BJOS
Brazilian Journal of Oral Sciences

Volume 21
2022
e227259

Original Article

Health literacy dimensions among public health service users with chronic diseases in Piracicaba, Brazil, 2019

Carla Fabiana Tenani[1], Manoelito Ferreira Silva Junior[2], Maria da Luz Rosário de Sousa[1,3], Marilia Jesus Batista[1,4,*]

[1] Department of Health Sciences and Children's Dentistry, School of Dentistry of Piracicaba, University of Campinas, Piracicaba, São Paulo, Brazil.

[2] Teacher at the Faculty of Dentistry of the State University of Ponta Grossa, Ponta Grossa, Paraná, Brazil.

[3] University of Zaragoza, Spain.

[4] Faculty of Medicine of Jundiaí, Jundiaí, São Paulo, Brazil.

Corresponding author:
Dr Marília Jesus Batista
Department of Health Sciences and Children's Dentistry, Piracicaba Dental School – University of Campinas. Avenida Limeira, 901 – Piracicaba, SP – Brazil.
Zip Code: 13414-018. P.O. Box 52.
Phone: 55 (19) 2106 5209;
Fax: 55 (19) 2106 5218.
Cell phone: 55 (11)94449 1191.
E-mail: mariliajbatista@yahoo.com.br, mariliamota@g.fmj.br

Editor: Altair A. Del Bel Cury

Received: October 13, 2021
Accepted: May 25, 2022

Aim: This study analyzes factors associated with dimensions of health literacy (HL) functional, communicative and critical among public health service users with chronic non-communicable diseases. **Methods:** A cross-sectional analytical research was carried out in Piracicaba, São Paulo, Brazil, with adults and older adults attending Family Health Units (FHU). Data were collected by oral exam (CPOD and CPI) and a questionnaire on systemic conditions, sociodemographic factors, health behaviors and HLS (HLS-14). The outcomes consisted of functional, communicative, and critical HL dimensions dichotomized by median (high and low), which were analyzed by chi-square test ($p<0.05$) to find associations with the variables studied. **Results:** The study sample comprised 238 FHU users with 62.7 (± 10.55) mean age, of which 47.5% (n=113) showed high functional HL, 50.0% (n=119) high communicative HL, and 46.2% (n=110) high critical HL. High functional HL was associated with men ($p<0.05$). Functional and communicative HL were associated with having higher education ($p<0.001$ and $p=0.018$, respectively). High communicative and critical HL were associated with regular use of dental and medical services ($p<0.05$). Individuals with low functional HL were more likely to present poor tooth brushing ($p=0.020$). High HL (in all three dimensions) was associated with regular flossing and having more teeth ($p<0.05$). **Conclusion:** Functional, communicative and critical HL were associated with health behaviors and clinical outcomes, whereas the functional dimension was also associated with sociodemographic factors. HL dimensions allowed to differentiate health-related factors.

Keywords: Health literacy. Oral health. Chronic disease. Health policy. National health programs. Public health.

Introduction

The demographic and epidemiological transition has widened the age pyramid and increased the prevalence of chronic non-communicable diseases (NCD) in the world population and, subsequently, in the Brazilian population[1]. Of strong behavioral character, these morbidities require co-responsibility between health professionals and patients to control their consequences. In this regard, health literacy (HL) has been considered a key to health promotion and to improve health decision-making[2].

Health Literacy refers to personal knowledge, motivation, and skills to make health decisions throughout life[2]. According to Nutbeam's concept, HL comprises three dimensions: functional, communicative, and critical literacy[3]. Functional HL consists of sufficient basic reading and writing skills to be used in everyday situations. In this dimension, one's role is passive. In the communicative dimension, one seeks information through direct communication with reliable sources, such as health professionals, thus playing an active role. The critical dimension requires more advanced cognitive skills, such as critical analysis to judge whether a health information is appropriate and represents a greater control over one's own health, requiring a proactive role[3,4].

A low HL can have an impact on people's health[5], representing difficulties in making health-related decisions. Studies suggest that adults and older individuals with low HL have less access to and understanding of health information, use medications inappropriately, have less disease prevention and control, with higher rates of morbidity and hospitalization[3]. Conversely, a high HL means being able to take responsibility for the collective health and one's own[6].

Measuring health literacy remains a challenge for health professionals and managers, especially regarding the elaboration of strategies for developing critical thinking[6]. Most of the existing instruments for HL measurement target specific health conditions such as oral health[7] or diabetes[8], and few of them take on a multidimensional approach[9,10]. Most measure only functional HL[11] and one more dimension[12].

Using an instrument able to assess the three HL dimensions, as described by Nutbeam, would thus allow us to identify the different aspects that might interfere in how people manage their health. In a community approach, information on the associated factors of HL dimensions contribute to assist and to plan health strategies in different health contexts, health conditions and/or age groups[13]. The Health Literacy Scale (HLS-14)[10], for example, is a validated instrument that presents three dimensions[14].

Given this context, this study sought to analyze the socio-demographic variables, health behaviors and clinical factors associated with HL dimensions among public health service users with chronic non-communicable diseases.

Materials and methods

Study design and location

A cross-sectional analytical study was carried out with users of the Unified Health System (SUS), with follow up at Family Health Units (FHU) in the municipality of Pira-

cicaba, São Paulo, Brazil, using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines[15].

Location

According to the last census (2010), Piracicaba has a population of 364,571 inhabitants in the urban area, with an adult and older population of 261,567[16].

In 2018, the municipality's health network had 71 Basic Health Units, of which 51 were FHUs. This study included only adult and older adult hypertensive and/or diabetic users.

Sample

We performed a sample calculation considering the prevalence of low HL as 50%, based on Puello (2018)[17], with a margin of error of 0.1 and design effect (deff)=2. Predicting probable losses, we added 20%, totaling 298 participants.

Sample selection

Selection took place in two stages: first, we chose the FHU and then the participants. We performed a probabilistic drawing of eight Family Health Units and then four alternates, considering the number of hypertensive and/or diabetic users in the population registered at the FHU, according to a study by Morgan (2013)[18]. After two FHU refused to participate, two of the alternates were included. We had to include the remaining two alternate FHU to reach the sample size, thus totaling a final sample of 10 participating FHU (Figure 1). Estimating possible losses and refusals, we added 10 participants for each selected FHU, with 40 users taken from the list of hypertensive and/or diabetic patients registered at each health unit.

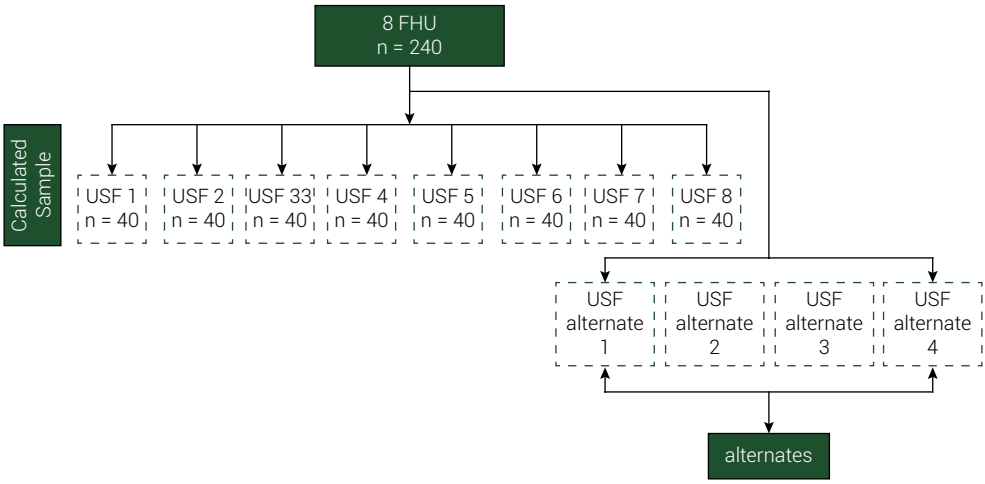

Figure 1. Distribution of the sample of NCD patients (type 2 diabetes and hypertension) and the FHUs selected for the study, adapted from Morgan (2013).

The health teams of each selected FHU randomly distributed 40 invitations to registered users with type 2 diabetes and/or SAH in attendance on the scheduled dates to participate in the study. Data collection took place at the FHU during its opening hours.

Inclusion criteria consisted of patients registered and monitored at the FHU in Piracicaba for type 2 diabetes and/or SAH, who attend the FHU on the scheduled day and time. Exclusion criteria included presence of abscesses or emergency oral health care on the day of collection, refusal to undergo clinical dental examination, and being unable to answer the questionnaire due to physical and/or psychological status (informed by the respective FHU).

Data collection

Clinical data were collected by a dental surgeon (DS) after an 8-hour theoretical and practical training with an experienced examiner, with intra-examiner agreement which, considered within reliability standards, ranged from 90.6% to 100.0% for caries and periodontal disease[19,20].

Clinical oral examinations were performed by the examining board, properly dressed, and under World Health Organization (WHO) criteria, using a sterile periodontal probe and a clinical mirror, with the participant sitting in a chair, under natural light[21], at the FHU offices. The clinical conditions evaluated were visible dental biofilm[22], index of decayed, lost and filled permanent teeth (DMFT) and Community Periodontal Index (CPI)[21].

Interviews were conducted with the participants following a questionnaire with 66 objective questions about behaviors, oral and general health determinants[20,23].

Subsequently, we applied the Health Literacy Scale (HLS-14)[10] validated in Brazilian Portuguese[14]. This instrument presents 14 questions (5 for the functional and communicative dimensions and 4 for the critical dimension), answered by a 5-point Likert-type scale, with the following categories: "strongly disagree," "disagree," "neither agree nor disagree," "agree" and "strongly agree." Total score ranges from 14 to 70 points, with higher scores indicating better HL. In the functional dimension (questions 1 to 5) the score is reversed, where agreeing means having low HL, whereas the questions related to communicative (questions 6 to 10) and critical literacy (questions 11 to 14) refer to high HL[10].

Data on blood pressure and glycemic indexes were collected from the current information in the medical records.

Application of the questionnaire and HL instrument and the clinical oral examination were performed on the same day.

Study variables

Our variable of interested was HL, presented, in each dimension, at two levels: low and high, dichotomized by the median. Cutoff points for high and low levels were 11.0 for the functional dimension, 16.5 points for the communicative dimension, and 14.0 for critical literacy. Figure 2 summarizes the three dimensions[3] and roles[4], namely: functional HL – passive role, communicative HL – active role, and critical HL – proactive role.

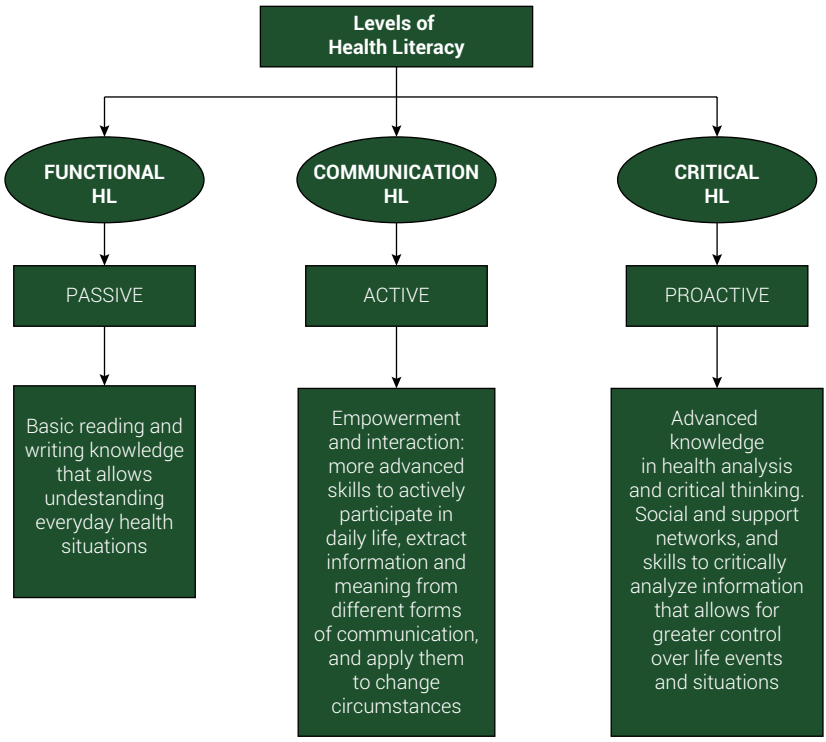

Figure 2. Flowchart of the adapted health literacy dimensions (Kickbusch, 2004; Nutbeam, 2000).

The study variables were grouped into sociodemographic, behavioral, and clinical data. Sociodemographic data consisted of age (considered continuously), gender (man or woman), and schooling level (less than 4 years, 4 full years, or 5 years or more), the cutoff point being elementary school[20,23].

Toothbrushing (up to 2 times/day, 3 or more times/day), flossing (daily use or no daily use), use of medical services (1 time/year [regular use], less than 1 time/year [irregular use]), and use of dental services (1 time/year [regular use], less than 1 time/year [irregular use]) were the health behaviors analyzed[20,23].

Oral and systemic clinical conditions comprised: tooth loss, not considering third molars in calculation performed by codes 4 and 5 of the DMFT index (has 20 teeth or more, or has between 1 and 19 teeth, or edentulous) based on the reduced dental arch theory[24]; presence of periodontal pocket with code 3 or 4 per sextant in the CPI index (> 4mm) (yes or no); blood glucose (up to 126mg/dl, 127mg/dl or more); blood pressure considered normal (systolic [<130mmHg] and diastolic [85-89]); and hypertension (systolic [≥140mmHg] and diastolic [90mmHg or more])[25,26].

Data analysis

We performed a descriptive analysis to obtain the frequency, mean, median and standard deviation, using the Statistical Package for the Social Sciences (SPSS) software version 20.0. Chi-square tests were performed comparing the HL dimen-

sions with the variables studied (p<0.05). Internal consistence was estimated by Cronbach's α (>0.70).

Ethical aspects

Study submitted and approved by the Research Ethics Committee under CAAE 94104618.7.0000.5418. The research started after approval and signing of the Informed Consent Form by the research participants.

Results

A total of 238 users with chronic diseases participated in the six-month data collection period. Two users refused to undergo clinical oral examination, and a sample loss characterized by the non-attendance of 162 invited users, which was expected and calculated in the sample size and selection method.

Mean age was 62.7 (±10.55) years old, and 78.5% (n=187) had lower schooling level. Regarding health behaviors, 68.1% (n=162) of the patients flossed regularly, and 74.8% (n=172) made irregular use of dental services (+1 year). As for the oral clinical exams, 57.6% (n=147) of participants presented a periodontal pocket > 4mm (Table 1).

Table 1. Characteristics of sociodemographic variables, access, health behavior and health conditions among patients with chronic non-communicable diseases (n=238), users of Primary Health Care in Piracicaba, SP, Brazil, 2019.

VARIABLES	SOCIODEMOGRAPHIC	n (%)
Age (years)	Mean	62.7(±10.55)
Gender	Women	**165 (69.3)**
	Men	73 (30.7)
Schooling level	4 years	86 (36.1)
	4 complete years	**101 (42.4)**
	5 years or over	51 (21.4)
HEALTH BEHAVIORS		
Toothbrushing	Up to 2 times/day	103 (43.3)
	3 or more times/day	**135 (56.7)**
Flossing	Daily use	76 (31.9)
	No daily use	**162 (68.1)**
Medical service frequency	Regular use (+ 1 time/year)	**181 (76.1)**
	Irregular use (- 1 time/year)	57 (23;9)
Dental service frequency	Regular use (up to 1 time/year)	58 (25.2)
	Irregular use (+ 1 time/ year)	**172 (74.8)**
CLINICAL CONDITIONS		
[1]Dental loss	Have 20 teeth or more	75 (31.5)
	Between 20 and 27 teeth	**86 (36.1)**
	Edentulous	77 (32.4)

Continue

Continuation

Periodontal pocket (> 4mm)	Yes	**137 (57.6)**
	No	101 (42.4)
Glycemia	Up to 126 mg/dl	113 (47.5)
	127 mg/dl or more	**125 (52.5)**
Systolic Blood Pressure	Up to 139 mmHg	**174 (73.1)**
	140 mmHg or over	64 (26.9)
Diastolic Blood Pressure	Up to 89 mmHg	**210 (88.2)**
	90 mmHg or over	28 (11.8)

Source: Prepared by the authors (2020). Note: (1) Reduced dental arch theory (Armellini and Fraunhofer, 2002).

Regarding health literacy (HL), total mean was 40.4 (± 9.3) points and the median 42.0 points. Analyzed by dimensions, the mean and standard deviation found were 11.0 (±4.4) for functional HL, 16.5 (±4.5) for communicative HL, and 14.0 (±3.4) for critical literacy. Among users, 47.5% (n=113) showed high functional HL, 50% (n=119) high communicative HL and 46.2% (n=110) high critical literacy.

Table 2 presents the distribution of the HL dimensions for each question of the HLS-14 instrument. Most patients showed low HL for all three dimensions: functional (questions 1 to 4) had a higher percentages of agreement; communicative (questions 7 to 10) and critical (questions 11 to 14) had higher percentages of disagreement.

Table 2. Distribution of Health Literacy for each question of the HLS-14 instrument among individuals with chronic non-communicable diseases (n=238), users of Primary Health Care in Piracicaba, SP, Brazil, 2019.

QUESTIONS ACCORDING TO THE HEALTH LITERACY DIMENSIONS*	ANSWERS				
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
	n (%)	n (%)	n (%)	n (%)	n (%)
FUNCTIONAL					
1. I find words I cannot read	**88 (37.0)**	82 (34.5)	39 (16.4)	23 (9.7)	6 (2.5)
2. The print is too small for me	**82 (42.0)**	90 (37.8)	22 (9.2)	22 (9.2)	4 (1.7)
3. The content is very difficult to understand	88 (37.0)	**89 (37.4)**	35 (14.7)	20 (8.4)	6 (2.5)
4. It takes me a long time to read (the instructions)	72 (30.3)	**75 (31.5)**	39 (16.4)	48 (20.2)	4 (1.7)
5. I need someone to help me read	65 (27.3)	45 (18.9)	27 (11.3)	**91 (38.2)**	10 (4.2)
COMMUNICATIVE					
6. I look for information in several places	31 (13.0)	**76 (31.9)**	31 (13.0)	69 (29.0)	31 (13.0)
7. I find the information I need	28 (11.8)	70 (29.4)	36 (15.1)	**83 (34.9)**	21 (8.8)
8. I understand the information found	26 (10.9)	70 (29.4)	45 (18.9)	**80 (33.6)**	17 (7.1)
9. I tell my opinion about the disease to my doctor, family, or friends	10 (4.2)	52 (21.8)	37 (15.5)	**115 (48.3)**	24 (10.1)

Continue

Continuation						
10. I put the information found into practice in my daily life	7 (2.9)	19 (8.0)	47 (19.7)	**139 (58.4)**	26 (10.9)
CRITICAL					
11. I know when the information is good for my case	10 (4.2)	37 (15.5)	52 (28.1)	**110 (46.2)**	29 (12.2)
12. I consider whether the information is true	6 (2.5)	27 (11.3)	35 (14.7)	**143 (60.1)**	27 (11.3)
13. I have knowledge to judge whether the information is reliable	17 (7.1)	72 (30.3)	57 (23;9)	**78 (32.8)**	14 (5.9)
14. I get information that helps me make decisions about how to improve my health	10 (4.2)	61 (25.6)	29 (12.2)	**112 (47.1)**	26 (10.9)

Source: Prepared by the authors (2020). Note: *HLS-14 instrument (Suka et al., 2013), validated in Brazil by Batista et al. (2020).

HL dimensions were associated with the sociodemographic, behavioral, and clinical variables. The bivariate analysis showed that having more than 20 teeth and regular flossing were associated with high HL in all three dimensions (Table 3).

Confirmatory analysis obtained a Cronbach's α = 0.87.

Table 3. Sociodemographic factors, access, health behaviors, and clinical conditions associated with health literacy dimensions among patients with chronic non-communicable diseases (n=238), users of Primary Health Care in Piracicaba, SP, Brazil, 2019.

VARIABLES		HEALTH LITERACY DIMENSIONS (HL)								
		FUNCTIONAL HL			COMMUNICATIVE HL			CRITICAL HL		
		< HL	> HL	p-value	< HL	> HL	p-value	< HL	> HL	p-value
		n (%)	n (%)		n (%)	n (%)		n (%)	n (%)	
SOCIODEMOGRAPHIC										
Gender	Women	95 (57.6)	70 (42.4)	**0.019**	79 (47.9)	86 (52.1)	0.325	86 (52.1)	79 (47.9)	0.440
	Men	30 (41.1)	**43 (58.9)**		40 (54.8)	33 (45.2)		42 (57.5)	31 (42.5)	
Schooling level	4 years	54 (62.8)	32 (37.2)	**<0.001**	50 (58.1)	36 (41.9)	**0.018**	48 (55.8)	38 (44.2)	0.056
	4 complete years	57 (56.4)	44 (43.6)		52 (51.5)	49 (48.5)		60 (59.4)	41 (40.6)	
	5 years or over	14 (27.5)	**37 (72.5)**		17 (33.3)	**34 (66.7)**		20 (39.2)	31 (60.8)	
HEALTH BEHAVIORS										
Toothbrushing	Up to 2 times/day	**63 (61.2)**	40 (38.8)	**0.020**	46 (44.7)	57 (55.3)	0.150	58 (56.3)	45 (43.7)	0.494
	3 or more times/day	62 (45.9)	73 (54.1)		62 (45.9)	73 (54.1)		70 (51.9)	65 (48.1)	
Flossing	Daily use	32 (42.1)	**44 (57.9)**	**0.028**	24 (31.6)	**52 (68.4)**	**<0.001**	28 (36.8)	**48 (63.2)**	**<0.001**
	No daily use	93 (57.4)	69 (42.6)		95 (58.6)	67 (41.4)		100 (61.7)	62 (38.3)	

Continue

Continuation

Medical service frequency	Regular use (+ 1 time/year)	98 (54.1)	83 (45.9)	0.372	101 (55.8)	80 (44.2)	**<0.001**	107 (59.1)	74 (40.9)	**0.003**
	Irregular use (- 1 time/year)	27 (47.4)	30 (52.6)		**39 (68.4)**	18 (31.6)		21 (36.8)	**36 (63.2)**	
Dental service frequency	Regular (up to 1 year since last time)	25 (43.1)	33 (56.9)	0.094	15 (25.9)	**43 (74.1)**	**<0.001**	20 (34.5)	**38 (65.5)**	**<0.001**
	Irregular (+ than 1 year since last time)	96 (55.8)	76 (44.2)		102 (59.3)	70 (40.7)		105 (61.0)	67 (39.0)	
CLINICAL CONDITIONS										
Dental loss	Have 20 teeth or more	29 (38.7)	**46 (61.3)**	**0.013**	25 (33.3)	**50 (66.7)**		27 (36.0)	48 (64.0)	**<0.001**
	Between 20 and 27 teeth	49 (57.0)	37 (43.0)		48 (55.8)	38 (44.2)	**0.002**	47 (54.7)	39 (45.3)	
	Edentulous	47 (61.0)	30 (39.0)		46 (59.7)	31 (40.3)		**54 (70.1)**	23 (29.9)	
Periodontal pocket (> 4mm)	Yes	51 (50.5)	50 (49.5)	0.591	45 (44.6)	56 (55.4)	0.149	**88 (64.2)**	49 (35.8)	**<0.0001**
	No	74 (54.0)	63 (46.0)		74 (54.0)	63 (46.0)		40 (39.6)	61 (60.4)	
Glycemia	Up to 126 mg/dl	61 (54,0)	52 (46,0)	0,668	50 (44,2)	63 (55,8)	0,092	60 (53,1)	53 (46,9)	0,840
	127 mg/dl or over	64 (51,2)	61 (48,8)		69 (55,2)	56 (44,8)		68 (54,4)	57 (45,6)	
Systolic Blood Pressure	Up to 139 mmHg	92 (52.9)	82 (47.1)	0.857	95 (54.6)	79 (45.4)	**0.019**	103 (59.2)	71 (40.8)	**0.006**
	140 mmHg or over	33 (51.6)	31 (48.4)		24 (37.5)	**40 (62.5)**		25 (39.1)	**39 (60.9)**	
Diastolic Blood Pressure	Up to 89 mmHg	112 (53.3)	98 (46.7)	0.492	105 (50.0)	105 (50.0)	1.000	112 (53.3)	98 (46.7)	0.704
	90 mmHg or over	13 (46.4)	15 (53.6)		14 (50.0)	14 (50.0)		16 (57.1)	12 (42.9)	

Source: Prepared by the authors (2019). Note: *Reduced dental arch theory (Armellini and Fraunhofer, 2002)

Discussion

Our study highlighted different associations between the dimensions of health literacy (HL) and sociodemographic factors, health behaviors, and clinical outcomes. A multidimensional evaluation of HL provides a broader approach that can deepen our understanding regarding HL levels and enhance one's health autonomy. Hence, the differential of a multidimensional instrument used to increase measurement sensitivity is evident, allowing more variables associated with the construct to be identified. Despite the research on validated HL tools, few studies have assessed HL dimensions and associated factors[27].

The Health Literacy Scale (HLS-14), validated in Brazilian Portuguese, showed good internal consistency, which is considered adequate when greater than or equal to 0.70. Its psychometrics properties were satisfactory to evaluate health literacy, as showed by Batista et al.[14].

Recent studies using HL instruments associated with NCDs, including oral diseases[27], have assessed mainly reading and writing skills[28], that is, only the functional dimension, disregarding communication and/or broad interaction with health care systems.

In our study, therefore, we chose to use the HLS-14 instrument, a pioneering tool for measuring the three HL dimensions (functional, communicative, and critical), according to Nutbeam (2000)[3]. Rapidly applicable, with reliable psychometric indexes not restricted to a specific area or health condition[10], it can serve both to define clinical protocols more consistent with reality, thus improving people's level of understanding of health information, and to carry out interventions capable of improving health literacy[29]. The questions with the greatest impact on literacy inquired about the difficulty in reading and finding information when needed, and in communicating one's opinion about a health condition and being able to judge whether the information is reliable.

Regarding sociodemographic factors, men showed greater functional literacy, result not found in other studies[30]. Gender inequity is an important social marker in Brazil, especially in a sample of predominantly older adults. This finding may indicate a lack of study opportunities in a generation where these opportunities, including decision-making, were restricted for women. Today, as observed in the 2010 census, women have a high level of schooling, with female school attendance increasing 9.8% in high school compared to men[16]. Studies also highlight that older adults may have limited understanding of health information[31] and greater participation of women due to the feminization of the aging process[32]. But even with this limited functional literacy, the literature points to greater self-care among women, including regular use of health services[33]. Consequently, HL needs to go beyond the functional level.

Our findings showed that high functional and communicative HL were associated with high schooling level. These HL dimensions are related to passive and more active attitudes, such as communication. However, we must consider the cognitive differences, skills, and roles between people with the same educational level[34]. As such, research that exclude illiterate individuals from its sample[30] may lose heterogeneity of results and restrict the understanding of literacy dimensions after all, literacy is one of and not the only aspect analyzed by HL dimensions. Studies show that functional literacy focuses on reading skills, in which the people act more passively in health-related issues[4]. Better reading and comprehension skills are associated with better formative education, which is related to schooling level, a marker and social determinant of health[35]. HL is thus related to one's schooling, reflecting on their health behaviors; consequently, developing health literacy can reduce health inequalities[36].

Regarding oral health behaviors, our results revealed that regular flossing was associated with high levels of all HL dimensions. Lower frequency of tooth brushing was associated with low functional HL, corroborating a recent study[37]. Oral health care and use of dental services can have an impact on clinical health conditions[13].

In our study, regular use of dental services was also associated with communicative and critical HL. The literature points out that, besides greater use of services, individuals with higher HL seek preventive consultations, showing a more active role in

the pursuit of health[4]. An unexpected finding in the present research was the association between low communicative and high critical HL and irregular use of medical services. This result can be explained by the sample characteristic of patients with chronic disease, who need continuous medical follow-up.

The presence of a periodontal pocket was associated with a low critical HL. Oral hygiene is associated with HL and with the risk of developing periodontal disease[38], which can lead to tooth loss.

Tooth loss the worst oral health outcome was associated with all HL dimensions, but remains inconclusive[13]. When associated with risk behaviors for oral diseases, HL becomes relevant as a measure to reduce and control tooth loss, as it can help promote oral and general health, and studies exploring this topic have been performed[39]. Thus, an in-depth knowledge of one's HL level can be an important differentiator in the health-disease process[40].

SAH was associated with communicative and critical HL, as shown by Borges et al. (2019)[30]. Considering that such dimensions of HL are associated with people's proactive abilities[4], blood pressure indices may, in this case, be influenced by aspects that interfere with their discharge, such as: frequency, type, and access to health services, interaction with health professionals, and others[37].

Since the outcomes of oral and general health diseases and aggravations, such as periodontal disease, tooth loss and SAH, are associated with more advanced dimensions of literacy, such as communicative and critical HL, it becomes clear that inequality negatively impacts health.

As for the limitations, we can cite the restricted sample of the study. Nonetheless, it was representative of Unified Health System users with SAH and diabetes, where important associations between the HL dimensions and aspects involving the integral health of these users, often neglected in research[2], were contemplated. Measuring health literacy by a self-report instrument is always challenging, but using a validated questionnaire and proper analysis can control bias, thus improving the quality of the study. Despite the limitations, our exploratory study presents unprecedent results that show a new perspective regarding the application and analysis of health literacy dimensions, reaffirming the need for greater research interest in exploring and improving on this topic in future studies.

Improving population HL can reduce the prevalence of chronic health conditions and the individual and collective impacts of these morbidities. Our results showed that using instruments that cover only functional literacy may be insufficient to assess health literacy, and that the analyzes need to incorporate all three dimensions to formulate safer and more accurate strategies for professionals, managers, and users.

The present work contributes to greater attention to the complexity and challenges involved in advancing the topic, serving as a starting point for future studies and as an aid to evidence-based public health policies that seek to improve the health of SUS users. Thus, future studies should consider HL using a multidimensional approach for public health policies and health promotion strategies.

In conclusion, functional, communicative, and critical HL dimensions were associated with sociodemographic, behavioral and clinical factors among adults and older adults with NCDs, users of public health services in a different way.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest regarding the research, authorship, and publication of this manuscript.

Funding

We thank the Coordination for the Improvement of Higher Education Personnel – CAPES (code 01) for funding this research. The authors thank Espaço da Escrita – Pró-Reitoria de Pesquisa – UNICAMP for the language services provided.

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Authors contribution

It is stated that, for the conception of the manuscript, the authors Marilia Jesus Batista and Carla Fabiana Tenani made substantial contributions, such as the design and elaboration of the work. The author Carla Fabiana Tenani performed the data acquisition. The authors Carla Fabiana Tenani, Manoelito Ferreira Silva Junior, Maria da Luz Rosário de Sousa and Marilia Jesus Batista analyzed and interpreted the data for the study. All authors critically reviewed the intellectual content and final approval of the version to be published. All authors agreed to be responsible for all aspects of ensuring that issues relating to the accuracy or completeness of any part of the work were properly investigated and resolved.

References

1. Hazra NC, Gulliford M. Evolution of the "fourth stage" of epidemiologic transition in people aged 80 years and over: population-based cohort study using electronic health records. Popul Health Metr. 2017 May;15(1):18. doi: 10.1186/s12963-017-0136-2.

2. WHO. Health literacy: the solid facts. Geneva: World Health Organization; 2013.

3. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000 Sep;15(3):259-67. doi: 10.1093/heapro/15.3.259.

4. Kickbusch, I. Improving Health Literacy in the European Union: towards a Europe of informed and active health citizens. In: European Health Forum Gastein. 2004 Oct 8 [cited 2022 Jan 5]. Available from: https://www.infosihat.gov.my/images/Bahan_Rujukan/He_Ict/Improving_Health_literacy.pdf.

5. Antunes ML, Lopes C. [Contributions of health literacy to the promotion and rationalization of health costs]. In: Lopes C, Almeida CV, editors. [Health literacy: models, strategies and intervention]. Lisboa: Edições ISPA; 2018. p.43-63. Portuguese.

6. Lopes C, Almeida CV. [Introduction]. In: Lopes C, Almeida CV, editors. [Health literacy in practice]. Lisboa; 2019. p.17-23. Portuguese.

7. Lima LCM, Neves ÉTB, Dutra LDC, Firmino RT, Araújo LJS, Paiva SM, et al. Psychometric properties of BREALD-30 for assessing adolescents' oral health literacy. Rev Saude Publica. 2019 Aug;53:53. doi: 10.11606/S1518-8787.2019053000999.

8. Sousa AAD, Quintão ALA, Brito AMG, Ferreira RC, Barros AME, Martins L. Development of a health literacy instrument related to diabetic foot. Esc Anna Nery. 2019;23(3):e20180332. doi: 10.1590/2177-9465-ean-2018-0332.

9. Al Sayah F, Williams B, Johnson JA. Measuring health literacy in peoples with diabetes: a systematic review and evaluation of available measures. Health Educ Behav. 2013 Feb;40(1):42-55. doi: 10.1177/1090198111436341.

10. Suka M, Odajima T, Kasai M, Igarashi A, Ishikawa H, Kusama M, et al. The 14-item health literacy scale for Japanese adults (HLS-14). Environ Health Prev Med. 2013 Sep;18(5):407-15. doi: 10.1007/s12199-013-0340-z.

11. Pavão ALB, Werneck GL. [Health literacy in low- and middle-income countries: a systematic review]. Cien Saude Colet. 2021 Sep;26(9):4101-14. Portuguese. doi: 10.1590/1413-81232021269.05782020.

12. Ishikawa H, Takeuchi T, Yano E. Measuring functional, communicative, and critical health literacy among diabetic patients. Diabetes Care. 2008 May;31(5):874-9. doi: 10.2337/dc07-1932.

13. Firmino RT, Martins CC, Faria LDS, Martins Paiva S, Granville-Garcia AF, Fraiz FC, et al. Association of oral health literacy with oral health behaviors, perception, knowledge, and dental treatment related outcomes: a systematic review and meta-analysis. J Public Health Dent. 2018 Jun;78(3):231-45. doi: 10.1111/jphd.12266.

14. Batista MJ, Marques ACP, Silva Junior MF, Alencar GP, Sousa MLR. Translation, cross-cultural adaptation and psychometric evaluation of Brazilian Portuguese version of the 14-item Health Literacy Scale. Cien Saude Colet. 2020 Jul;25(7):2847-57. doi: 10.1590/1413-81232020257.22282018.

15. Malta M, Cardoso LO, Bastos FI, Magnanini MMF, Silva CMFP. STROBE initiative: guidelines on reporting observational studies. Rev Saude Publica. 2010; 44(3): 559-65. doi: 10.1590/S0034-89102010000300021.

16. IBGE. Brazilian Institute of Geography and Statistics Foundation. [Panorama]. Rio de Janeiro: IBGE; 2010 [cited 2022 Jan 4]. Available from: https://cidades.ibge.gov.br/brasil/sp/piracicaba/panorama. Portuguese.

17. Puello SCP. [Evaluation of health literacy] [dissertation]. Piracicaba: School of Dentistry of Piracicaba, University of Campinas; 2018. Portuguese.

18. Morgan BS. [Evaluation of telephone monitoring in the promotion of diabetes self-care in primary health care] [dissertation]. Belo Horizonte: School of Nursing, Federal University of Minas Gerais; 2013. Portuguese.

19. Frias AC, Antunes JLF, Narvai PC.]Reliability and validity of oral health surveys: dental caries in the city of Sao Paulo, 2002]. Rev Bras Epidemiol. 2004;7(2):144-54. Portuguese. doi: 10.1590/S1415-790X2004000200004.

20. Ministry of Health of Brazil. [SB Brazil 2010: national oral health survey: main results]. Brasília: Ministry of Health; 2011 [cited 2019 Apr 29]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/pesquisa_nacional_saude_bucal.pdf. Portuguese.

21. WHO. World Health Organization. Oral health surveys: basic. 5th ed. Genebra: WHO; 2017 [acesso 2019 jan 07]. Available from: https://www.who.int/publications/i/item/9789241548649.

22. Ainamo J, Bay I. Problems and proposals for recording gingivitis and plaque. Int Dent J. 1975 Dec;25(4):229-35.

23. Silva Junior MF, de Sousa MdR, Batista MJ. Prospective cohort of adult oral health in Piracicaba, SP, Brazil. BMC Res Notes. 2019 Apr;12(1):221. doi: 10.1186/s13104-019-4243-y.

24. Armellini D, von Fraunhofer JA. The shortened dental arch: a review of the literature. J Prosthet Dent. 2004 Dec;92(6):531-5. doi: 10.1016/j.prosdent.2004.08.013.

25. Ministry of Health of Brazil. [Strategies for the care of the person with chronic disease: systemic arterial hypertension Brasília]: Ministry of Health; 2013 [cited 2021 Dec 12]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/estrategias_cuidado_pessoa_doenca_cronica.pdf. Portuguese.

26. Queres JFM, Lima BA, Camara MPM, Santos MCC, Taboada GF. [Evaluation of knowledge and attitudes and their relation to diabetes mellitus control parameters]. J Health Connect. 2018;2(1):21-9. Portuguese.

27. Taoufik K, Divaris K, Kavvadia K, Koletsi-Kounari H, Polychronopoulou A. Development of a Greek Oral health literacy measurement instrument: GROHL. BMC Oral Health. 2020 Jan;20(1):14. doi: 10.1186/s12903-020-1000-5.

28. Ghaffari M, Rakhshanderou S, Ramezankhani A, Mehrabi Y, Safari-Moradabadi A. Systematic review of the tools of oral and dental health literacy: assessment of conceptual dimensions and psychometric properties. BMC Oral Health. 2020 Jul;20(1):186. doi: 10.1186/s12903-020-01170-y.

29. Dennis S, Williams A, Taggart J, Newall A, Denney-Wilson E, Zwar N, Shortus T, et al. Which providers can bridge the health literacy gap in lifestyle risk factor modification education: a systematic review and narrative synthesis. BMC Fam Pract. 2012 May;13:44. doi: 10.1186/1471-2296-13-44.

30. Borges FM, Silva ARVD, Lima LHO, Almeida PC, Vieira NFC, Machado ALG. Health literacy of adults with and without arterial hypertension. Rev Bras Enferm. 2019 Jun;72(3):646-53. doi: 10.1590/0034-7167-2018-0366.

31. Chin J, Madison A, Gao X, Graumlich JF, Conner-Garcia T, Murray MD, et al. Cognition and Health Literacy in Older Adults' Recall of Self-Care Information. Gerontologist. 2017 Apr;57(2):261-8. doi: 10.1093/geront/gnv091.

32. Argimon Irani I. de Lima, Lopes Regina Maria Fernandes, Terroso Lauren Bulcão, Farina Marianne, Wendt Guilherme, Esteves Cristiane Silva. [Gender and education: a study through the mini-mental state examination (MMSE) in elderly]. Aletheia. 2012 Dec;38-39:153-61. Potuguese.

33. Mesa MS. Health Care Disparities Between Men and Women With Type 2 Diabetes. Prev Chronic Dis. 2018;15:E46. doi: 10.5888/pcd15.170120.

34. Matsuyama RK, Wilson-Genderson M, Kuhn L, Moghanaki D, Vachhani H, Paasche-Orlow M. Education level, not health literacy, associated with information needs for patients with cancer. Patient Educ Couns. 2011 Dec;85(3):e229-36. doi: 10.1016/j.pec.2011.03.022.

35. Marmot M, Atkinson T, Bell J, Black C, Broadfoot P, Cumberlege J, et al. Fair society, healthy lives: the Marmot Review. Strategic review of health inequalities in England. The Marmot Review; 2010 Feb [cited 2020 Oct 11]. Available from: https://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review/fair-society-healthy-lives-full-report-pdf.pdf.

36. 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(sup2):54-60. doi: 10.1080/10810730.2016.1201175.

37. Batista MJ, Lawrence HP, Sousa MDLR. Oral health literacy and oral health outcomes in an adult population in Brazil. BMC Public Health. 2017 Jul;18(1):60. doi: 10.1186/s12889-017-4443-0.

38. Timková S, Klamárová T, Kovaľová E, Novák B, Kolarčik P, Madarasová Gecková A. Health literacy associations with periodontal disease among slovak adults. Int J Environ Res Public Health. 2020 Mar;17(6):2152. doi: 10.3390/ijerph17062152.

39. Tenani CF, De Checchi MHR, Bado FMR, Ju X, Jamieson L, Mialhe FL. Influence of oral health literacy on dissatisfaction with oral health among older people. Gerodontology. 2020 Mar;37(1):46-52. doi: 10.1111/ger.12443.

40. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Board on Population Health and Public Health Practice; Roundtable on Health Literacy. Integrating Oral and General Health Through Health Literacy Practices: Proceedings of a Workshop. Wojtowicz A, Olson S, editors. Washington (DC): National Academies Press (US); 2019 Jul 31.