

Is oral health literacy associated with conceptions of care and behavior related to the prevention of COVID-19?

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Abstract: The aim of the present study was to investigate the impact of oral health literacy (OHL) on conceptions of care and behaviors related to COVID-19. The sample came from two preliminary cross-sectional studies that determined the level of OHL of parents/guardians of six-to-12-year-old children in two major Brazilian cities (Curitiba and Belo Horizonte). Functional OHL was measured using the Brazilian version of the Rapid Estimate of Adult Literacy in Dentistry (BREALD-30) and the Health Literacy Dental Scale (HeLD-14) for the evaluation of interactive OHL. Participants were recruited through e-mail, social media, and telephone contact. The questionnaire on conceptions of care and behaviors related to COVID-19 was created based on the guidelines of the World Health Organization. Two hundred nineteen individuals participated in the study. There was no significant difference in socioeconomic and demographic variables and in the medians of BREALD and HeLD-14 between the two cities ($P>0.05$). Higher levels of functional OHL were associated with an appropriate conception that individual care affects collective care ($P=0.038$), but with an inappropriate conception of seeking medical assistance in cases of mild symptoms ($P=0.030$). Higher levels of interactive OHL were related to social distancing behavior in the city of Curitiba ($P=0.049$) and in the overall sample ($P=0.040$). It is concluded that functional OHL was associated with two of the investigated conceptions about COVID-19, while interactive OHL was associated with social distancing behavior. These data may suggest that different dimensions of the OHL can have an impact on different aspects of coping with the pandemic.

Keywords: Health Literacy; Behavior; COVID-19.

Introduction

COVID-19 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)¹ and was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020, because of its broad dissemination throughout the world.² Brazil was severely affected by COVID-19, with alarming rates of contagion and mortality. The adoption of social distancing and basic measures for controlling the transmission of SARS-CoV-2, *e.g.*, the use of face masks and disinfection of hands and surfaces of objects, were recommendations

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of health organizations, such as WHO (2020) and CDC (2019), and were widely publicized by all means of communication in Brazil. However, these simple and effective actions for the mitigation of the risk of transmission of the new coronavirus are not always adopted.³

Different factors serve as barriers to the adoption of individual actions for the control of the transmission of COVID-19. In this context, researchers have studied the influence of health literacy on adherence to prevention and control procedures.^{4,5} Health literacy is defined as the capacity to access, process, understand, and utilize information aimed at the promotion and maintenance of a good health status.⁶ Two studies that used instruments for assessing an individual's capacity to perform certain tasks and to follow health advice from different sources observed that individuals with low levels of health literacy are less likely to incorporate basic COVID-19 preventive measures into their daily lives.^{4,5} In the same way, other studies have found that inadequate literacy was associated with a poorer understanding of information and worse attitudes during the pandemic.⁷⁻⁹

As medical and dental systems share some similarities, the concept of health literacy can be adapted to dentistry, which is known as oral health literacy (OHL).¹⁰ Although the literature is consistent regarding the association between health literacy and medical outcomes, no studies have yet investigated the association between OHL and the adoption of individual coronavirus control measures. As oral health is an integral part of general health and well-being, oral health literacy research should include health-related actions and decisions that occur in other contexts.¹¹ In addition, as OHL involves a multidimensional nature,¹² it is important to include different tools that allow a more comprehensive and in-depth assessment of the association between OHL and the different health outcomes.

It is also known that populations and individuals affected by COVID-19 are at greater risk of oral diseases and are more subject to barriers regarding access to oral health services.¹³ The oral cavity is a potential source of COVID-19 transmission¹⁴ and

saliva is the main vehicle of the disease,¹ which underscores the importance of oral health promotion during the pandemic scenario. Thus, the hypothesis of this investigation is that lower levels of OHL are associated with lower adherence to basic control measures against COVID-19, verified by worse conceptions of care and behavior in relation to the disease. Therefore, the aim of the present study was to investigate whether different dimensions of oral health literacy are associated with conceptions of care and behaviors related to COVID-19.

Methodology

Ethical aspects

This study received approval from the institutional review boards of the Division of Health Sciences of Universidade Federal de Minas Gerais (UFMG) and Universidade Federal do Paraná (UFPR). Parents/guardians were invited to participate via e-mail, mobile text messages (WhatsApp), or telephone contact. After agreeing to participate, the volunteers received the statement of informed consent electronically.

Study design and participants

A cross-sectional multicenter study was conducted in two major Brazilian cities (Belo Horizonte in the state of Minas Gerais [MG] and Curitiba in the state of Paraná [PR]) between January and April 2021. The convenience sample was obtained from two recent preliminary cross-sectional studies that measured the OHL of parents/guardians of six-to-12-year-old children. In Belo Horizonte, the sample was composed of 206 parents/guardians of children under care at the pediatric dentistry clinic of the UFMG School of Dentistry. In Curitiba, the sample was composed of 466 parents/guardians – 199 (42.7%) of children under care at the UFPR pediatric dentistry clinic and 267 (57.3%) of children under care at the dental services of primary care units. All parents/guardians were literate and older than 18 years. Parents/guardians who did not have an e-mail address or WhatsApp account and those who did not return contact through text messages or telephone calls were excluded from the study.

Considering the classification of the United Nations Development Program, both cities have a high municipal human development index: 0.810 for Belo Horizonte and 0.856 for Curitiba. Belo Horizonte is located in the southeastern region of Brazil and has a population of 2,521,564 inhabitants. Curitiba is located in the southern region of the country and has a population of 1,908,359 inhabitants.

Socioeconomic and demographic data

The following socioeconomic and demographic data were collected from the parents/guardians: age, sex, marital status (single, married/in a common-law marriage, separated/divorced, widowed), schooling (illiterate, incomplete elementary school education – 1st to 5th grades, elementary school education – 1st to 5th grades, incomplete elementary school education – 6th to 9th grades, elementary school education – 6th to 9th grades, incomplete high school education, high school education, incomplete college education, college education), and monthly family income.

Assessment of oral health literacy

OHL was measured using the Brazilian version of the Rapid Estimate of Adult Literacy in Dentistry (BREALD-30)¹⁵ and Health Literacy Dental Scale (HeLD-14),¹⁶ both of which have been translated and validated for use in Brazil.

BREALD-30 consists of a list of 30 words related to oral health in increasing order of pronunciation difficulty, which are read aloud by the respondent to the interviewer. Correctly and incorrectly pronounced words are given a score of 1 and 0, respectively. The final score ranges from 0 to 30, with higher scores denoting a higher level of OHL.¹⁵

HeLD-14 is the short version of the HeLD-29¹⁶ and measures the capacity to seek, understand, and utilize information for proper oral health decision making. The instrument is composed of 14 items distributed among the following conceptual domains: communication, understanding, receptivity, utilization, support, economic barriers, and access. The response options are arranged into different degrees of difficulty regarding the performance of each task (unable to perform task, could perform task with considerable difficulty, could perform task

with some difficulty, could perform task with little difficulty, and could perform task with no difficulty), with scores from 0 to 4 points. The total score ranges from 0 to 56 points, with higher scores denoting less difficulty in performing the tasks, indicating a higher level of OHL.¹⁶

Online questionnaire addressing conceptions of care and behaviors related to COVID-19

Parents/guardians who agreed to participate in the study received a link to the online questionnaire available on the Survey Monkey platform (in Belo Horizonte) and Google Forms (in Curitiba). The questionnaire addresses conceptions and behaviors related to COVID-19 and was created based on recommendations of the World Health Organization (WHO).¹ The first part of the questionnaire was composed of six items on conceptions of care in the pandemic scenario, whose response options were arranged on a three-point Likert scale (I agree, I neither agree nor disagree, I disagree). This response scale was selected to simplify the reading and understanding of the instrument, as the questionnaire was administered remotely. The second part of the questionnaire was composed of four items addressing behaviors/prevention practices adopted by the respondent in relation to COVID-19, whose response options included the frequency at which each practice was performed (always, sometimes, never).

Statistical analysis

For the comparison of socioeconomic/demographic characteristics and OHL scores (measured using BREALD-30 and HeLD-14) between the samples from the two cities (Belo Horizonte and Curitiba), the chi-square test was used for categorical variables and the Mann-Whitney U test was used for quantitative variables, as the Kolmogorov-Smirnov test revealed non-normal distribution ($P < 0.05$). Socioeconomic/demographic variables were categorized as follows: sex (male or female); marital status (lives with partner [married/in common-law marriage] or lives without partner [single, separate/divorced, widowed]); schooling (< eight years [illiterate, incomplete

elementary education – 1st to 5th grades, elementary education – 1st to 5th grades, incomplete elementary education – 6th to 9th grades, elementary education – 6th to 9th grades] or ≥ eight years [incomplete high school, complete high school, incomplete college education, college education]). The conceptions of care and behavior were grouped according to the category that would indicate greater adherence to the recommendations for the control of the COVID pandemic (“agree”/“always”) and to those categories indicated a low conviction for the adoption of the measures (“neither agree nor disagree” or “disagree”/“sometimes,” or “never”). Associations between OHL (evaluated by both instruments) and conceptions of care /behaviors related to COVID-19 were analyzed using the Mann-Whitney U test. All analyses were performed using the STATA program, version 12.0 (StataCorp LP, College Station, USA), with the significance level set at 5% ($p < 0.05$).

Results

Among the 672 parents/guardians eligible for the study (206 in Belo Horizonte and 466 in Curitiba), 453 did not have an electronic contact (e-mail or *WhatsApp*) or did not answer the messages requesting

their participation. Thus, a total of 219 parents/guardians participated in the study: 109 (47.6%) in Belo Horizonte and 110 (52.4%) in Curitiba. In Belo Horizonte, 50.5% of the participants were male and 51.5% had more than eight years of schooling. In Curitiba, 54.1% of the participants were male and 66.7% had more than eight years of schooling. Average monthly family income was slightly higher in Belo Horizonte (R\$ 3,084.95) as compared to Curitiba (R\$ 3,042.67). No statistically significant differences between the two groups were found regarding socioeconomic and demographic characteristics. Median BREALD-30 scores were 26 and 24 and median HeLD-14 scores were 45 and 45.5 in Belo Horizonte and Curitiba, respectively (Table 1).

In Belo Horizonte, higher levels of OHL measured by BREALD-30 were associated with better conceptions and were related to combating COVID-19 regarding the statement “My protection and the care I take to prevent COVID-19 affect the health of other people” ($p = 0.038$). However, participants in Curitiba with higher BREALD-30 scores had worse conceptions in the item “In cases of fever, dry cough, and tiredness, I should seek immediate medical assistance at a reference healthcare service for COVID-19” ($p = 0.030$).

Table 1. Characteristics of the study population (n = 219).

Variable	Belo Horizonte (n = 109)	Curitiba (n = 110)	p-value
Age (mean, SD)	39.00 (7.97)	37.62 (8.85)	0.128*
Sex (n, %)			
Male	17 (45.9)	20 (54.1)	0.610**
Female	92 (50.5)	90 (49.5)	
Marital status (n, %)			
Lives with partner	81 (49.1)	84 (50.9)	0.725**
Lives without partner	28 (51.9)	26 (48.1)	
Family income (R\$) (mean, SD)	3084.95 (2575.89)	3042.67 (2433.98)	0.714*
Schooling (n, %)			
< 8 years	7 (33.3)	14 (66.7)	0.113**
≥ 8 years	102 (51.5)	96 (48.5)	
BREALD-30 (median, min-max)	26 (10-30)	25 (4-30)	0.129*
HeLD-14 (median, min-max)	45 (16-56)	45.5(12-56)	0.636*

*Mann-Whitney U test; **Chi-square test

Regarding the HeLD-14, no associations were found between the level of OHL and conceptions of care for combating COVID-19 in either city ($p > 0.05$) (Table 2).

Table 3 displays the associations between OHL measured using the BREALD-30 and HeLD-14 and behaviors related to COVID-19. Only the question “Have you maintained social distance (at least 1.5 to 2 meters from other people) to avoid contamination by COVID-19?” was associated with OHL among the participants in the city of Curitiba ($p = 0.049$) and in the overall sample ($p = 0.040$) (Table 3).

Discussion

The present study evaluated the association between OHL and conceptions of care /behaviors related to COVID-19. Although no association was found between OHL and adherence to basic measures for combating the new coronavirus for the majority of the evaluated aspects, it was observed that functional OHL was associated with conceptions about COVID-19, while interactive OHL was associated with social distancing behavior. To the best of our knowledge, no previous studies

Table 2. Associations between level of OHL measured by BREALD-30 and HeLD-14 and care conceptions related to COVID-19 in the cities of Belo Horizonte and Curitiba, Brazil.

Variable	BREALD-30		TOTAL	HeLD-14		TOTAL
	Belo Horizonte	Curitiba		Belo Horizonte	Curitiba	
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	
I should wash/sanitize my hands often even when not visibly dirty using soap and water or 70% alcohol						
I agree	25 (10–30)	25 (4–30)	25 (4–30)	45 (16–56)	45.5 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	27.5 (26–29)	19.5 (18–21)	23.5 (18–29)	33 (30–36)	42.5 (13–52)	34.5 (30–52)
p-value	0.276	0.176	0.854	0.057	0.937	0.179
When coughing or sneezing, I should cover my nose and mouth with the inner part of my elbow and sanitize my hands immediately						
I agree	26 (10–30)	25 (4–30)	25 (4–30)	45 (16–56)	45 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	–	25 (18–28)	25 (18–28)	–	51 (33–55)	45.5 (33–55)
p-value	0.907	0.961	0.803	0.370	0.520	0.786
I should wear a mask in public places and where people circulate.						
I agree	26 (10–30)	25 (4–30)	25 (4–30)	45 (16–56)	45.5 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	–	23.5 (21–26)	23.5 (21–26)	–	46.5 (41–52)	46.5 (41–52)
p-value	–	0.718	0.499	–	0.637	0.555
Social distancing measures (maintaining at least 1.5 to 2 meters of distance) are essential to stop the spread of COVID-19						
I agree	26 (10–30)	25 (4–30)	25 (4–30)	45 (16–56)	46 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	27 (22–28)	23 (18–29)	24.5 (18–29)	49 (41–49)	45 (37–52)	46 (34–52)
p-value	0.711	0.943	0.955	0.658	0.996	0.810
My protection and the care I take to prevent COVID-19 affect the health of other people						
I agree	26 (13–30)	25 (4–30)	25 (4–30)	47 (18–56)	45 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	24 (10–29)	23 (16–28)	24 (10–29)	43 (16–53)	46.5 (22–53)	45 (16–53)
p-value	0.038	0.258	0.052	0.285	0.996	0.381
In cases of fever, dry cough, and tiredness, I should seek immediate medical assistance at a reference health service for COVID-19						
I agree	26 (10–30)	24 (4–30)	25 (4–30)	45.5 (16–56)	45 (12–56)	45 (12–56)
I neither agree nor disagree/Disagree	25 (16–27)	26 (20–30)	25 (16–30)	41 (39–53)	47 (40–56)	45 (39–56)
p-value	0.232	0.030	0.400	0.912	0.224	0.398

Table 3. Associations between level of OHL measured by BREALD-30 and HeLD-14 and behaviors related to COVID-19 in the cities of Belo Horizonte and Curitiba, Brazil.

Variable	BREALD-30		TOTAL	HeLD-14		TOTAL
	Belo Horizonte	Curitiba		Belo Horizonte	Curitiba	
	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)	Median (Min-Max)
Have you avoided touching your face with your hands?						
Always	26 (16–30)	25 (12–30)	25 (12–30)	47 (16–54)	47 (12–56)	47 (12–56)
Sometimes or never	26 (10–30)	24 (4–30)	25 (4–30)	44 (20–56)	44 (17–54)	44 (17–56)
p-value	0.867	0.166	0.382	0.777	0.332	0.074
Do you wash/sanitize your hands often using soap and running water or 70% alcohol?						
Always	25 (13–30)	25 (4–30)	25 (4–30)	46.5 (16–56)	46 (12–56)	46 (12–56)
Sometimes or never	27 (10–29)	25 (16–30)	27 (10–30)	39 (35–49)	45 (27–52)	42 (27–52)
p-value	0.699	0.562	0.523	0.058	0.881	0.192
Do you wear a face mask in public places and in high-circulation areas?						
Always	25.5 (10–30)	25 (4–30)	25 (4–30)	45 (16–56)	45.5 (12–56)	45 (12–56)
Sometimes or never	–	24 (21–28)	27(21–28)	–	48.5 (45–52)	45 (38–52)
p-value	0.385	0.991	0.616	0.404	0.420	0.858
Have you maintained social distancing (at least 1.5 to 2 meters from other people) to avoid contamination by COVID-19?						
Always	26 (10–30)	25 (6–30)	25 (6–30)	46 (18–56)	47 (12–56)	47 (12–56)
Sometimes or never	25 (16–30)	24 (4–30)	24.5 (4–30)	42 (16–54)	43.5 (17–52)	42.5 (16–54)
p-value	0.658	0.292	0.298	0.373	0.049	0.040

have investigated the association between oral health literacy and individual COVID-19 prevention practices. Studies have demonstrated that lower levels of general health literature are related to inappropriate practices regarding basic transmission control measures,^{4,5} as well as poorer understanding of the guidelines for the prevention of the disease.⁷⁻⁹

In recent years, studies have focused on the relationship between health literacy and different oral health outcomes.¹⁷⁻²⁰ A study conducted with parents of American Indians observed that higher levels of health literacy, measured by three items that assessed confidence in reading or completing medical forms, presented lower levels of knowledge and inappropriate behavior in their children’s oral health.¹⁹ Also, another study showed that low health literacy was associated with the use of emergency dental visits in a Brazilian population of adults and older adults.²⁰ These data reinforce the close relationship between general and oral

health. In the case of COVID-19, a strong association between the coronavirus and the oral cavity has been demonstrated, as individuals affected by the virus are at greater risk of oral diseases and have more oral health disparities compared to those without the coronavirus.¹³ Moreover, as saliva is the main source of transmission of the disease,¹⁴ OHL may be an important factor to consider in the formulation of COVID-19 prevention strategies.

Two instruments were used to evaluate conceptions of care and behaviors related to COVID-19 in the present study. OHL is a complex concept that is difficult to measure because it involves multiple aspects.⁶ Different instruments have been proposed for assessing the different dimensions of OHL. BREALD-30 is used to assess the more functional dimension through word recognition and is therefore capable of measuring individual information comprehension skills.¹⁵ HeLD-14 is used to assess the interactive dimension, measuring the capacity

and skills of individuals to perform particular functions and tasks related to oral health.¹⁶ Despite measuring different dimensions, the instruments are complementary and constitute smaller segments of the broader concept of OHL. Future studies are needed to explore whether the impact of different types of OHL on different health behaviors actually varies. Such an understanding will enable a more effective approach, given that interventional strategies could be directed at improving the main skills involved in the outcome of interest.

More appropriate conceptions regarding the impact of self-care on other people were associated with a higher level of functional OHL measured using BREALD-30. The functional dimension of health literacy has been defined as the individual's skills in reading and writing that effectively promote everyday situations.⁶ As official conceptions of care related to COVID-19 have been disseminated especially by the media,²¹ this may suggest that functional OHL plays a more important role. In the case of COVID-19, self-care is a decision-making process that seeks to prevent the disease and promote the maintenance of well-being during the COVID-19 pandemic. Owing to the community transmission of the disease,¹⁴ caring for oneself has a significant impact on the health of surrounding people.²¹ Health literacy was considered a predictor of more effective self-care behaviors in the prevention of COVID-19^{4,5} and was associated with understanding the importance of basic actions that promote one's own health, as well as the health of others.⁷⁻⁹

In contrast, inappropriate answers regarding the immediate search for medical assistance in the case of mild symptoms that may be related to the disease, such as fever, dry cough, or tiredness, were associated with higher levels of OHL measured by BREALD-30. Thus, individuals with higher functional OHL scores reported not seeking care at the onset of the first symptoms in one of the cities evaluated in the present investigation. A recent study has proposed a theoretical model for determining factors of resistance against the adoption of prevention strategies for the new coronavirus. One of the dimensions evaluated in the study was the perception of severity, which was defined as the personal belief related to the

individual process of suffering and the intensity of symptoms. Higher levels of schooling were associated with a lower perception of the severity of the symptoms of the coronavirus as compared to lower levels of schooling, consequently leading to a delay in seeking healthcare services.²² These results can be extrapolated to levels of OHL, as schooling has been reported to be one of the main explanatory factors for functional literacy.²³

Social distancing performed by the population, especially in the early phases of the pandemic, was a fundamental measure for the control of the transmission of the coronavirus, the aim of which was to avoid the contact of healthy individuals with contaminated individuals and surfaces.²¹ Researchers have demonstrated that individuals who believe that social distancing measures are an effective method for reducing transmission of the virus are more likely to adhere to restrictions.^{21,24} The practice of social distancing was associated with higher levels of interactive OHL in the city of Curitiba, as well as in the overall sample. Therefore, individuals with higher HeLD-14 scores had a better understanding of the need for social distancing and demonstrated more appropriate behaviors. Interactive literacy is related to more advanced skills and, along with social skills, can apply new information that results in change.⁶ Previous studies have concluded that higher levels of general health literacy were associated with the adoption of social distancing and respect for the lockdown stipulated by governmental institutions as a COVID-19 control measure.^{7-9,25}

The present study has limitations that should be considered, particularly the participation criteria imposed by the pandemic, which required social distancing. As the study was conducted remotely, some participants were excluded for not having e-mail or a WhatsApp account or for not returning contact made by text messages or calls on cell phones, thus increasing the risk of selection bias. Moreover, the behaviors and conceptions associated with OHL differed in the two cities included in the study. Despite having similar sociodemographic characteristics, the different results found in the two samples may be explained by differences in strategies adopted by different state and municipal

authorities in Brazil for combating the disease. In addition, this study presented a low response rate and used a non-probabilistic sample, which can produce false-negative results.²⁶ This aspect also demonstrates the challenges associated with the development of research in the COVID-19 context. Studies with larger samples and including other Brazilian regions are needed for a better understanding of the association between OHL and conceptions/behaviors related to COVID-19.

Despite the limitations of this study, it can be suggested that OHL can influence the adherence to basic COVID-19 control measures, with lower functional literacy related to worse conceptions of care and lower interactive literacy associated with inappropriate behavior. These findings demonstrate the importance of analyzing factors that are more easily modifiable through basic intervention strategies. However, these results cannot be viewed separately, given that the adoption of preventive measures related to COVID-19 are framed in a broad context linked to behavioral, economic, cultural, political and social factors.²⁷ This establishes the

need for future research methods to be dedicated to incorporating the aforementioned issues by using more complex approaches.

Conclusion

The results of the present study show that oral health literacy is not associated with conceptions of care or behaviors related to basic actions for combating COVID-19 with regard to most of the aspects evaluated. However, functional OHL was associated with two of the conceptions about COVID-19, while interactive OHL was associated with social distancing behavior. These data may suggest that different dimensions of the OHL can interfere in different aspects of coping with the pandemic.

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