Ethical aspects

The research protocol was evaluated and registered by the Committee of Ethics and Research of the Health Services of Veracruz, and assigned the folio SEIC-007-2016. Participation was voluntary after signing the informed consent form. Collected data was used solely for research purposes and anonymity was kept.

Results

Most of the participants were women (72.2%), with an average age of 59 years old (± 11.3) and married (45.6%); only 40% of them were not involved in any type of relationship (Table 1).

38.9% of the sample were under glycemic control. In relation to the duration of disease, most of them reported that they have been diabetic for at least 10 years after diagnosis. While most of the participants (45.6%) had an inadequate level of HL, only 6.7% reached a sufficient level (Table 2).

We observed significant differences in the averages of all dimensions of health literacy by education level (Table 3). As the education level increased, the HL level was also increased, especially in the attention and care and disease prevention dimensions (Figure 1).

Table 1. General description of the sample

Variable	n=90
Gender	
Men, n (%)	25 (27.8)
Women, n (%)	65 (72.2)
Age (years), average ± SD	59.4 ± 11.3
Education, n (%)	
No education	27 (30)
Primary school	25 (27.8)
Junior high school	25 (27.8)
High school or above	13 (14.4)
Body Mass Index, n (%)	
Normal	21 (23.3)
Overweight	36 (40.0)
Obesity	33 (36.7)
BMI average (kg/m2) ± SD	28.5 ± 4.8
Under glycemic control*	35 (38.9)
Time of duration of diabetes (years) ± SD	9.6 ± 7.6
Under nutrition plan, n (%)	65 (72.2)
Self-care behaviors, average ± SD	
Diet self-care	14.7 ± 5.9
Exercise self-care	3.2 ± 3.9
Glucose self-care	1.3 ± 1.4
Medication intake	6.7 ± 1.0
Diabetic complications, n (%)	
Diabetic retinopathy	33 (36.7)
Diabetic foot	11 (12.2)
Nephropathy	12 (13.3)
Neuropathy	28 (31.1)
Cardiovascular diseases	1 (1.1)

SD= Standard Deviation; *fasting plasma glycemia between 70-130 mg/dl

Table 2. Description of health literacy

Variable	n=90
Dimensions and capacities (average ± SD)	
Attention and care	44.86 ± 5.7
Disease prevention	39.94 ± 4.4
Health promotion	33.50 ± 6.1
To access/obtain	31.24 ± 4.7
To understand/comprehend	30.25 ± 4.1
To process/judge	30.39 ± 3.9
To apply/use	26.77 ± 3.6
Health literacy index, n (%)	
Inadequate	41 (45.6)
Problematic	43 (47.8)
Sufficient	6 (6.7)

SD= Standard Deviation

The capacities and dimensions of HL were compared to age groups through analysis of variance, which showed significant differences in the dimension of health promotion and "to access/obtain" capacity, as follows: there are lower health promotion and reduced capacity to access health information in older participants (Figure 2).

Table 3. Comparison of averages of dimensions and capacities of health literacy according to education levels

Dimension		Average	SD	F	*p*-value
Attention and care	No education	41.68	5.69	6.78	<0.001
	Primary school	44.42	5.89		
	Junior high school	46.39	4.12		
	High school or above	49.42	4.79		
Disease prevention	No education	37.72	3.99	5.19	0.002
	Primary school	39.4	4.27		
	Junior high school	41.4	4.31		
	High school or above	42.67	4.14		
Health promotion	No education	29.45	4.04	8.6	<0.001
	Primary school	33.94	5.54		
	Junior high school	34.88	5.68		
	High school or above	38.82	6.12		
To access/obtain	No education	28.77	3.99	6.72	<0.001
	Primary school	30.45	4.82		
	Junior high school	32.5	4.16		
	High school or above	35.17	3.58		
To understand/comprehend	No education	27.88	3.8	7.32	<0.001
	Primary school	30.38	3.8		
	Junior high school	30.92	3.77		
	High school or above	33.54	2.87		
To process/judge	No education	27.69	3.57	8.21	<0.001
	Primary school	30.8	3.41		
	Junior high school	31.95	3.35		
	High school or above	32.67	3.98		
To apply/use	No education	25.31	2.58	3.43	0.021
	Primary school	26.58	3.76		
	Junior high school	27.44	3.66		
	High school or above	28.92	4.01		

Anova of one factor. Groups: 1) No education, 2) Primary school, 3) Junior high School, 4) High school or above

Diet self-care showed a significant correlation with all dimensions and capacities of HL, with the only exception being "to process/judge". On the other hand, diet self-care was inversely correlated with glucose. The rest of the self-care dimensions did not show significant correlations with HL. Age inversely correlated with the dimensions of HL: disease prevention and health promotion. Also, there was an inverse correlation between age and the capacities of HL: to access/obtain and to process/judge (Table 4).

Given that diet self-care was significantly associated with dimensions of health literacy, we developed a linear regression model to identify predictor variables. The score of the Durbin-Watson test indicated that there was error independence (2.078) and the variance inflation factor (VIF) showed that the non-multicollinearity assumption was met (values between 1.109 and 1.621). We found that the health promotion dimension was significantly associated with diet self-care (Table 5).
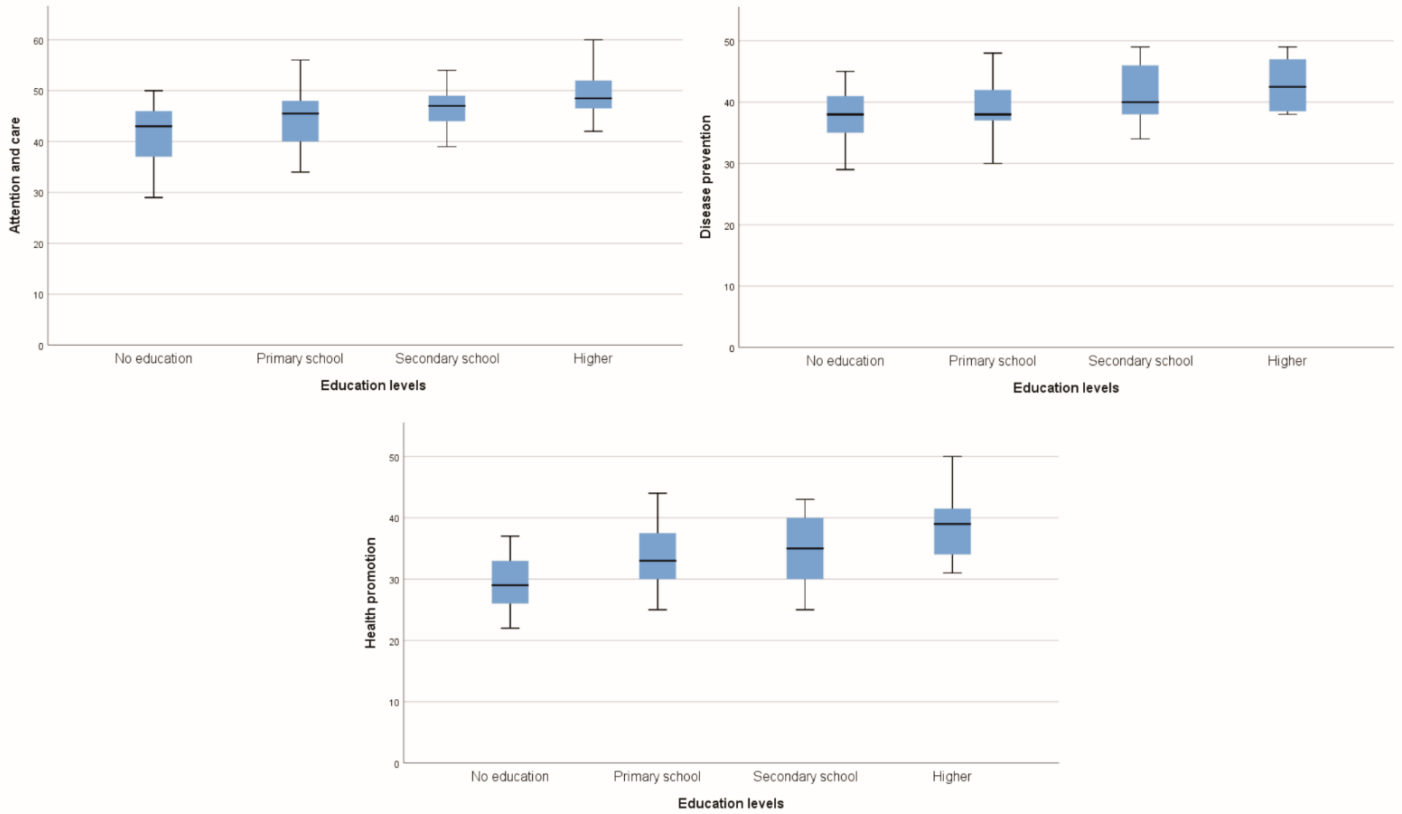

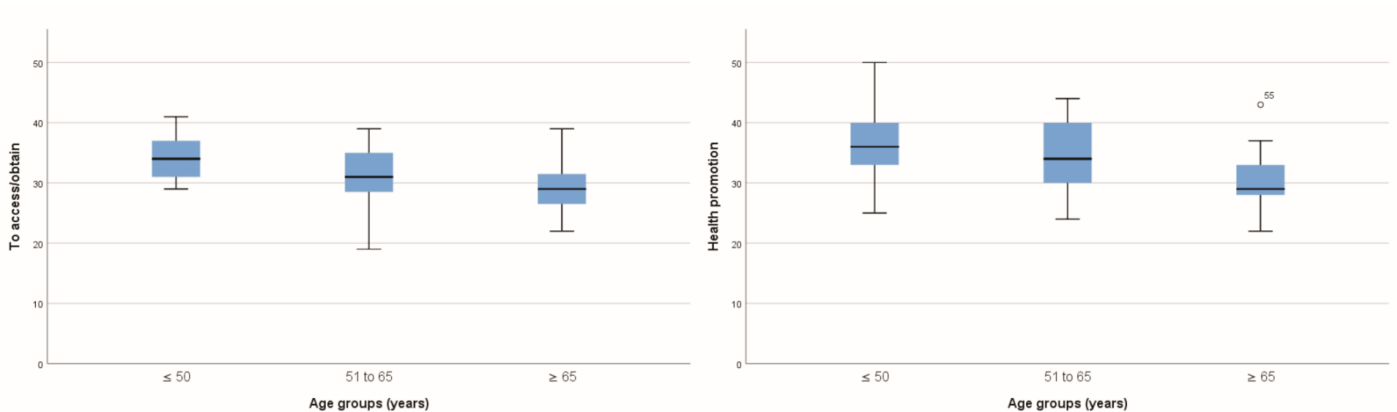**Figure 1.** Averages of dimensions of health literacy according to education levels

Figure 2. Averages of dimensions of health literacy according to age groups

Table 4. Correlations between level of health literacy, glycemia, self-care behaviors, and age

Health Literacy	Diet	Exercise	Glucose monitoring	Foot care	Medication intake	Age
Attention and care	0.280**	0.057	0.193	0.188	-0.055	-0.112
Disease prevention	0.274*	0.207	0.068	0.076	-0.014	-0.216*
Health promotion	0.324**	-0.077	0.235	0.077	0.064	-0.306*
To access/obtain	0.345**	0.055	0.194	0.116	-0.060	-0.303*
To understand/comprehend	0.294**	0.062	0.203	0.160	0.010	-0.195
To process/judge	0.185	-0.047	0.054	0.033	0.000	-0.246*
To apply/use	0.317**	0.175	0.107	0.086	-0.013	-0.085
Glycemia	-0.331**	0.008	0.05	-0.114	0.024	-0.084

**p≤0.001 *p≤0.05

Table 5. Multivariate analysis to determine predictor variables of diet self-care

Health literacy	B	Standard error	β	t	p-value
Constant	-6.580	7.74		-0.850	0.000
Attention and care	0.168	0.16	0.18	1.04	0.303
Disease prevention	-0.212	0.24	-0.17	-0.88	0.384
Health promotion	0.417	0.17	0.43	2.44	0.018
Age	0.132	0.07	0.25	2.00	0.051

Discussion

Studies on HL and its relationship with health improvement have been mainly developed in individuals with chronic noncommunicable diseases like hypertension and diabetes. Also, the impact of HL on adherence to medication and its social implications has been examined[11,15,21]. Some studies conducted in the USA and the Netherlands with type 2 diabetic patients found that

low levels of HL were associated with the presence of disease complications and lack of glycemic control[16,22,23]. Since these approaches mainly focused on a linear relationship between HL and either glycemic control or presence of complications, there is a lack of studies on the mechanisms that mediate these relationships, such as self-care behaviors.

27.8% of our participants had not concluded the first year of primary school, which has been previously associated with both limitations for access to health information and low levels of HL[14,24]. Consequently, it is evident that the population we studied displays deficiencies in reading and writing, which represents barriers to meet the recommendations of health professionals. This is confirmed by our finding which showed that most of the participants demonstrated an inadequate or problematic level of HL.

As for complications derived from diabetes, our patients more frequently reported retinopathy (36.7%). This is consistent with a previous study comparing patients that had high HL with those exhibiting low levels of HL which confirmed that the latter had a two times higher risk of developing retinopathy[22]. In this regard, it is a priority that diabetic patients adopt and improve self-care behaviors to minimize long term complications[25]. Thus, the high retinopathy frequency that we observed needs to be deeply explored in subsequent studies to elucidate whether there is a causal relationship.

In reference to diet self-care, a little more than half of our participants (53.4%) followed a healthy nutrition plan for 3 to 5 days during the last week. Previous studies have revealed that diet self-care activities should be taken on average 4 days a week; they have also suggested that diet self-care is one of the areas that requires more intervention due to its relationship with glycemic control and the fact that patients do not consistently adhere to these practices[13,26]. Thus, it is important to consider that glucose fluctuations and consequent health complications become a risk when diabetic patients keep an appropriate nutrition for only 4 days a week.

On the other hand, diet self-care showed a significant correlation with all dimensions and capacities of HL, the only exception being to process/judge. This is

consistent with what has been reported by Santesmases, *et al.*, who found that poor self-care behaviors are related to low level of understanding of health information[27]. Although this transversal study is not able to establish causality, it points to a relationship that could be useful for prevention and this is the reason why we suggest further longitudinal research.

Likewise, the fact that diet self-care was inversely correlated with the level of blood glucose indicates that those with a higher diet self-care had a lower level of glycemia. To this respect, Lee, *et al.*, have reported that self-care activities, especially those involved in diet and exercise, affect glycemic control in type 2 diabetic patients from Taiwan[28].

HL can be a key component for patients' self-care. The observed correlation between HL and age suggests that older people may face more difficulties in accessing, understanding, and judging health information. This is the reason why we suggest to consider new educational strategies to facilitate the interpretation of such information. In addition, it is important to contemplate that aging requires better assistance strategies involving health professionals and social support networks in order to facilitate that elderly patients follow helpful recommendations by health professionals. Some studies have pointed that having user-friendly methods of intervention based on drawings and images could help them to better understand health promotion issues and thereby improve HL[23,27].

Conclusions

The HL level in type 2 diabetic patients was mostly inadequate, which becomes a problem since they must develop multiple activities related to their disease care and control (glycemia self-monitoring, medication intake, scheduling medical appointments, diet control, etc.). It is essential to promote health literacy strategies especially when low education levels and advanced age are present. This is supported and highlighted by our finding which shows the association between diet self-care and HL, particularly with its dimension of health promotion. This represents an evidence that HL is important for self-care of patients.

Acknowledgments

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. Romero MF, Ruiz-Cabello AL. Alfabetización en salud; concepto y dimensiones. Proyecto europeo de alfabetización en salud. Rev Comun y Salud. 2012;2(2):91-98.
2. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Heal Promot Int. 2000;15(3):259-267.
3. Gutiérrez JP, Rivera-Dommarco J, Shamah-Levy T, llalpando-Hernández S, Franco A, Cuevas-Nasu L, et al. Encuesta nacional de salud y nutrición 2012. Resultados Nacionales. Cuernavaca, México: Instituto Nacional de Salud Pública; 2012.
4. International Diabetes Federation. IDF Diabetes Atlas. 7th ed. Brussels, Belgium: Int Diabetes Fed; 2015. [Citado 01 May 2017]; Disponible en: http://www.diabetesatlas.org/
5. Instituto Nacional de Salud Pública. Encuesta Nacional de Salud y Nutrición de Medio Camino 2016. Informe Final de Resultados [Internet]. México: INSP; 2016 [Citado 25 Abr 2017]. Disponible en: http://www.promocion.salud.gob.mx/dgps/descargas1/doctos_2016/ensanut_mc_2016-310oct.pdf
6. Centro Nacional de Excelencia Tecnológica en Salud. Tratamiento de la diabetes mellitus tipo 2 en el primer nivel de atención [Internet]. México: CENETEC; 2014. [Citado 20 Abr 2017] Disponible en: http://www.cenetec.salud.gob.mx/descargas/gpc/CatalogoMaestro/718_GPC_Tratamiento_de_diabetes_mellitus_tipo_2_/718GER.pdf
7. Olivella-Fernández MC, Bastidas-Sánchez CV, Castiblanco-Amaya MA. La adherencia al autocuidado en personas con enfermedad cardiovascular: abordaje desde el modelo de Orem. Aquichan. 2012;12(1):53-61.
8. Secretaria de Salud, México. Norma Oficial Mexicana NOM-015-SSA2-2010, Para la prevención, tratamiento y control de la diabetes mellitus. México: Secretaria de Salud; 2010.
9. Manzini FC, Simonetti JP. Nursing consultation applied to hypertensive clients: application of Orem's self-care theory. Rev Lat Am Enfermagem. 2009;17(1):113-119.
10. Trujillo-Olivera LE, Nazar-Beutelspacher A. Autocuidado de diabetes: una mirada con perspectiva de género. Estudios Demográficos y Urbanos. 2011;26(3):639-670.
11. Reisi M, Mostafavi F, Javadzade H, Mahaki B, Tavassoli E, Sharifirad G. Impact of health literacy, self-efficacy, and outcome expectations on adherence to self-care behaviors in iranians with type 2 diabetes. Oman Med J. 2016;31(1):52-59.
12. Inoue M, Takahashi M, Kai I. Impact of communicative and critical health literacy on understanding of diabetes care and self-efficacy in diabetes management: a cross-sectional study of primary care in Japan. BMC Fam Pract. 2013;14(1):1-9.

13. Bohanny W, Wu SF, Liu CY, Yeh SH, Tsay SL, Wang TJ. Health literacy, self-efficacy, and self-care behaviors in patients with type 2 diabetes mellitus. J Am Assoc Nurse Pract. 2013;25(9):495-502.

14. Leung AYM, Cheung MKT, Chi I. Relationship among patients' perceived capacity for communication, health literacy, and diabetes self-care. J Health Commun. 2014;19(sup 2):161-172.

15. Friis K, Vind BD, Simmons RK, Maindal HT. The relationship between health literacy and health behaviour in people with diabetes: A Danish population-based study. J Diabetes Res. 2016;2016:1-7.

16. van der Heide I, Uiters E, Rademakers J, Struijs JN, Schuit AJ, Baan CA. Associations among health literacy, diabetes knowledge, and self-management behavior in adults with diabetes: results of a dutch cross-sectional study. J Health Commun. 2014;19(sup2):115-131.

17. Herrera-Lían A, Andrade Y, Hernández O, Manrique J, Faria K, Machado M. Personas con diabetes mellitus tipo 2 y su capacidad de agencia de autocuidado, Cartagena. Av en Enfermería. 2012;30:39-46.

18. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053-1058.

19. Luna Ruiz-Cabello A. La alfabetización en salud de la población española: Variables relacionadas según los resultados del proyecto europeo de alfabetización en salud. Murcia: Universidad de Murcia; 2015.

20. Vincent D, McEwen MM, Pasvogel A. The validity and reliability of a Spanish version of the summary of diabetes self-care activities questionnaire. Nurs Res. 2008;57(2):101-106.

21. Fan JH, Lyons SA, Goodman MS, Blanchard MS, Kaphingst KA. Relationship Between Health Literacy and Unintentional and Intentional Medication Nonadherence in Medically Underserved Patients With Type 2 Diabetes. Diabetes Educ. 2016;42(2):199-208.

22. Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C, et al. Association of health literacy with diabetes outcomes. JAMA. 2002;288(4):475-82.

23. Hersh L, Salzman B, Snyderman D. Health Literacy in Primary Care Practice. Am Fam Physician. 2015;92(2):118-24.

24. Friis K, Lasgaard M, Rowlands G, Osborne RH, Maindal HT. Health literacy mediates the relationship between educational attainment and health behavior: A Danish population-based study. J Health Commun. 2016;21(sup 2):54-60.

25. Gamboa-Moreno E, Ochoa de Retana-García L, del Campo-Pena ME, Sánchez-Perez A, Catalina Martínez-Carazo C, Arbonies-Ortiz JC, et al. A Pilot Study to Assess the Feasibility of the Spanish Diabetes Self-Management Program in the Basque Country. J Diabetes Res. 2016;2016:1-11.

26. Eyüboğlu E, Schulz PJ. Do health literacy and patient empowerment affect self-care behaviour? A survey study among Turkish patients with diabetes. BMJ Open. 2016;6(3):e010186.

27. Santesmases-Masana R, González-de Paz L, Real J, Borràs-Santos A, Sisó-Almirall A, Navarro-Rubio MD. Alfabetización en salud en pacientes con insuficiencia cardiaca atendidos en atención primaria. Atención Primaria. 2017;49(1):28-34.

28. Lee EH, Lee YW, Moon SH. A Structural Equation Model Linking Health Literacy to Self-efficacy, Self-care Activities, and Health-related Quality of Life in Patients with Type 2 Diabetes. Asian Nurs Res (Korean Soc Nurs Sci). 2016;10(1):82-87.