Health Literacy: Key to Self-Care in Diabetes & Hypertension

Mahycol Reynner Harold Bravo-Ramirez[1,*], Danis Yanet Castillo-Esquivel[2]

ABSTRACT

Introduction: Health literacy is a fundamental tool for improving patients self-care, so this study evaluated the association between health literacy and self-care in patients with hypertension and type 2 diabetes mellitus.

Method: Cross-sectional observational study of 200 patients at Hospital Florencia de Mora (June–November 2024), using the Health Literacy Survey Questionnaire (HLS-Q12), Diabetes Self-Management Questionnaire, and Self-Care of Hypertension Inventory. Parametric tests (t-test, ANOVA) and multivariate analyses were applied.

Results: The sample included 47.5% patients with hypertension, 39.5% with diabetes, and 13% with both conditions, mean age 67.54 years (±8.82), female predominance (58.5%). Health literacy demonstrated a moderate correlation with self-care in patients with hypertension ($r = 0.648$; $p < 0.001$) and weak but significant correlation in patients with diabetes ($r = 0.274$; $p < 0.001$). Multivariate analyses revealed that health literacy was associated with 42% of self-care variance in patients with hypertension ($\beta = 0.927$; 95% CI: 0.729–1.125; $p < 0.001$), while in patients with diabetes, together with sex factor, it was associated with 10.6% of variance ($\beta = 0.117$; 95% CI: 0.027–0.207; $p = 0.011$).

Conclusion: Health literacy shows a stronger association with self-care hypertension's patients than in patients with diabetes, suggesting the need for differentiated strategies to improve self-care in both populations.

AUTHOR AFFILIATIONS

[1] Facultad de Ciencias Médicas, Universidad César Vallejo, Trujillo, Peru
[2] Facultad de Humanidades, Universidad Privada del Norte, Lima, Peru
* Corresponding author: Facultad de Ciencias Médicas, Universidad César Vallejo, Trujillo, Peru; mbravor11@ucvvirtual.edu.pe

INTRODUCTION

Health literacy has emerged as a topic of growing importance in the field of public health as a fundamental component in the management of chronic, non-communicable diseases, particularly arterial hypertension and type 2 diabetes mellitus. These pathologies represent a significant challenge for global health systems, with a prevalence of 18.6 million cases of arterial hypertension and 476.6 million in patients with diabetes diagnosed up to 2021 (1, 2).

In the Peruvian context, statistics show that approximately 10% of the population suffers from hypertension and 5.9% from diabetes mellitus. However, adherence rates to treatment are worryingly low, reaching only 61.2% in patients with hypertension and 64.4% in patients with diabetes (2, 3). This situation underscores the imperative need to understand the factors that influence the effective management of these chronic conditions.

Health literacy, conceptualized by Sorensen as the ability of individuals to access, understand, evaluate and apply health information, has become a crucial determinant in health-related decision making (4). This concept, first introduced by Simonds in the 1970s, has evolved significantly to become a central element of modern health care (5, 6).

Sorensen's model establishes four essential competencies that are fundamental to health literacy: accessing, understanding, valuing and applying health information. These competencies are directly intertwined with three critical dimensions: health care, disease prevention and health promotion (4). The interaction between these competencies and dimensions defines the individual's ability to effectively manage his or her health.

On the other hand, self-care, recognized as a vital element since the 19th century, has been theorized by Riegel through his Middle Range Theory, which identifies three fundamental dimensions: maintenance, monitoring and management of self-care (7). This theory emphasizes the importance of factors such as previous experience, motivation, cultural beliefs and access to medical care in the process of self-care.

In the specific context of type 2 diabetes mellitus, self-care requires a multifaceted approach that encompasses four main dimensions according to Schmitt: glucose management, dietary control, physical activity and the use of medical care (8). Each of these dimensions contributes significantly to effective disease control and prevention of complications.

For patients with hypertension, Dickson's model, based on Riegel's theory, establishes three critical dimensions: self-care maintenance, self-care management, and confidence in self-care (9, 10). This theoretical framework emphasizes the importance of self-efficacy and adaptive capacity in the effective management of hypertension.

A thorough understanding of the relationship between health literacy and self-care in patients with hypertension and diabetes mellitus is essential for the development of effective interventions to improve health outcomes. This research aims to explore how different levels of health literacy influence self-care practices, considering the multiple dimensions and competencies involved in both con-structs, with the ultimate goal of optimizing management and control strategies for these prevalent chronic diseases.

MATERIALS AND METHODS

An observational, cross-sectional study was conducted at Hospital Florencia de Mora, a public secondary-level hospital in Trujillo, Peru, serving predominantly low to middle-income patients from urban and peri-urban areas. From June to November 2024, consecutive patients attending outpatient consultations for hypertension and/or diabetes management were invited to participate. Of 370 eligible patients approached, 200 agreed to participate (response rate: 54%). The non-randomized convenience sampling was conducted during regular clinic hours across different days of the week to enhance representativeness. All participants provided prior informed consent after receiving detailed information about the study objectives and procedures.

Likewise, the information collected on sociodemographic variables as well as on health literacy and self-care was carried out in person by means of an anonymous questionnaire, respecting confidentiality and patient well-being, excluding incomplete answers and those who did not wish to participate.

Patients were included if they had a confirmed diagnosis of arterial hypertension (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg) and/or type 2 diabetes mellitus (fasting glucose ≥126 mg/dL or HbA1c ≥6.5%) documented in their medical records, with at least 6 months since diagnosis. Patients with both conditions (n = 26, 13% of the sample) were analysed separately in each disease group according to their specific management needs. Exclusion criteria included cognitive impairment that would prevent understanding the questionnaires, severe complications requiring hospitalization, and pregnancy.

Health literacy was measured using the HLS-Q12 Health Literacy Questionnaire, an abbreviated version derived from the original HLS-EU-Q47 (European Health Literacy Questionnaire). This instrument consists of 12 items assessed on a 4-point Likert scale ranging from 1 (very difficult) to 4 (very easy) and assesses health literacy in three conceptual areas: healthcare, disease prevention and health promotion, with four items per area. The theoretical score range extends from 12 to 48 points, with higher scores indicating higher levels of health literacy and a greater ability to access, understand and apply health information for better self-care and better health decision-making. For this study, the Spanish version validated by Muñoz-Villaverde et al. (2024) was used, which demonstrated strong psychometric properties with a Cronbach's alpha of 0.88 and a McDonald's omega of 0.91; however, no specific cultural adaptation for the Peruvian context was documented. The questionnaire showed good internal consistency in the validation sample, with an interpretation of the scores that follows the original framework: lower scores (12–24 points) indicate significant difficulties in managing health information, average scores (25–36 points) demonstrate moderate health literacy with some

limitations, and the highest scores (37–48 points) show a high capacity for autonomous health management (11).

The Diabetes Self-Management Questionnaire (DSMQ), developed at the Research Institute of the Diabetes Academy in Mergentheim, Germany, was employed to assess self-care behaviors in diabetic patients. This instrument comprises 16 items evaluating four subscales: Glucose Management (5 items), Dietary Control (4 items), Physical Activity (3 items), and Health-Care Use (3 items), plus one additional item assessing overall self-care that contributes only to the Sum Scale. Each item is rated on a 4-point Likert scale ranging from 0 (does not apply to me) to 3 (applies to me very much), with responses converted such that higher scores indicate more effective self-care behaviors. Scale scores are calculated as sums of item scores and transformed to a 0–10 range (raw score/theoretical maximum score × 10), where a score of 10 represents optimal self-care. In practical terms, higher subscale scores reflect better diabetes management practices: superior blood glucose monitoring and medication adherence (Glucose Management), healthier dietary choices facilitating glycemic control (Dietary Control), regular physical activity (Physical Activity), and consistent adherence to medical appointments (Health-Care Use). The original validation by Schmitt et al. (2013) demonstrated robust psychometric properties with excellent internal consistency (Cronbach's alpha = 0.84 for the Sum Scale; subscales ranging from 0.60 to 0.77) and significant correlations with HbA1c values. For this study, the Spanish version was utilized; however, no specific cultural adaptation for the Peruvian context has been documented (8).

Finally, to measure self-care in patients with hypertension, the Self-Care of Hypertension Inventory version 2.0 (SC-HI v.2.0) was employed, originally developed by Dickson et al. (2017). This instrument comprises three independent scales: self-care maintenance (11 items), self-care management (6 items), and self-care confidence (6 items). The Colombian Spanish version validated by Herrera et al. (2021) was used, which demonstrated adequate psychometric properties with Cronbach's alpha coefficients of 0.64 for maintenance, 0.70 for management, and 0.86 for confidence. For the present study, no additional cultural adaptation was required for the Peruvian population. Each scale is scored separately and standardized from 0 to 100 using the following formula: [(obtained score – minimum possible score) × 100] / (maximum possible score – minimum possible score). Higher scores indicate better self-care behaviors, with scores of 70 or above generally considered adequate self-care. In practical terms, higher maintenance scores reflect consistent adherence to health-promoting behaviors and treatment regimens, higher management scores indicate effective recognition and response to elevated blood pressure, and higher confidence scores demonstrate greater self-efficacy in performing self-care activities (10).

Data analyses was performed using SPSS (Statistical Package for Social Sciences) for Windows, version 24.0, employing descriptive statistics such as means and standard deviations (SD) for quantitative variables, while frequencies and percentages were used for qualitative variables. The Kolmogorov-Smirnov normality test confirmed the normal distribution of all continuous variables ($p > 0.05$). Comparative analyses included t-tests for independent samples to examine differences by gender and one-way ANOVA to assess differences between educational levels (primary, secondary, and higher education). Pearson's correlation coefficients were calculated to assess the relationships between health literacy, age, gender, educational level, and self-care outcomes in both patient groups. Separate multivariate regression models were constructed for diabetic and patients with hypertension, with unstandardised beta coefficients (β) and 95% confidence intervals (CI) to indicate the magnitude and direction of associations. For diabetic patients, the final model included health literacy and gender as independent variables, while age and educational level were excluded due to non-significant correlations ($p > 0.05$). In patients with hypertension, health literacy was introduced as the only associated variable, as other sociodemographic variables did not show significant associations with self-care outcomes. Model fit was assessed using the coefficient of determination (R^2), which represents the proportion of variance in self-care explained by the predictive variables. A significance level of $p < 0.05$ was set for all statistical tests.

This study was approved by the Ethics Committee of Hospital Florencia de Mora with Approval number: 1794-2024-1734. All participants provided written informed consent prior to their inclusion in the study. Participation was entirely voluntary, and participants were informed of their right to withdraw at any time without consequences. Confidentiality and anonymity of all data were strictly maintained throughout the study, with all information stored securely and accessible only to the research team. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

As shown in Table 1, a demographic composition of 200 participants between in patients with diabetes and hypertension was revealed, the latter standing out with 54%, with an average age of 67.54 years (±8.82), predominantly female (58.5%), while it was evident that the educational level was mostly high school level (85.5%).

In Table 2, the results show the mean scores of the sociodemographic variables, emphasizing that there is a significant difference in self-care in diabetic patients according to sex (t = 2.25; p = 0.03), highlighting women ($\overline{x}$ = 21.51; SD ± 3.105) over men ($\overline{x}$ = 20.82; SD ± 3.642), while in patients with hypertension the opposite is true. In the level of education, the outstanding means were at the elementary school level both in self-care in diabetic ($\overline{x}$ = 21.38; SD ± 3.739) and in patients with hypertension ($\overline{x}$ = 71.91; SD ± 10.634), but when evaluating differences by ANOVA it did not show significance in relation to the other levels.

For diabetic patients, glucose management presented a mean of 7.5 (±2.153), while physical activity showed the lowest value, with 2.9 (±1.628). In patients with hypertension, the maintenance dimension registered the highest

Tab. 1 Sociodemographic variables, health literacy scores and self-care in patients with hypertension and diabetes.

Sociodemographic variables	N	%	x̄ ± SD
Sex			
Male	83	41.5	
Female	117	58.5	
Morbidity			
Hypertension	108	54	
Diabetes	92	46	
Level of education			
Elementary	21	10.5	
Secondary	171	85.5	
Higher	8	4	
Age			67.54 ± 8.82
Health Literacy			30.8 ± 7.431
Self-care in patients with diabetes			**21.2 ± 3.330**
Glucose management			7.5 ± 2.153
Dietary control			5.6 ± 1.319
Physical activity			2.9 ± 1.628
Self-care in patient with diabetes			5.0 ± 1.233
Self-care in patients with hypertension			**70.8 ± 11.022**
Maintenance			30.2 ± 6.492
Management			19.4 ± 3.618
Confidence			21.2 ± 3.224

N: number of participants; SD: standard deviation.

Tab. 2 Comparison of means between sociodemographic variables and health literacy with self-care in patients with hypertension and diabetes with their dimensions.

Variables	Patients with diabetes		Patients with hypertension	
	Mean ± SD	"t" test / ANOVA (p-value)	Mean ± SD	"t" test / ANOVA (p-value)
Total self-care score	21.20 ± 3.33	–	70.80 ± 11.02	–
Sex				
Male	20.82 ± 3.64	2.25[†] (0.03)*	67.94 ± 12.80	2.43[†] (0.67)
Female	21.51 ± 3.11		72.85 ± 9.20	
Education level				
Elementary	21.38 ± 3.74	0.50[†] (0.61)	71.91 ± 10.63	0.57[†] (0.57)
Secondary	21.29 ± 3.34		70.93 ± 11.13	
Higher	19.33 ± 1.53		64.33 ± 9.61	
Health Literacy	"r" coeficcient	p-value	"r" coeficcient	p-value
Total self-care	0.274	<0.001**	0.648	<0.001**
GM / M	0.27	0.01*	0.61	<0.001**
DC / G	0.16	0.11	0.52	<0.001**
PA / C	–0.11	0.11	0.41	<0.001**
Medical care	0.24	0.01*	–	–

* p < 0.05; ** p < 0.001; [†] ANOVA F-test and "t" test; GM = glucose management, DC = dietary control, PA = physical activity, MC = medical care (Self-care in patients with diabetes); M = maintenance, G = management; C = confidence (Self-care in patients with hypertension). Prior to the multivariate study, correlation was performed in Table 3, which identified health literacy for both and sex with self-care in diabetic patients, which were added to the regression model.

Tab. 3 Correlation of sociodemographic variables, health literacy and self-care in patients with diabetes and hypertension.

	Health literacy	Age	Sex	Level of education
Self-care in patients with diabetes	0.274**	−0.062	0.217*	−0.061
Self-care in patients with hypertension	0.648**	0.004	0.039	−0.070

* Correlation is significant at the 0.05 level (bilateral).
** Correlation is significant at the 0.01 level (bilateral).

mean of 30.2 (±6.492), with confidence showing comparable values of 21.2 (±3.224). Regarding the relationship between health literacy and self-care, a moderate positive correlation was observed in patients with hypertension ($r = 0.648$; $p < 0.001$), indicating that approximately 42% of the variance in self-care could be attributed to health literacy levels. This moderate association was consistently observed across all self-care dimensions in this group. In contrast, diabetic patients exhibited a weak but statistically significant correlation ($r = 0.274$; $p < 0.001$), suggesting that health literacy accounted for only 7.5% of the variance in overall self-care. Among the specific dimensions in patients with diabetes, weak correlations were found with glucose management ($r = 0.27$; $p = 0.01$) and medical care ($r = 0.24$; $p = 0.01$), while dietary control and physical activity showed no significant associations.

Consequently, the multivariate analyses in Table 4, in relation to self-care in in patient with diabetes, sex and health literacy, explains 10.6% of its variance, the latter standing out between both, showing that for each time that health literacy increases, self-care increases by 0.117 times (95% CI: 0.027–0.207; $p = 0.011$). In addition, women will have 1.196 points higher than men in self-care in patients with diabetes. On the other hand, when performing linear regression, regarding self-care in patients with hypertension, 42% of the variance was explained by health literacy ($\beta=0.927$ [95% CI: 0.729–1.125; $p < 0.001$]).

DISCUSSION

This study provided information related to the association between health literacy and self-care in both diseases with a predominance of hypertension. Self-care in diabetic patients was associated with health literacy, which showed the strongest association among the variables studied ($\beta = 0.117$ [95% CI, 0.027–0.207; $p = 0.011$]). This finding is similar to the studies by Butayeva et al. (12) and Su Hyun et al. (13), where health literacy is considered as a tool in which patients can actively participate, thus generating greater self-care, despite the fact that there are studies in South America that refute this (14). On the other hand, a slight relationship was shown with medical care and glucose control, which is reinforced by several studies (12, 15–17), while dietary control and physical activity were not correlated. This is due to the fact that in our country 24.1% of people over 15 years of age have obesity and 37.2% are overweight, while 61.3% have excess weight, being reinforced by the low score obtained ($\overline{x} = 2.9$; SD ± 1.628), suggesting a potential area for intervention by the health system (18).

To address these deficiencies in dietary control and physical activity, targeted health literacy interventions could prove beneficial. Evidence demonstrates that interventions addressing low health literacy – including structured patient education programs, self-care training sessions, and comprehensive disease management strategies – are effective in improving diabetes outcomes (19). Specifically, nurse-led educational programs incorporating visual aids, problem-solving exercises, and teach-back techniques have shown statistically significant improvements in health-promoting behaviors, including medication adherence, dietary management, and complication prevention among patients with diabetes (20). Such interventions could directly address the observed gaps in physical activity and dietary control dimensions identified in this study.

Another of the variables that showed association in the regression model was the female sex ($\beta = -1.196$ [95% CI, −2.47–0.037; $p = 0.045$]) standing out with a better assessment compared to men, which is similar to the study by Abdulaziz et al. (21) ($\beta= 0.20$ [95% CI, 0.10–0.96; $p = 0.015$]). This is explained by the fact that women by nature generally normalize seeking medical help, while male stereotypes encourage resistance to vulnerability. On the other hand, the study by Okoye et al. (22), where in addition to reporting that women have a lower literacy rating, presents 2.96 times more risk of poor self-care ($\beta = 2.96$ [95% CI, 0.70–5.11; $p = 0.140$]). In addition to mentioning that also in the mean a significant difference between

Tab. 4 Multivariate analyses of health literacy, sex, and self-care in patients with diabetes and hypertension.

	Self-care in patients with diabetes					Self-care in patients with hypertension				
	β	β Standard	CI 95%	p-value	R^2	β	β Standard	CI 95%	p-value	R^2
Health literacy	0.117	0.245	0.027–0.207	0.011*	0.106	0.927	0.648	0.729–1.125	0.000**	0.42
Sex[a]	−1.196	−0.177	−2.47–0.037	0.045*		–	–	–	–	–

* Correlation is significant at the 0.05 level (bilateral).
** Correlation is significant at the 0.01 level (bilateral).
[a] Sex: Female = 0; Male = 1.

both sexes was evidenced (t = 2.25; p = 0.03) with women again predominating with higher scores, despite the fact that in other countries such as Nigeria (22) and Iran (23) males had higher scores, due to the social characterization marked in those places.

On the other hand, self-care in patients with diabetes did not correlate with sociodemographic variables such as age, being comparable to the study by Hussein et al. (15), and objected to by others (23–25). This is due to the different pathophysiological alterations such as cognitive alterations, visual impairment, peripheral neuropathy and psychological wear and tear resulting from the chronic disease, which significantly limit the capacity for self-care, in addition to the average age in our study ($\overline{x}$ = 67.54; SD ± 8.82). In the same way, the level of education did not show significance in the results, despite the fact that the highest score was given by patients at the primary level followed by secondary level, in contrast to other studies where the highest score was given by patients at the higher level (22, 23). This is due to the fact that most of the participants were over 60 years of age, where, taking into account the sociocultural level in our environment in past years, in addition to the deficit and economic crisis of the country at that time, hindered the completion of their studies at school, which is currently reflected in our sample represented with 96% between primary and secondary level.

With regard to the self-care in patients with hypertension, literacy showed a stronger association (R^2 = 0.42; β = 0.927 [95% CI, 0.729–1.125; p = 0.000]), being analogous to the study by Davirshpour et al. (26) (β = 0.639 [95% CI, 0.276–0.410; p = 0.000]) and to that of other studies (27, 28). Similarly, a moderate correlation was revealed between the two (r = 0.648; p = 0.000); similar to that of Spriprachot et al. (29) (r = 0.858; p = 0.000). This is due to the fact that timely knowledge of the disease improves the actions in patients with hypertension.

It is worth mentioning that, in contrast to diabetic patients, literacy shows significant correlations with the dimensions of self-care in patients with hypertension, in addition to being associated with a greater proportion of their variance. This inequity is due to the fact that hypertensive older adults achieve better self-care compared to diabetic patients due to the less complex nature of their therapeutic regimen, since the management of arterial hypertension differs greatly from that of diabetes mellitus because blood pressure control is performed by noninvasive devices such as digital blood pressure monitors, which are harmless to the patient, unlike diabetes, which requires digital punctures or invasive tests for its control. Similarly, the burden of disease management varies between conditions, with hypertension presenting fewer lifestyle disruptions compared to diabetes. While the patients with hypertension primarily require medication adherence and periodic blood pressure monitoring, diabetic patients face more complex self-management demands including glucose monitoring, dietary control, physical activity, and medical care as identified by Xie et al. (30). This complexity is reflected in the multiple behavioral dimensions required for diabetes self-care, whereas hypertension management does not necessitate extensive meal planning in social settings or continuous invasive monitoring, resulting in reduced social stigma and enhanced disease acceptance.

CONCLUSION

Health literacy showed significant associations with self-care in both in patients with hypertension and diabetes, although with different magnitudes of association. In patients with hypertension, health literacy was associated with 42% of the variance in self-care, showing significant correlations with all its dimensions, suggesting a stronger and more consistent relationship. In diabetic patients, health literacy, together with gender, was associated with 10.6% of the variance in self-care, where women showed better levels of self-care than men. The results suggest the need to develop differentiated strategies to improve self-care in both populations, considering that health literacy, although important, shows limited association as a single factor with adequate self-care, especially in diabetic patients, where other factors not identified in this study could have a significant influence.

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