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Dental caries, oral health literacy and affordability of fluoride toothpaste in rural and urban populations in Northeast Brazil: a population-based cross-sectional study

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Abstract

Background

The state of Paraíba presents higher dental caries indices compared to the Northeast region of Brazil, with untreated lesions being associated with low levels of oral health literacy. Rural populations may exhibit poorer oral health conditions and reduced access to fluoridated dentifrices. This study compared the prevalence of dental caries, oral health literacy, and access to fluoridated dentifrice between rural and urban areas of a municipality in Northeast Brazil.

Methods

A population-based cross-sectional epidemiological study was conducted in Alhandra, Paraíba, including permanent residents from rural and urban areas matched by age and sex (5, 12, 15–19, 35–44, and 65–74 years). Accessibility to fluoridated dentifrice (FTAR) was assessed through interviews, and oral health literacy (OHL) was evaluated using the BOHAL-AQ instrument in adults. Calibrated examiners (Kappa > 0.60) performed intraoral clinical examinations using the DMFT/dmft indices. Data were analyzed using JAMOVI ($p < 0.05$), applying Pearson and Spearman correlation tests.

Results

The mean dmft/DMFT scores (standard deviation) in the rural area were 2.20 (3.68), 0.91 (0.94), 1.00 (1.05), 6.10 (3.04), and 8.10 (1.66) for the age groups of 5, 12, 15–19, 35–44, and 65–74 years, respectively. In the urban area, the corresponding values were 4.10 (3.11), 0.90 (1.52), 1.10 (1.66), 5.80 (3.74), and 6.90 (4.18), respectively. Inadequate oral health literacy (OHL) was observed in 55% of individuals in the rural area and 50% in the urban area, with no statistically significant difference between areas ($p = 0.331$), although it was associated with educational level ($p < 0.001$). Inaccessibility to fluoridated dentifrice was higher in the rural area (5.88%) compared to the urban area (2.04%). A moderate correlation was observed, indicating that higher OHL was associated with greater accessibility to fluoridated dentifrice in the rural area ($\rho = -0.681$).

Conclusions

Although residents from rural and urban areas of Alhandra, Paraíba, showed similar oral health outcomes, greater vulnerability was observed in the rural area. In this context, both settings require educational strategies and public policies aimed at reducing oral health inequalities.

Introduction

Health literacy refers to the cognitive and social skills that determine individuals' ability to access, understand, and use information for health care and maintenance[1]. Oral health literacy (OHL) is considered a social determinant of health (SDH)[2], playing an essential role in reducing disparities and promoting oral health[3]. Low levels of oral health literacy have been associated with the presence of dental biofilm and untreated caries lesions, a higher likelihood of tooth loss, and seeking dental care primarily due to pain or caries. These findings reinforce the importance of integrating health literacy into oral health promotion and care strategies[4,5].

In Brazil, dental caries is a highly prevalent chronic noncommunicable disease (NCD) that has remained stable over recent decades, with a proportional increase according to age[6–9]. In Paraíba, caries indices (dmft/DMFT) are high across all age groups and exceed the averages observed in the Northeast region, except among 5-year-old children[9]. Oral health policy in Brazil emphasizes regular access to fluorides as a key strategy for caries prevention[10]. Fluoridated dentifrice is the main form of topical fluoride use, being both effective and accessible when used regularly[11]. Its widespread availability in the Brazilian market contributes to the reduction of dental caries[12]. However, studies have highlighted inequalities in access to this product in low- and middle-income countries, including Brazil[13,14].

Accessibility to fluoridated dentifrice is defined as the ability to afford the recommended annual dose based on an individual's daily income; when the cost exceeds one day's wage, the product is considered unaffordable[13,14]. In this context, vulnerable populations, such as those living in rural areas, are more exposed to inaccessibility. In Paraíba, rural areas face extensive geographic distances, transportation barriers, seasonal access, lack of water supply, and socioeconomic deprivation, all of which hinder the provision of dental services within the Family Health Strategy (FHS) and specialized care[15].

The last national epidemiological survey to include rural populations in Brazil was conducted more than 20 years ago (SB Brasil 2000), resulting in limited data availability on oral health in these areas. Therefore, studies are needed to jointly assess dental caries, oral health literacy, and accessibility to fluoridated dentifrice, particularly in small municipalities in Northeast Brazil.

In this context, the present study aimed to evaluate and compare dental caries, oral health literacy, and accessibility to fluoridated dentifrice among residents of rural and urban areas of the municipality of Alhandra, Paraíba. The study hypothesis is that rural populations present a higher prevalence of dental caries, lower levels of oral health literacy, and reduced accessibility to fluoridated dentifrice compared to urban populations.

Methods

Study design

This is a comparative cross-sectional observational epidemiological study on dental caries conducted in rural and urban areas of the municipality of Alhandra, Paraíba, Brazil. A survey was carried out through interviews using a standardized questionnaire that included identification data, socioeconomic and

behavioral conditions, as well as the fluoride toothpaste affordability ratio (FTAR). In addition, intraoral clinical examinations were performed to assess the DMFT/dmft index, and a questionnaire was applied to evaluate oral health literacy (OHL) among adults.

Study setting

Paraíba, located in the Northeast region of Brazil, has a population of 3,974,687 inhabitants distributed across 223 municipalities, subdivided into four mesoregions: Mata Paraibana, Agreste Paraibano, Borborema, and Sertão Paraibano. The state has the sixth lowest Human Development Index (HDI = 0.698) and one of the lowest average monthly household per capita incomes in the country[16][17].

The municipality of Alhandra, located in the Mata Paraibana region, has a medium HDI (0.582) and a population of 18,007 inhabitants (11,153 urban and 6,854 rural)[16]. The selection of the municipality and its rural and urban areas was based on convenience sampling, through a partnership with the Municipal Health Department, and considered criteria such as accessibility, availability of telephone and internet services, and the presence of a cooperative oral health team.

Study population

According to information provided by the Alhandra Municipal Health Department, the rural area of Taperubus comprises 629 individuals, of whom 161 were within the age groups included in this study. A census-based sample was used following the SB Brasil (2004) guidelines[7]. Permanent residents of the rural area aged 5, 12, 15–19, 35–44, and 65–74 years were included.

Urban participants were selected using matching by age and sex (exact matching or nearest neighbor matching)[18]. As the entire eligible rural population was included, no prior sample size calculation was performed. Exclusion criteria were absence on the day of data collection and the presence of flu-like symptoms. The final sample consisted of 100 individuals: 50 from the rural area and 50 from the urban area.

Study variables

The study outcomes were dental caries prevalence, assessed using the decayed, missing, and filled teeth index (dmft/DMFT), oral health literacy (OHL), and accessibility to fluoridated dentifrice (FTAR). The main independent variables included place of residence (rural or urban), age group, sex, and educational level. The study also included potential associated factors such as socioeconomic and behavioral variables (income, access to water, use of dental services, and oral hygiene habits).

Data collection

Data collection was conducted between March and December 2024. Examiners performed home visits and assessments at Primary Health Care Units (PHCUs). After signing the informed consent/assent forms, participants received an oral hygiene kit, underwent supervised toothbrushing, and received an intraoral clinical examination. Subsequently, they completed the interview questionnaire and, for adults, the oral health literacy instrument. The questionnaire used in this study was developed based no previously validated instruments in the literature, with adaptations to the context of the population. Relevant sources have been cited accordingly. A pilot study was conducted to assess the clarity and applicability of the questionnaire. The final version of the questionnaire is provided as a supplementary file (Supplementary File 1).

Examiners were calibrated for caries detection based on SB Brasil (2000) manuals[19] and video training provided by the Oral Biology Laboratory (LABIAL-UFPB). Calibration, conducted both in lux and in vivo, was considered adequate when Kappa > 0.60[20]. Clinical examinations for dental caries (DMFT/dmft) were performed after supervised toothbrushing, under natural light, using a dental mirror and WHO probe. SB Brasil (2024) diagnostic codes for crown, root, and treatment needs were recorded[9].

The interview included identification data, socioeconomic status (income, access to water, government assistance benefits), use of oral health services, oral hygiene habits, and data required for FTAR calculation. FTAR was estimated based on an adaptation of Gkekas et al. (2022)[14], by multiplying the price per gram of fluoridated dentifrice by 182.5 and dividing the result by the individual's daily wage.

A value of 182.5 g was considered the recommended annual consumption of fluoridated dentifrice. FTAR ≤ 1 indicates affordability, whereas FTAR > 1 indicates unaffordability. For minors, interviews were conducted with parents or guardians, while adults responded independently.

OHL was assessed using the BOHL-AQ questionnaire[21], validated for Brazil by Almeida et al. (2022)[22], applied to individuals aged 35–44 and 65–74 years. The instrument consists of 17 items across four domains: reading comprehension, numeracy, listening, and decision-making. Each correct answer corresponds to one point. Scores were categorized as inadequate (0–9), marginal (10–11), and adequate (12–17).

Bias control

Strategies were adopted to minimize potential biases, including examiner calibration, use of validated instruments appropriate for the studied age groups, and a pilot study to standardize data collection procedures. However, self-reported information may be subject to information bias.

Statistical analysis

Data were organized using Microsoft Excel and analyzed in JAMOVI. Means, standard deviations, frequencies, and FTAR were calculated. Categorical variables were presented as absolute numbers and percentages, and numerical variables as means and medians (quartiles).

Normality was assessed using the Shapiro–Wilk test ($p < 0.05$). For non-normally distributed data, Mann–Whitney U and Kruskal–Wallis tests were used, with Dwass–Steel–Critchlow–Fligner post hoc comparisons. For normally distributed data, Student's t-test and ANOVA were applied, followed by Tukey's post hoc test. Correlations between DMFT, FTAR, and OHL were assessed using Pearson (for normal data) or Spearman (for non-normal data) coefficients. No missing data were observed.

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

Ethical considerations

This study was approved by the Research Ethics Committee involving Human Subjects of the Federal University of Paraíba (CAAE: 77237124.6.0000.5188; Approval No. : 6,669,027), in accordance with the Declaration of Helsinki and Resolution No. 466/2012 of the Brazilian National Health Council[23]. All participants provided written informed consent and assent.

Results

The sample consisted of 100 participants, with 50 residents from rural areas and 50 from urban areas. Participants from both settings showed similar sociodemographic profiles, with a predominance of males among children and females in the remaining age groups, family income ≤ 2 minimum wages, access to piped water, and dental visits in public services within the last six months. Receipt of government benefits was reported by at least half of the participants, except among older adults.

Dental caries experience (dmft/DMFT)

Mean dmft/DMFT values by age group and locality are presented in Table 1. Participants from the rural area showed lower mean dmft at age 5, similar DMFT means among adolescents aged 12 and 15–19 years, and higher DMFT means among adults (35–44 years) and older adults (65–74 years) compared to those from the urban area.

A statistically significant difference was observed only for the "Filled" component among adolescents aged 15–19 years ($p = 0.036$), which remained significant after adjustment for multiple comparisons ($p = 0.03$).

Table 1. dmft/DMFT values across age groups in rural and urban areas of Alhandra, Paraíba, Brazil.

Categories	Age Groups									
	Rural Area					Urban Area				
	5	12	15-19	35-44	65-74	5	12	15-19	35-44	65-74
DMFT										
Mean (SD)	2,20 (3,68)	0,91 (0,94)	1,00 (1,05)	6,10 (3,04)	8,10 (1,66)	4,10 (3,11)	0,90 (1,52)	1,10 (1,66)	5,80 (3,74)	6,90 (4,18)
Confidence Interval	-0,43-4,83	0,28-1,54	0,25-1,75	3,93-8,27	6,91-9,29	1,88-6,32	-0,19-1,99	-0,09-2,29	3,13-8,47	3,91-9,89
Median	1,00	1,00	1,00	6,50	9,00	4,50	0,00	0,00	6,00	8,00
Decayed Teeth										
Mean (SD)	1,90 (3,38)	0,73 (0,65)	0,10 (0,32)	0,10 (0,32)	0,40 (0,70)	3,80 (3,01)	0,80 (1,48)	0,40 (0,84)	0,60 (0,84)	0,50 (0,85)
Confidence Interval	-0,52-4,32	0,29-1,16	-0,13-0,33	-0,13-0,34	-0,1-0,9	1,65-5,95	-0,26-1,86	-0,2-1,00	-0,00-1,20	-0,11-1,11
Median	0,50	1,00	0,00	0,00	0,00	4,00	0,00	0,00	0,00	0,00
Missing Teeth										
Mean (SD)	0,00 (0,00)	0,00 (0,00)	0,00 (0,00)	3,40 (3,78)	7,40 (2,01)	0,20 (0,00)	0,10 (0,32)	0,50 (1,08)	2,30 (2,36)	5,70 (5,12)
Confidence Interval	0,00-0,00	0,00-0,00	0,00-0,00	0,70-6,10	5,96-8,83	-0,25-0,65	-0,13-0,33	-0,27-1,27	0,61-4,00	2,04-9,36
Median	0,00	0,00	0,00	2,00	8,50	0,00	0,00	0,00	1,50	7,00
Filled Teeth										
Mean (SD)	0,30 (0,48)	0,18 (0,60)	0,90 (0,88)	2,60 (2,76)	0,30 (0,95)	0,10 (0,32)	0,00 (0,00)	0,20 (0,63)	2,90 (3,11)	0,70 (1,06)
Confidence Interval	-0,05-0,65	-0,22-0,59	0,27-1,53	0,63-4,57	-0,38-0,98	-0,13-0,33	0,00-0,00	-0,25-0,65	0,68-5,12	-0,06-1,46
Median	0,00	0,00	1,00	1,50	0,00	0,00	0,00	0,00	2,00	0,00

Oral Health Literacy (OHL)

OHL was assessed in 40 adult and older participants, with 20 individuals from each locality (Table 2). In the rural area, 55% presented inadequate OHL and 20% marginal OHL; in the urban area, these proportions

were 50% and 20%, respectively.

OHL scores were higher among participants with secondary or higher education and among those who reported brushing their teeth two or more times per day. A statistically significant difference in educational level was observed between adults from rural and urban areas ($p < 0.001$). Individuals with higher educational attainment presented higher OHL scores (Fig. 1).

Table 2
Mean (standard deviation) oral health literacy (OHL) scores in rural and urban areas of Alhandra, Paraíba, Brazil.

Oral Health Literacy (OHL)				
Area	**n**		**Adults**	**Older Adults**
			Mean (SD)	**Mean (SD)**
Rural	20	**Score**	8,40 (3,69)	5,10 (2,08)
		Level of Education		
		Didn't study	0,00 (0,00)	5,33 (4, 16)
		Elementary School	5,40 (2,07)	5,00 (0,82)
		High School and College	11,40 (1,95)	0,00 (0,00)
		Tooth Brushing		
		Once a day	7,50 (0,71)	5,00 (NA)
		≥ 2	8,63 (4, 14)	5,11 (2, 20)
Urban	20	**Score**	9,90 (3,00)	3,90 (2,60)
		Level of Education		
		Didn't study		3,50 (2, 12)
		Elementary School	8,00 (2,92)	3,57 (2,76)
		High School and College	11,80 (1,64)	7,00 (NA)
		Tooth Brushing		
		Once a day	0,00 (0,00)	3,50 (2, 12)
		≥ 2	9,90 (3,00)	4,57 (2,51)
			p-value	
Comparison Test		**Score**	p = 0,331a	p = 0,269a
		Level of Education	p < 0,001b,*	p = 0,405c
		Tooth Brushing	p = 0,408c	p = 0,222c

aTeste T de Student; bANOVA,*Post Hoc de Tukey: p < 0,001; cKruskal-Wallis; NA: Not applicable.

Fluoridated dentifrice affordability ratio (FTAR)

FTAR estimates for both localities are presented in Table 3. Fluoridated dentifrice was considered unaffordable for 5.88% of participants in the rural area and 2.04% in the urban area. The mean FTAR was

lower in the urban area, with no statistically significant differences between areas (p = 0.109) or across age groups.

Most adolescents in the rural area (70%) and half of the 12-year-old participants in the urban area were unaware of the presence of fluoride in dentifrice. Perceived financial difficulty in purchasing the product was reported by caregivers of adolescents in the rural area and children in the urban area, as well as by half of the adults in the rural area and older adults in the urban area.

Table 3
FTAR values by age group in rural and urban areas of Alhandra, Paraíba, Brazil.

Area	n	Mean (SD)	Confidence Interval	Median
Rural	**51**	**0,35 (0,27)**	**0,27 – 0,43**	**0,25**
5 years-old	10	0,54 (0,32)	0,30 – 0,77	0,56
12 years-old	11	0,28 (0,19)	0,15 – 0,47	0,22
15–19 years-old	10	0,36 (0,36)	0,10 – 0,62	0,23
35–44 years-old	10	0,28 (0,26)	0,09 – 0,47	0,19
65–74 years-old	10	0,30 (0,12)	0,22 – 0,39	0,28
Urban	**49**	**0,29 (0,30)**	**0,20 – 0,37**	**0,19**
5 years-old	10	0,46 (0,57)	0,05 – 0,86	0,30
12 years-old	10	0,21 (0,15)	0,09 – 0,32	0,15
15–19 years-old	10	0,25 (0,18)	0,13 – 0,38	0,18
35–44 years-old	10	0,24 (0,13)	0,15 – 0,34	0,21
65–74 years-old	9	0,27 (0,19)	0,12 – 0,42	0,31

Correlation between DMFT, OHL, and FTAR

Among adults aged 35–44 years in the rural area, a moderate and statistically significant inverse correlation was observed between OHL and FTAR (ρ = −0.681), indicating that higher FTAR values (lower access to fluoridated dentifrice) were associated with lower levels of OHL (Fig. 2).

Discussion

This study investigated the prevalence of dental caries, levels of oral health literacy (OHL), and the fluoride toothpaste affordability ratio (FTAR) among socioeconomically vulnerable residents from rural and urban areas of a small municipality in Paraíba, Northeast Brazil. The main findings indicate a similar socioeconomic profile and shared vulnerabilities related to OHL and fluoridated dentifrice accessibility in both settings. These results reinforce the importance of social determinants in oral health and their role in

integrating care and guiding actions within Primary Health Care (PHC) in the Brazilian Unified Health System (SUS).

Historically, the Northeast region of Brazil presents poorer social and health indicators compared to the national average, reflecting structural inequalities and social vulnerabilities[24]. In this study, the similar socioeconomic profile observed between rural and urban participants suggests that, in small municipalities, social vulnerability may be shared across territories, affecting the local economy, education, and access to oral health services, which are predominantly delivered through PHC within the SUS[25].

Brazilian rural areas face challenges that influence the utilization of oral health services, including financial constraints, lower educational levels, and geographical barriers to PHC access[26]. In Paraíba, these specificities pose challenges for the management and implementation of Oral Health Policy, including the prevalence of temporary employment contracts for dentists, which may compromise the effectiveness of PHC actions[27]. This highlights the need for integrated care strategies across the entire territory, particularly in contexts of greater social vulnerability.

Regarding caries experience, among 5-year-old children, dmft values were low in the rural area and moderate in the urban area, indicating a higher disease burden among urban children, a pattern similar to that observed in southern Brazil[28]. In both areas, adolescents presented very low DMFT values, suggesting a potential impact of expanded Family Health Strategy (FHS) coverage. However, adults and older adults showed high DMFT values, with a predominance of the “Missing” component, reflecting the cumulative impact of the disease throughout life, particularly among older individuals in rural areas, who historically face more challenging health conditions[29]. Nevertheless, except for 5-year-old children, the age groups evaluated showed lower DMFT means than those reported for Paraíba in SB Brasil 2024[9], which may be related to local organization of oral health services and the effectiveness of PHC.

OHL was predominantly classified as inadequate in both areas, with slightly worse performance among rural residents. Participants with higher educational levels showed better OHL scores, corroborating previous studies demonstrating an association between lower education and limited OHL[30]. These findings emphasize the need for continuous health education strategies tailored to the comprehension level of the adult population[4], integrated into PHC practices, with a focus on improving OHL levels and, consequently, enhancing health communication and patient autonomy.

No statistically significant correlation was found between DMFT and OHL, supporting studies that report weak or absent associations between these variables[32]. However, parents or caregivers with higher OHL levels tend to seek dental care for children more frequently[33], which may positively influence oral health promotion and prevention over time.

Regarding FTAR, most participants demonstrated affordability of fluoridated dentifrice, although cases of unaffordability were identified in both areas. Regular monitoring of the availability and affordability of this product should be incorporated into public health strategies, particularly among populations affected by noncommunicable diseases (NCDs). Government policies aimed at price regulation and improved access to essential products are fundamental to achieving Universal Health Coverage[34]. The unaffordability of

fluoridated dentifrice remains a challenge in low- and middle-income countries, disproportionately affecting socioeconomically disadvantaged populations[14].

Additionally, a statistically significant correlation between OHL and FTAR was observed among adults in the rural area, suggesting that OHL may influence decisions related to access to and use of fluoridated dentifrice for oral health care.

From a public health perspective, the findings of this study contribute to strengthening the Brazilian National Oral Health Policy (Brasil Sorridente) by expanding knowledge on regions underrepresented in national surveys. The results highlight the need to address social inequalities through intersectoral public policies that promote OHL, expand access to oral health services, and ensure the availability of essential products such as fluoridated dentifrices, whose anticaries effectiveness and risk–benefit profile are well established[34].

This study has limitations that should be considered. The cross-sectional design does not allow causal inferences between variables. The scarcity of studies addressing oral health conditions in Brazilian rural areas limits comparisons with existing literature. Furthermore, the use of self-reported data may introduce information bias. However, the integration of dental caries, oral health literacy, and fluoridated dentifrice accessibility, combined with a census-based approach in the rural area and the use of validated and standardized instruments, strengthens the robustness of the findings.

Therefore, the results of this study may be relevant to similar household and socioeconomic contexts in small municipalities in Northeast Brazil, contributing to the planning of actions and the reduction of social inequalities in oral health within PHC.

Conclusion

Although residents from rural and urban areas of Alhandra, Paraíba, presented similar prevalence of dental caries, levels of oral health literacy (OHL), and accessibility to fluoridated dentifrice (FTAR), greater vulnerability was observed in the rural area. Nevertheless, the urban population also requires attention and targeted oral health actions.

The findings of this study contribute to the planning of actions within Primary Health Care (PHC) and support decision-making by local health managers in oral health care. In this context, public policies and intersectoral strategies that integrate the promotion of OHL, collaboration with public schools, and the expansion of access to fluoridated dentifrices may strengthen the prevention and control of dental caries in Paraíba, aiming to reduce oral health inequalities.

Abbreviations

PHC
Primary Health Care
BOHL

AQ–Brazilian Oral Health Literacy Assessment Questionnaire
DMFT
Decayed, Missing, and Filled Teeth (permanent dentition)
dmft
Decayed, Missing, and Filled Teeth (primary dentition)
NCDs
Noncommunicable Diseases
SDH
Social Determinants of Health
FHS
Family Health Strategy
FTAR
Fluoride Toothpaste Affordability Ratio
HDI
Human Development Index
LABIAL
Oral Biology Laboratory
OHL
Oral Health Literacy
WHO
World Health Organization
NOHP
National Oral Health Policy
SB Brasil
Brazilian National Oral Health Survey
SUS
Brazilian Unified Health System
ICF
Informed Consent Form
IAF
Informed Assent Form
PHCU
Primary Health Care Unit

Declarations

Ethics approval and consent to participate

The Research Ethics Committee of the Federal University of Paraíba certifies that the project “Prevalence of dental caries and access to fluoridated toothpaste in rural and urban areas of municipalities with high social risk in Paraíba”, CAAE number 77237124.6.0000.5188, by Raiana Gurgel de Queiroz, meets the

recommendations of the National Health Council – Ministry of Health of Brazil for research on human beings and, therefore, was approved by this committee on February 26, 2024. The study was conducted in accordance with the Declaration of Helsinki. Written informed consent and assent was obtained from all participants prior to data collection.

Consent for publication

Not applicable. This study does not contain any identifiable data from individual participants.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

RGdQ, LSdA, DCC and FCS writing original draft preparation. RGdQ, LSdA, DCC and FCS contributed to calibration and training. RGdQ, LSdA, DCC, VB, TELdC and FCS all contributed to the data collection. RGdQ, LSdA and FCS analized the data. RGdQ, LSdA, DCC, VB, TELdC and FCS edited and revised the manuscript. All authors have read and approved the final manuscript.

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Figures

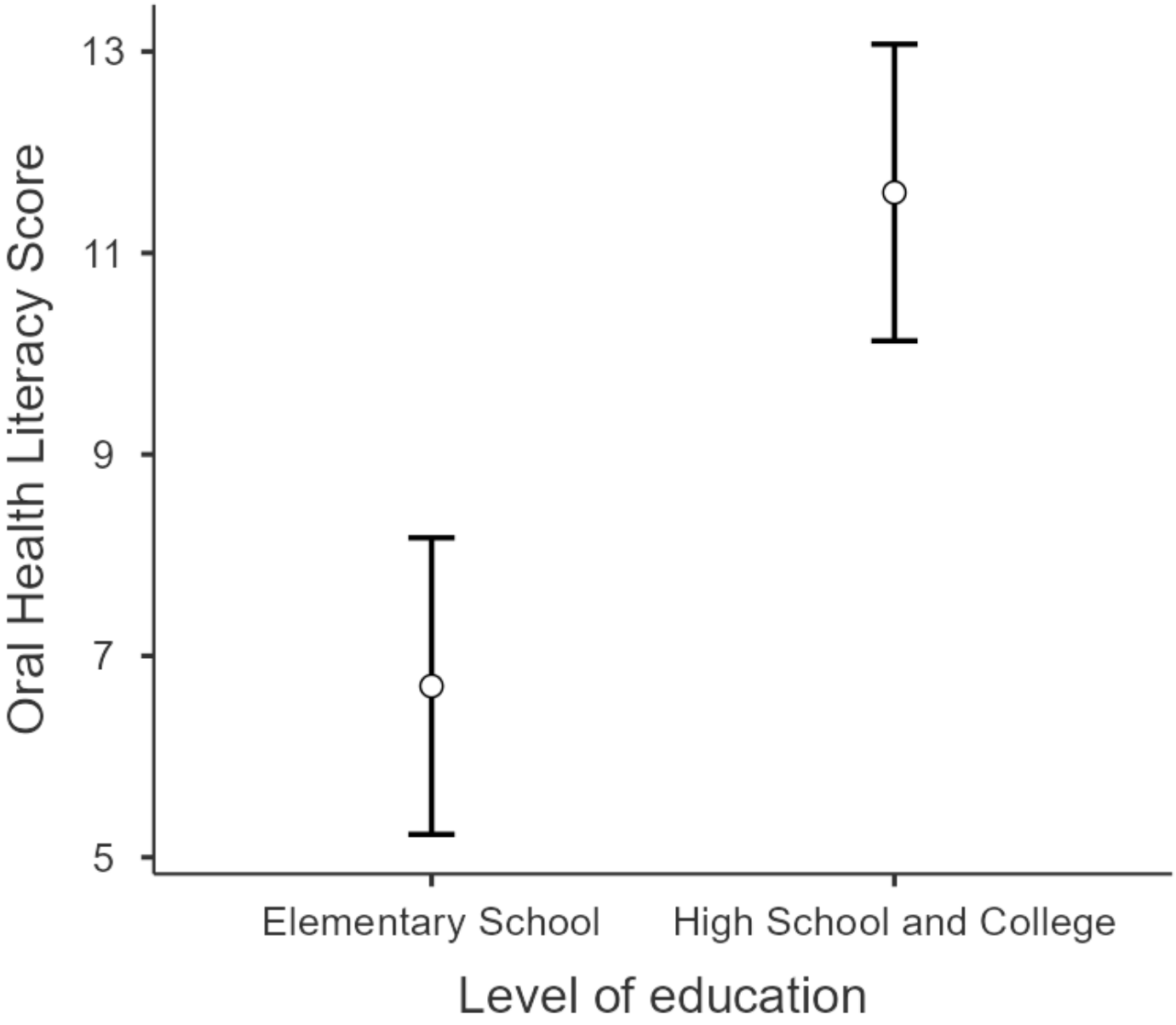


Figure 1

Comparison of oral health literacy (OHL) scores among adults by educational level.

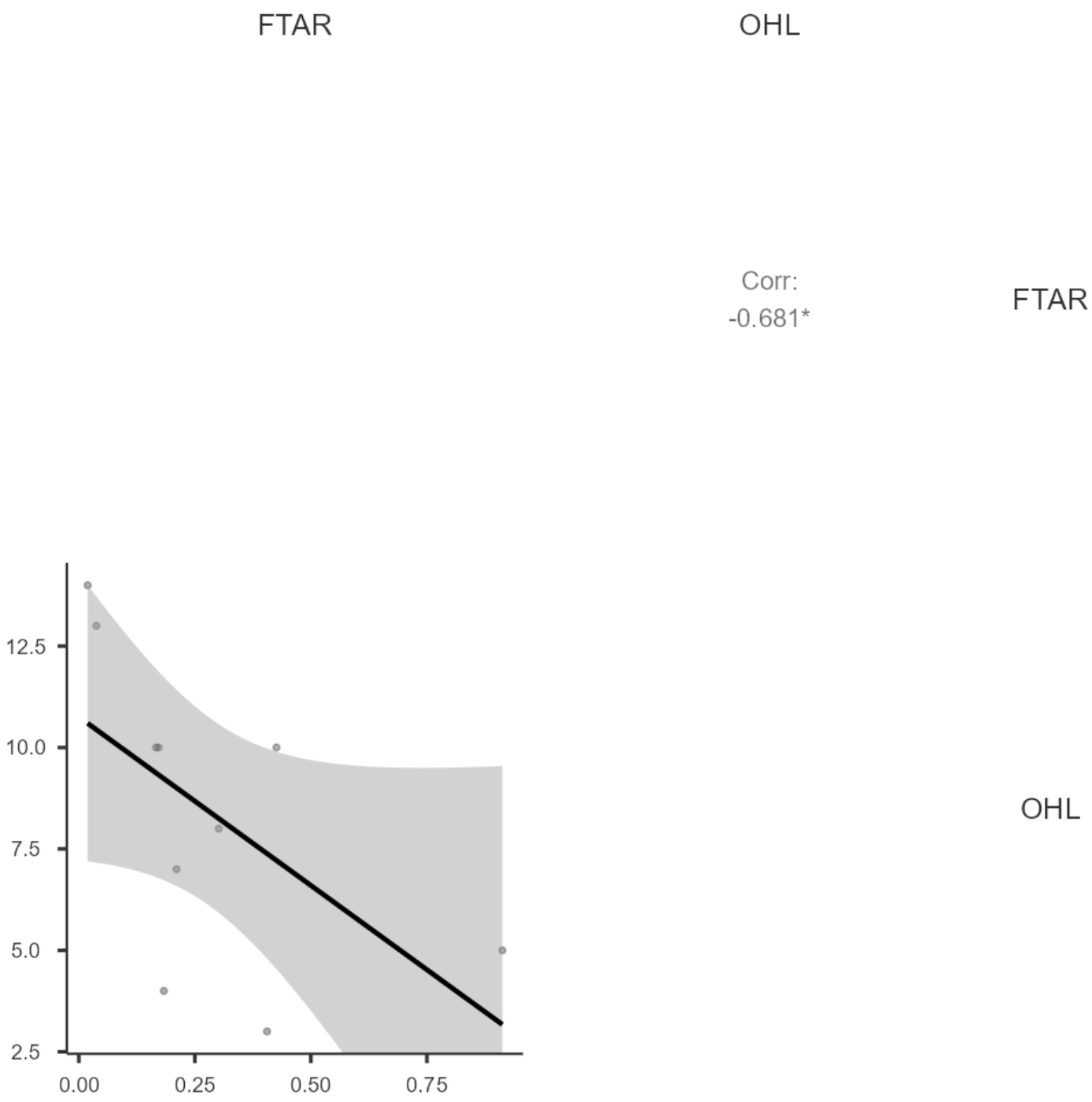


Figure 2

Moderate correlation between OHL and FTAR among adults in the rural area (Spearman's test).

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