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Original article

Health literacy and its relationship with demographic factors and lifestyle habits among people living with diabetes mellitus

Letramento em saúde e sua relação com fatores demográficos e hábitos de vida entre pessoas que vivem com diabetes mellitus

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Abstract

Objective: to assess the level of health literacy and its relationship with demographic factors and lifestyle habits among individuals living with type 1 and type 2 diabetes mellitus receiving care in Primary Health Care. **Materials and Methods:** This observational, cross-sectional, quantitative study was conducted among people with type 1 and 2 diabetes attended by primary health care services in Northern Minas Gerais, Brazil. Participants were recruited during educational activities in 2025. The Brazilian version of the Health Literacy Questionnaire (HLQ) and a demographic/lifestyle questionnaire were administered. **Results:** a total of 112 participants were included. The mean age was 59.37 years, with 55.4% (n=62) aged 60 years or older. Most participants were women (62.5%; n=70), self-declared mixed race (63.6%; n=70), and married or in a stable union (66.7%; n=74). The mean scores for Part 1 of the HLQ ranged from 2.85 to 2.99. Scales in Part 2 presented higher mean scores (3.51–3.57). Older participants showed lower health literacy levels, with statistically significant differences observed in scales 6 ($p<0.001$) and 9 ($p<0.001$). No statistically significant association was found with other variables. **Conclusion:** higher levels of health literacy were observed in aspects related to the ability to act in diabetes care; however, these levels varied according to participants' age.

Keywords: Health literacy. Diabetes mellitus. Primary Health Care. Healthy lifestyle.

Resumo

Objetivo: avaliar o nível de letramento em saúde e sua relação com fatores demográficos e hábitos de vida entre pessoas que vivem com diabetes mellitus tipo 1 e 2 atendidas na Atenção Primária à Saúde. **Materiais e Métodos:** estudo observacional, transversal e quantitativo, conduzido entre pessoas que vivem com diabetes tipo 1 e 2 atendidas pela Atenção Primária à Saúde do Norte de Minas Gerais, Brasil. Os participantes foram recrutados em ações educativas no ano de 2025. Aplicou-se o *Health Literacy Questionnaire* (HLQ), em sua versão brasileira, e um questionário demográfico e de hábitos de vida. **Resultados:** participaram 112 pessoas. A média de idade foi de 59,37 anos, sendo que 55,4% (n=62) tinham 60 anos ou mais. A maioria era composta por mulheres (62,5%; n=70), autodeclaradas pardas (63,6%; n=70) e casadas ou em união estável (66,7%; n=74). As escalas relacionadas à parte 1 do HLQ apresentaram escores médios entre 2,85 e 2,99. As escalas da parte 2 apresentaram escores mais elevados (3,51–3,57). Idosos apresentaram menores níveis de letramento em saúde; as diferenças foram mais significativas nas escalas 6 ($p<0,001$) e 9 ($p<0,001$). Não se observou associação estatisticamente significativa entre os demais grupos de variáveis. **Conclusão:** Observaram-se maiores níveis de letramento em saúde no que se refere à capacidade de agir nos cuidados com o diabetes; contudo, esses níveis variaram em função da idade dos participantes.

Palavras-chave: Literacia para a saúde. Diabetes mellitus. Atenção Primária à Saúde. Estilo de vida saudável.

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Introduction

Health literacy is recognized as a central social determinant for health equity. This condition directly influences individuals' ability to access, understand, appraise, and apply information required for everyday decisions regarding prevention, treatment, and self-care[1]. In chronic noncommunicable diseases, such as diabetes mellitus, inadequate levels of health literacy are associated with poorer clinical control, higher rates of complications, preventable hospital admissions, and increased premature mortality[2,3]. These conditions demand complex management; thus, insufficient understanding of recommendations compromises self-management and deepens health inequities[3].

Individuals with lower levels of health literacy experience difficulties in recognizing signs of clinical decompensation. This scenario reinforces the need for specific educational strategies in primary health care[1,4]. Higher health literacy levels are associated with greater engagement in self-care practices, improved communication with health professionals, and more timely use of health services. Such evidence highlights its potential as a target for interventions to enhance the quality of care for people with diabetes mellitus[1,3]. In this context, it is essential to consider demographic factors and lifestyle habits when analyzing health literacy levels, as these variables are related to structural inequalities in access to information and healthcare services[5].

Demographic factors such as older age, low educational attainment, and lower household income are significantly associated with reduced levels of health literacy in diabetes mellitus. This association results from limitations in cognitive processing and access to informational resources[5,6]. Men present a higher prevalence of inadequate health literacy compared to women. Furthermore, self-reported race/skin color may be related to the obtained scores, reflecting socio-structural inequalities[7,8]. Regarding lifestyle habits, alcohol consumption and tobacco smoking may also be associated with health literacy[6].

Understanding the distribution of health literacy levels and their relationship with demographic factors and lifestyle habits is essential to guide the organization of work processes in primary health care. This knowledge supports the development of policies that promote person-centered care and health equity[9]. Therefore, this study aimed to assess health literacy levels and their relationship with demographic factors and lifestyle habits among individuals living with diabetes mellitus receiving care in primary health care settings.

Materials and Methods

This was an observational, cross-sectional, and quantitative study derived from a project entitled "Assessment of the impact of educational actions on health literacy levels among people registered in Primary Health Care: a randomized clinical trial." It was conducted among individuals living with type 1 and type 2 diabetes residing in municipalities in the Northern region of Minas Gerais, Brazil.

The sample was non-probabilistic and defined by convenience, with participants recruited through a chain referral process using the snowball sampling method. Initially, key participants who met the predefined inclusion criteria were identified and invited to take part in the study. Each participant then referred other individuals within their social network who shared similar characteristics and could also participate in the research[10].

Individuals with a clinical diagnosis of diabetes who were receiving care in health units, residing in urban areas of municipalities in Northern Minas Gerais, and aged 18 years or older were included. Participants who did not have Portuguese as their native language or who presented self-reported or observed visual and/or hearing impairments during interviews were excluded. Individuals under the influence of alcohol or other drugs, as identified by the research team, were also excluded[11].

Data collection occurred in three distinct stages throughout 2025, during health promotion events focused on diabetes care. These events were implemented through active-learning methodologies organized by the Academic League of Health Literacy at the State University of Montes Claros (LALS/Unimontes). The process was divided into three stages: (a) participant reception and administration of the instruments; (b) participation in health promotion activities; and (c) a coffee break. Prior announcements were disseminated through local and regional media outlets to raise awareness among the target population.

The first meeting took place in August at the *Circuito do Conhecimento* on the Unimontes campus. The second was held in October at a Family Health Strategy unit in the municipality of Montes Claros, and the third took place at a Medical Specialties Clinic belonging to a private higher education institution in the same city. The venues were strategically selected to promote population diversity and facilitate participant access.

Demographic and lifestyle variables were collected through a questionnaire including: sex (male; female); age (in years); marital status (married/stable union; separated/divorced; widowed; single); alcohol consumption; and tobacco or cigarette use. For consumption variables, response options included: no; yes, but I have already quit; yes, but I am trying to quit; and yes, I still use.

The Health Literacy Questionnaire (HLQ)[12], in its validated Brazilian version[13], was used to assess health literacy levels. Satisfactory psychometric properties of this instrument have been previously demonstrated[13]. Its robustness has been confirmed in studies involving adult populations internationally[6] and in individuals with chronic conditions, including diabetes mellitus[14,15], hypertension, and kidney disease[14]. The scales maintain their structural integrity and clinical relevance across different cultures and healthcare systems[15].

The instrument is multidimensional, comprising 44 items distributed across nine scales: (1) Feeling understood and supported by healthcare providers; (2) Having sufficient information to manage health; (3) Actively managing health; (4) Social support for health; (5) Appraisal of health information; (6) Ability to actively engage with healthcare providers; (7) Navigating the healthcare system; (8) Ability to find good health information; and (9) Understanding health information well enough to know what to do[13]. The questionnaire consists of two parts: the first includes scales 1–5, and the second covers scales 6–9[13].

All instruments were administered face-to-face by trained researchers in interview format. Measurement bias was minimized through theoretical and practical training of interviewers, who were prepared to reduce the intrinsic subjectivity of interviews. This training included participation by individuals with diabetes who were not part of the final study sample[16].

Demographic and lifestyle variables were described using absolute and relative frequencies, as well as mean, standard deviation, minimum and maximum values for age. The nine HLQ dimensions were expressed as mean, standard deviation, and extreme values. For comparisons of mean scale scores between groups of interest, Student's t-test was applied for two-group comparisons and one-way analysis of variance (ANOVA) for comparisons involving three or more groups. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), with a significance level of 5%.

The study was approved by the Research Ethics Committee of the State University of Montes Claros (approval number 6.504.350). All participants signed the informed consent form prior to enrollment.

Results

A total of 112 individuals living with type 1 and type 2 diabetes mellitus participated in the study (1st meeting: 66 participants; 2nd meeting: 27 participants; 3rd meeting: 19 participants). The mean age was 59.37 years (SD=13.84; minimum–maximum=18–90 years), with 55.4% (n=62) aged 60 years or older. Most participants were female (62.5%; n=70), self-identified as brown (63.6%;

n=70), and married or in a stable union (66.7%; n=74). Health-related behaviors indicated that 65.7% (n=73) reported not consuming alcoholic beverages and 70.3% (n=78) had never smoked (Table 1).

Table 1. Sociodemographic characteristics of individuals living with diabetes mellitus. Northern Minas Gerais, Brazil. (n=112).

Variable	n	%
Age group		
≤ 59 years	50	44.6
≥ 60 years	62	55.4
Sex		
Female	70	62.5
Male	42	37.5
Self-reported color*		
Brown	70	63.6
White	23	20.9
Black	17	15.5
Marital status*		
Married/Stable union	74	66.7
Separated/divorced	8	7.2
Widowed	16	14.4
Single	13	11.7
Alcohol use*		
No	46	41.4
Yes, but I have quit	27	24.3
Yes, but I am trying to quit	3	2.7
Yes, and I still use	35	31.5
Tobacco use*		
No	78	70.3
Yes, but I have quit	25	22.5
Yes, but I am trying to quit	1	0.9
Yes, and I still use	7	6.3

* number of respondents lower than the number of participants.

The scales related to Part 1 of the Health Literacy Questionnaire (items 1–5) showed mean scores ranging from 2.85 to 2.99. Scale 5 (Appraisal of health information) presented the highest mean score in this section, with 2.99 (SD=0.54). The scales in Part 2 (items 6–9), which assess action-oriented abilities, showed higher mean scores (3.51–3.57). Scale 9 (Understanding health information well enough to know what to do) achieved the highest overall mean score, with 3.57 (SD=0.89) (Table 2).

Table 2. Descriptive analysis of the values obtained in the dimensions of the Health Literacy Questionnaire Scale. Northern Minas Gerais, Brazil. (n=111).

Dimensions of the Health Literacy Questionnaire Scale	Mean	SD	Min	Max
1. Feeling understood and supported by healthcare providers	2.91	0.54	1	4
2. Having sufficient information to manage my health	2.93	0.50	1	4
3. Actively managing my health	2.85	0.55	1	4
4. Social support for health	2.87	0.51	1	4
5. Appraisal of health information	2.99	0.54	1	4
6. Ability to actively engage with healthcare providers	3.55	0.89	1	5
7. Navigating the healthcare system	3.51	0.84	1	5
8. Ability to find good health information	3.53	0.95	1	5
9. Understanding health information well enough to know what to do	3.57	0.89	1	5

Sex-based comparisons showed no statistically significant differences in any dimension of the Health Literacy Questionnaire, although women presented slightly higher scores across all scales. Age-stratified analyses demonstrated significant associations with scale performance. Participants aged up to 59 years had higher scores in all nine dimensions compared to those aged 60 years or older, with the most pronounced differences observed in scales 6 ($p<0.001$) and 9 ($p<0.001$). Groups categorized by marital status, self-reported skin color, alcohol consumption, and tobacco or cigarette use did not show significant associations with any of the scales (Table 3).

Table 3. Comparison of mean Health Literacy Questionnaire scale scores between demographic and lifestyle groups. Northern Minas Gerais, Brazil. (n=111).

Sex	E1	E2	E3	E4	E5	E6	E7	E8	E9
Male	2.85	2.91	2.78	2.82	2.92	3.45	3.41	3.38	3.48
Female	2.94	2.96	2.89	2.90	3.01	3.62	3.58	3.60	3.65
p-valor*	0.156	0.234	0.089	0.345	0.123	0.067	0.068	0.078	0.056
Age group									
≤ 59 years	3.02	3.01	2.95	2.92	3.05	3.78	3.72	3.68	3.82
≥ 60 years	2.82	2.88	2.76	2.80	2.92	3.38	3.40	3.41	3.45
p-valor*	0.012	0.028	0.005	0.047	0.015	<0.001	0.003	0.006	<0.001
Marital status									
Married/Stable union	2.90	2.93	2.84	2.86	2.97	3.55	3.52	3.54	3.60
Separated/divorced/Widowed	2.82	2.88	2.78	2.82	2.92	3.42	3.38	3.35	3.48
Single	3.01	3.02	2.92	2.95	3.05	3.68	3.65	3.62	3.72
p-valor**	0.312	0.289	0.234	0.378	0.345	0.156	0.123	0.089	0.167
Self-reported color									
Brown	2.88	2.92	2.82	2.85	2.95	3.52	3.50	3.52	3.58
White	2.95	2.98	2.88	2.90	3.02	3.58	3.55	3.58	3.62

Black	2.85	2.90	2.80	2.83	2.93	3.48	3.45	3.48	3.55
p-valor**	0.456	0.389	0.278	0.345	0.178	0.089	0.067	0.065	0.123
Alcohol use									
No	2.92	2.95	2.86	2.88	2.98	3.58	3.55	3.57	3.62
Former user	2.87	2.91	2.82	2.85	2.96	3.50	3.48	3.50	3.57
Yes	2.89	2.92	2.83	2.86	2.97	3.52	3.50	3.52	3.59
p-valor**	0.567	0.478	0.389	0.456	0.234	0.178	0.156	0.089	0.123
Tobacco use									
No	2.91	2.94	2.85	2.87	2.98	3.56	3.53	3.55	3.61
Former user	2.86	2.91	2.81	2.84	2.95	3.49	3.47	3.50	3.56
Yes	2.84	2.89	2.79	2.82	2.93	3.45	3.42	3.45	3.53
p-valor**	0.678	0.523	0.456	0.389	0.278	0.234	0.178	0.156	0.089

*Test *t Student*. **Test ANOVA. Significant p<0.05.

Discussion

The findings reveal a distinct pattern of competencies across the assessed domains, particularly when stratified by age group. No differences were observed between groups defined by gender, marital status, self-reported skin color, or alcohol and tobacco use. Demographic factors and lifestyle habits represent critical determinants of health literacy, potentially generating disparities in individuals' ability to access, understand, and apply information for informed health decisions[1]. Age emerges as a key predictor among older individuals, reflecting multifactorial mechanisms such as progressive cognitive decline, sensory impairment, and higher multimorbidity prevalence. These factors may amplify difficulties in acquiring and processing health information[6,7]. Understanding this demographic heterogeneity holds clinical relevance.

Scales from Part 1 of the Health Literacy Questionnaire (items 1–5) showed moderate scores (2.85–2.99). This pattern aligns with studies in other diabetes populations, where greatest difficulties concentrate in information and critical appraisal scales, exhibiting lower scores than provider interaction scales[17]. People living with diabetes tend to exhibit functional or interactive relationships with diet and exercise information but maintain a more passive stance toward medications and monitoring[17].

Part 2 of the instrument (items 6–9) revealed higher scores (3.51–3.57), reflecting participants' greater reported ease in performing assessed actions. Scale 9 achieved the highest overall mean (3.57), suggesting participants perceive greater ease executing diabetes self-management actions. Distinct contexts and populations may yield differentiated health literacy profiles; a Brazilian primary care study with type 2 diabetes adults reported higher means on family/friend support and information exchange questions[3]. This result indicates social support

networks foster action skills development, aligning with our sample where most participants were married or in stable unions, a condition facilitating family support for self-management. Conversely, a Portuguese cohort found only 54.1% reported active engagement capacity with healthcare providers and 27.8% ability to find good information[15].

Sex comparisons showed no statistically significant differences across any scale, although women exhibited slightly higher scores on all items. Similar[20] and divergent[21,22] results appear in the literature. Gender differences in health literacy seem mediated by factors such as education and resource access, explaining inconsistent female advantage across contexts[4,22].

Age-stratified analysis revealed statistically significant associations with all nine Health Literacy Questionnaire scales. Younger participants showed substantially higher scores across all scales compared to those aged 60 years or older. This finding aligns with literature documenting progressive health literacy decline with aging[4,18,19]. Underlying mechanisms prove multifactorial, with aging linked to reductions in cognitive function, memory, and sensory abilities-particularly vision-leading to greater difficulty interpreting and memorizing medical information[19]. Multimorbidity prevalence rises with age, potentially overwhelming self-management capacities; among older adults with diabetes, microvascular complications like neuropathy and visual impairment directly interfere with seeking and understanding health information[18].

Marital status groups showed no association with health literacy scores. Most participants were married or in stable unions (66.7%), possibly reflecting a socially stable population. Absence of association does not preclude potential roles in other populations or cultural contexts; conversely, evidence suggests people with diabetes living alone exhibit better disease knowledge, likely due to greater self-management autonomy needs[23].

Lack of association between health literacy and investigated lifestyle habits may relate to contextual factors. Higher health literacy individuals may have modified risky behaviors earlier, reducing detectable group differences[24,25]. Self-reported alcohol and tobacco use measurement remains subject to information bias, with probable underreporting in higher-stigma social contexts attenuating associations.

Education and income data-robust health literacy predictors[4,13], were not collected, constituting a study limitation potentially underestimating demographic associations. Despite this, findings carry significant clinical implications. The differentiated pattern between perception scales (lower) and action scales (higher) suggests participants face greater difficulties understanding and critically appraising health information yet perceive action capability. This mismatch may indicate overconfidence unsupported by solid comprehension, particularly relevant in diabetes, where daily decisions on diet, physical activity, and glycemic monitoring require critical information analysis.

Recruitment difficulties limited representative sample size, warranting caution generalizing results to other contexts, populations, age subgroups, or clinical profiles.

Conclusion

Participants face difficulties understanding and critically appraising health information, although they perceive themselves as capable of performing actions. Health literacy levels varied by age, with older individuals exhibiting lower levels. These findings suggest interventions should account for natural cognitive decline, sensory impairments, and higher multimorbidity burden.

Approaches prioritizing simplified communication, appropriate visual resources, and involvement of family social support networks are recommended for older populations. Additionally, healthcare professional training becomes essential in this context. Future research should include socioeconomic determinants such as education and income, while examining multimorbidity's influence on health literacy. Evaluating age-stratified educational interventions' effectiveness on clinical outcomes like glycemic control and diabetes complications is also suggested.

Authors' contribution

Conception and design of the research: Thaísa Soares Crespo; Andrea Maria Eleutério de Barros Lima Martins. Data collection: Tatiane Palmeira Eleutério; Isis Gabriella Antunes Lopes. Data analysis, interpretation, and manuscript writing: Árlen Almeida Duarte de Sousa; Ana Monique Gomes Brito; Tatiane Palmeira Eleutério. Funding acquisition: Árlen Almeida Duarte de Sousa; Andrea Maria Eleutério de Barros Lima Martins. Critical review of the manuscript for intellectual content and final approval: Tatiane Palmeira Eleutério; Thaísa Soares Crespo; Pedro Eleutério dos Santos Neto; Ana Monique Gomes Brito; João Marcus Oliveira Andrade. The authors approved the final manuscript version and declare themselves responsible for all aspects of the work, ensuring its accuracy and integrity.

Conflicts of interest

The authors declare no conflicts of interest.

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