Family structure, sociodemographic factors and type of dental service associated with oral health literacy in the early adolescence

Estrutura familiar, fatores sociodemográficos e tipo de serviço odontológico associados ao alfabetismo em saúde bucal no início da adolescência

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Abstract *The aim of this study was to evaluate associations between oral health literacy and family, sociodemographic and dental service characteristics in early adolescents. A cross-sectional study was conducted with 740 schoolchildren. The following variables were investigated using validated questionnaires: oral health literary (BREALD-30), sociodemographic characteristics, type of dental service and family functioning (FACES III). Associations were tested using robust Poisson regression analysis (α=5%). Higher oral health literacy was associated with the female sex (RR=1.09; 95%CI: 1.03-1.14), connected type of family cohesion (RR=1.12; 95%CI: 1.05-1.20), rigid (RR=1.14; 95%CI: 1.04-1.25) and structured (RR=1.11; 95%CI: 1.04-1.20) types of family adaptability, more than eight years of mother's schooling (RR=1.16; 95%CI: 1.10-1.22), age of caregiver more than 38 years (RR=1.07; 95%CI: 1.02-1.13) and the use of private dental services (RR=1.06; 95%CI: 1.01-1.12). The level of oral health literacy in early adolescents was associated with sex, family structure, mother's schooling, caregiver's age and type of dental service used.*
Key words *Oral Health, Health literacy, Adolescent health, Adolescent, Family relations*

Resumo *Este estudo avaliou a associação de fatores sociodemográficos, familiares e do tipo de serviço odontológico utilizado ao alfabetismo em saúde bucal em pré-adolescentes. Trata-se de um estudo transversal com 740 escolares. Foram avaliados o alfabetismo em saúde bucal (BREALD-30), fatores sociodemográficos, tipo de serviço odontológico e funcionalidade familiar (FACES III) por meio de questionários validados. A associação entre as variáveis foi avaliada por meio de regressão de Poisson robusta (α=5%). Um maior alfabetismo em saúde bucal foi associado ao sexo feminino (RR=1.09; IC95%: 1.03-1.14), coesão familiar do tipo conectada (RR=1.12; IC95%: 1.05-1.20), adaptabilidade familiar dos tipos rígida (RR=1.14; IC95%: 1.04-1.25) e estruturada (RR=1.11; IC95%: 1.04-1.20), escolaridade materna superior a oito anos de estudo (RR=1.16; IC95%: 1.10-1.22), idade do responsável superior a 38 anos (RR=1.07; IC95%: 1.02-1.13) e uso de serviços odontológicos privados (RR=1.06; IC95%: 1.01-1.12). O nível de alfabetismo em pré-adolescentes foi associado ao sexo, estrutura familiar, idade e escolaridade do responsável e tipo de serviço odontológico utilizado.*
Palavras-chave *Saúde bucal, Alfabetização em saúde, Saúde do adolescente, Adolescentes, Relações familiares*

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Introduction

Oral health literacy (OHL) is an emerging topic and there has been recent concern in understanding how it exerts an influence on the health of the population. As OHL is considered a health determinant, researchers have studied its consequences on health-related behaviours and habits that exert an impact on oral health status[1]. Thus, efforts have been directed at developing instruments for the assessment of skills related to OHL, such as word recognition[2], conceptual knowledge[3] and the ability to perform mathematical calculations[4]. Such studies have been largely directed at adults and children (proxy measures), with few investigations into the OHL of adolescents[5].

Low OHL has recently been associated with difficulties in seeking information on oral health as well as a low frequency of follow up visits during dental treatment in adults[6]. Such behaviours favour the emergence of oral health problems[1,4]. OHL has been associated with some oral health outcomes, such as dental caries in preschool children, but such knowledge has not yet been consolidated in the literature due to the variety of methods employed and the scarcity of studies on this issue[7].

Moreover, factors capable of determining the level of OHL have been explored little. The few studies that have investigated this issue have focused on the association between OHL and socio-demographic variables, such as ethnicity, sex, income, schooling and urban mobility, as well as access to information on oral health[2-4,8]. Higher levels of OHL have been associated with adequate oral health behaviours, which suggests that OHL has a positive effect regarding the prevention of dental problems[9]. However, such findings have come from studies conducted predominantly with adults and there are no records of this information on individuals at the onset of adolescence. Hence, the period of adolescence has received little attention, as reflected by the scarcity of instruments for measuring OHL in this age group. However, adolescence is an important phase of human development, as it results in physical and emotional transformations that can exert an influence on the perception of the importance of oral health habits on the part of adolescents[10].

Family relations are an important aspect to consider in the study of OHL among adolescents. The onset of adolescence (preadolescence) is considered a transition phase in which children undergo physical, hormonal, behavioural and cognitive changes[11]. In this period, the influence of the family environment remains and, although early adolescents experience a greater sense of independence, parents remain active in the maintenance of preventive care and healthy habits and exert an influence on the oral health of their children[12]. Moreover, there are reports that changes in family functioning can exert a negative impact on the learning process in adolescents[13]. Therefore, the influence of the family on OHL in adolescents merits further investigation, especially at the onset of this phase, when habits are in the process of forming.

The aim of the present study was to evaluate the association between oral health literacy and socio-demographic factors, family characteristics and the use of dental services in a representative sample of 12-year-old students.

Methods

Study design and sample

An analytical, cross-sectional study was conducted in a medium-sized city in northeast Brazil. The population of this study was composed by 24.911 early adolescents according to the National Institute for Educational Studies and Research[14,15]. This age group was considered in this study because they account for a high proportion in the city[14]. Sample calculation and sampling was performed to preserve internal and external validity. The sample was composed of 12-year-old early adolescents randomly selected from 14 public and 18 private schools in the city. Probabilistic two-stage cluster sampling was performed. Schools were randomly selected in the first stage and students were selected from the schools using a simple randomisation procedure. The number of students selected was proportional to the number enrolled students in each of the six administration districts of the city in this age group[15]. The sample was calculated considering a 95% significance level, 5% acceptable rate of error and 50% prevalence rate to obtain a maximum variability. A correction factor of 1.6 was applied for the design effect and the sample was increased by 20% to compensate for possible dropouts. The final sample was composed of 769 12-year-old students.

Eligibility criteria

Early adolescents 12 years of age enrolled at public and private schools in the city were included in the study. We excluded individuals with physical, sensory, mental or behavioural limitations previously diagnosed by a trained professional or according to the reports of caregivers and educators.

Theoretical training and calibration exercises

OHL was measured using the Brazilian version of the Rapid Estimate of Adult Literacy in Dentistry (BREALD-30), which has been validated for use on adolescents[16]. Two examiners were trained in three steps by an expert in the field[17]. Theoretical training was performed first with criteria for the administration of the BREALD-30. This was followed by practical training. During the calibration phase, the examiners watched videos of individuals with different levels of OHL and attributed scores to each case. Inter-examiner agreement was calculated between each examiner and the experienced expert (K=0.87 to 0.88) and intra-examiner agreement was calculated by comparing the results of an initial evaluation and the repetition of the evaluation after a seven-day period (K=0.87 to 0.89). The level of agreement among the examiners was considered satisfactory for the execution of the study.

Pilot study

A pilot study was conducted with 50 12-year-old students (25 from a public school and 25 from a private school) to test the adequacy of the methods. The results of the pilot study revealed that no changes to the proposed methods were needed. The early adolescents who participated in this step were not included in the main study.

Data collection

The BREALD-30 was used to measure the OHL of the students. This is an easy-to-administer instrument designed to determine the recognition of words related to oral health. It can be employed with adolescents and has recently been validated for use in Brazil[16]. The participants performed a reading of 30 words related to dentistry in increasing order of difficulty. One point was attributed for each correctly pronounced word. The final score was determined by the sum of adequately pronounced words and ranged from 0 to 30 points, with higher scores corresponding to a higher level of OHL. Oral Health Literacy was used as a continuous measure because cut points can vary significantly from different populations and there is not a standard categorization in the literature. Moreover, OHL was previously designed to be applied as a continuous variable in the training process[17].

The sociodemographic data were collected from the caregiver with the aid of a questionnaire addressing information on sex of the early adolescents, self-declared ethnicity/skin colour, position in the family, number of residents in the home, mother's schooling and caregiver's age. The students were also asked what type of dental service (public or private) they have used during their last appointment.

The Brazilian Economic Classification System[18] was used to identify the socioeconomic status of the participants. This system categorises families based on the purchasing power of consumer goods, educational level of the head of the household and access to paved streets and treated water. For the present study, four categories were considered in decreasing order of socioeconomic status: Class A, Classes B1-B2, Classes C1-C2 and Class D-E.

Family cohesion and adaptability were evaluated using the validated Brazilian version of the FACES III[19], which the students answered. This instrument is composed of 20 questions with the following scored response options: hardly ever =1; rarely =2; sometimes =3; often =4; almost always =5. The scores obtained by the sum of odd numbered questions indicate family cohesion and those obtained by the sum of even numbered questions indicate family adaptability[20].

Regarding family cohesion (the degree of affective union among the members of a family), families can be classified as "disengaged" (from 10 to 34 points) indicating a very low cohesion and considerable independence in family relations, "separated" (from 35 to 40 points) indicating a low to moderate cohesion and less distancing among family members, "connected" (from 41 to 45 points) indicating a moderate to high cohesion and closer family relations and ties or "enmeshed" (from 46 to 50 points) indicating a very high cohesion and relationships of dependence among family members.

Family adaptability is understood as the capacity of a family to alter its structure based on its needs. In this regard, families can be classified as "rigid" (from 10 to 19 points) representing a

very low adaptability when one of the members centralises the authority and there are no changes in the system, "structured" (from 20 to 24 points) representing a low to moderate adaptability, open for the sharing of roles, "flexible" (from 25 to 29 points) representing a moderate to high adaptability, more flexible regarding rules and the distribution of activities or "chaotic" (from 30 to 50 points) representing a very high adaptability, no definition regarding the roles and activities of the family members[21].

Direct acyclic graph (DAG)

A directed acyclic graph (DAG) was created using the DAGitty software (version 3.0) to select the adjustment factors included in the analysis and study relations among the variables (Figure 1). The use of this tool is important, as it assists in the adequate estimate of the real effect of different exposures on the outcome studied and strengthens the inference of the results obtained in observational studies[22]. The DAG includes the dependent variable, exposure factors and other variables that were not collected but can exert an influence on the outcome. The following variables were considered confounding factors: mother's schooling, caregiver's marital status, number of residents in the home and adolescent's ethnicity.

Statistical analysis

Descriptive analysis was performed for the characterisation of the sample. The dependent variable was OHL in early adolescents, which was treated as a continuous variable. The measure used to establish the magnitude of associations was the Rate Ratio (RR) because the outcome was obtained as a score. Robust Poisson regression analysis was used to determine associations between variables. Variables with a p-value <0.20 in the bivariate analysis were incorporated into the multivariate analysis. Those with a p-value <0.05 in the multiple model were considered to be associated with OHL and were maintained in the final model. SPSS (SPSS for Windows, version 22.0, SPSS Inc, Chicago, IL, USA) was used for the statistical tests.

Ethical aspects

This study received approval from the Human Research Ethics Committee and was conducted in accordance with the Declaration of Helsinki, which governs international principles for research involving human subjects.

Results

Seven hundred forty students participated in the present study (response rate: 96.23%). The loss of 29 early adolescents was due to absences from school on the three consecutive days of the data collection process.

Table 1 displays the data for the characterisation of the sample. The majority was female (56.8%) and lived in families with up to five members (79.3%). Nearly half of the sample belonged to social class C (48.5%); 58% of the mothers had up to eight years of schooling and the main caregiver of the student was older than 38 years of age in 51% of the sample. "Disengaged" was the most frequent family cohesion category (46.8%) and "flexible" was the most frequent family adaptability category (31.1%). The majority of the sample used private dental services (58.3%).

In the Poisson multiple regression model (Table 2), the variables associated with better OHL among the 12-year-old adolescents were the female sex (RR=1.09; 95%CI: 1.03-1.14), mother's schooling > eight years of study (RR=1.16; 95%CI: 1.10-1.22), age of adolescent's main caregiver older than 38 years (RR=1.07; 95%CI: 1.02-1.13) and the use of private dental services (RR=1.06; 95%CI: 1.01-1.12). Associations were also found with family functioning. OHL was associated with the "connected" family cohesion category (RR=1.12; 95%CI: 1.05-1.20) as well as the "rigid" (RR=1.14; 95%CI: 1.04-1.25) and "structured" (RR=1.11; 95%CI: 1.04-1.20) family adaptability categories.

Discussion

The female sex, a higher level of mother's schooling, older caregiver's age and the use of private dental services were associated with higher levels of OHL among the students analysed in the present study. Moreover, types of family cohesion and adaptability exerted an influence on the level of OHL. These findings can contribute to the establishment of preventive strategies directed at early adolescence. To the best of our knowledge, this is the first study to consider the association between OHL and socio-demographic factors, family characteristics and the use of dental services among 12-year-old adolescents.
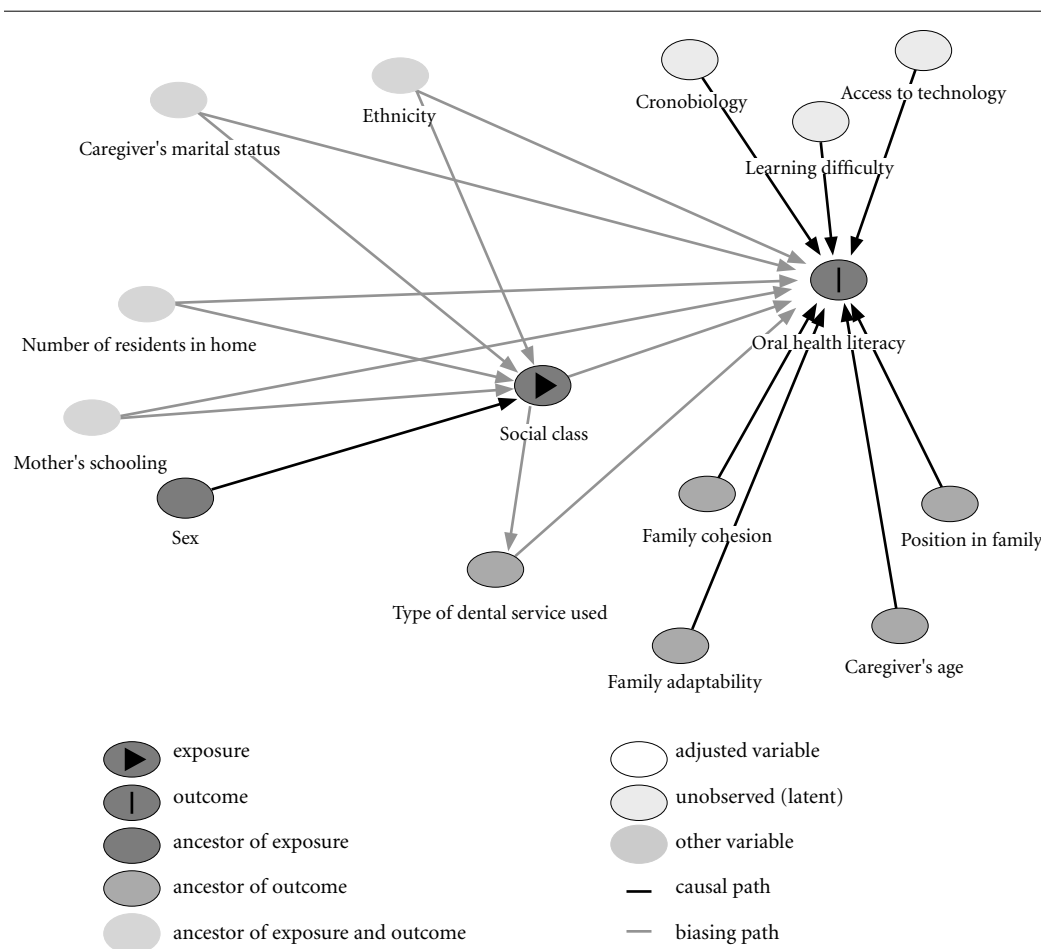
Figure 1. Directed acyclic graph (DAG) for the association of Family structure, sociodemographic factors and type of dental service associated with oral health literacy.

Source: Elaborated by the authors.

The higher level of OHL among girls may be explained by their performance in reading and writing activities, which tends to be better in comparison to boys[23]. This result may also reflect a greater concern on the part of the female sex to maintain an adequate oral health status and visit the dentist more often[24].

Factors related to parents/caregivers often exert an important influence on the habits and behaviours of their children. Maternal characteristics, such as schooling, have received greater attention in the literature, since mothers are generally the main caregivers of children[25], especially in locations with a predominantly patriarchal culture, such as Brazil. Unsatisfactory attitudes on the part of caregivers in terms of oral health can result in poorer oral health behaviours. In

this sense a low OHL level of caregivers may affect the level of OHL of their children leading to oral health problems as untreated dental caries[26]. Moreover, caregivers are customarily the primary source of information among children[27], which underscores the important role parents/caregivers play in the development of OHL.

The acquisition of knowledge on the part of parents with regards to caring for their children increases with the increase in age. This contributes to the consolidation of preventive care in terms of oral hygiene, which may contribute to better OHL in children[28]. Moreover, poor oral hygiene habits and dental problems have been found in children with younger parents/caregivers[29]. However, further studies are needed on the influence of caregiver's age on OHL and, ul-

Table 1. Characterisation of sample of adolescents.

Variables	Frequency	
	n	**%**
Sex		
Female	420	56.8
Male	320	43.2
Ethnicity/self-declared skin colour		
White	215	29.1
Non-white	525	70.9
Position in family		
Only child	6	0.8
Oldest child	261	35.3
Middle child	174	23.5
Youngest child	299	40.4
Mother's schooling		
≤8 years of study	426	58.0
>8 years of study	308	42.0
Caregiver's age		
<38 years	360	49.0
≥39 years	374	51.0
Social class		
Class A	17	2.3
Class B1-B2	174	23.6
Class C1-C2	358	48.5
Class D and E	189	25.6
Number of residents in home		
≤5	577	79.3
>6	151	20.7
Caregiver's marital status		
Married	419	56.8
Single, divorced, widowed	319	43.2
Family cohesion		
Enmeshed	14	1.9
Connected	87	11.8
Separated	293	39.6
Disengaged	346	46.8
Family adaptability		
Rigid	90	12.2
Structured	226	30.5
Flexible	230	31.1
Chaotic	194	26.2
Type of dental service used		
Public	229	41.7
Private	320	58.3

Source: Elaborated by the authors.

timately, oral health status at the onset of adolescence.

The social class of the adolescents' families did not remain associated with OHL. This finding may be related to the fact that family characteristics play a more decisive role in OHL among early adolescents than social class. Parents are mainly responsible for the formation of oral health habits and knowledge in this phase of life[30]. Therefore, it is likely that social class did not exert a direct influence on access to oral health information and consequently did not influence the level of OHL. A previous study in India with university students has demonstrated that socioeconomic status is associated with the level of Oral Health Literacy[31]. However, for this study adolescent's social class was not associated with the level of OHL. The use of dental services in Brazil has increased in the last years, probably because of the Family Health Strategy program extension[32]. Therefore, this result may have occurred due to a major influence of the educational level of parents on the level of oral health literacy of adolescents than socioeconomic strata itself, indicating that the last acts as a modulator.

The students who visited private dental services demonstrated a higher OHL level, likely due to the greater physical structure at these services that may engage patients and influence on the frequency of educational interventions. It was also found previously that adolescents covered by public health care services were more prone to dental caries and classified their own oral health negatively[33]. The areas included in this study are mainly covered by public dental services in the Family Health Strategy. A previous study has demonstrated that adolescents presented lower satisfaction with public services compared to private services[34]. Other previous studies have demonstrated that Family Health Strategy has focused in dental treatments instead of dental education and patients also relate structural limitations of dental public services as not getting to make a new appointment or returning to a further evaluation[35,36]. These findings probably indicate that private services tend to perform better than public services in offering oral health instructions and attending adolescents dental health expectations.

Family relations have been explored little in the literature with regards to oral health. In the present study, cohesion (degree of family union) was associated with OHL in the students. Those with a moderate level of dependence among family members (connected families) had better OHL. Previous studies found that higher levels of family cohesion were associated with healthy eating and oral health practices in adolescents[37,38]. These findings indicate that family support can favour early adolescents by contributing to better

Table 2. Poisson regression for oral health literacy and associated factors in adolescents.

Variables	Oral health literacy	Bivariate		Multivariate	
		Unadjusted Rate Ratio (RR)*		Adjusted Rate Ratio (RR)†	
	Mean (SD)	(95%CI)	p-value	(95%CI)	p-value
Sex					
Male	16.42 (5.81)	1.00		1.00	
Female	17.49 (5.87)	1.06 (1.01-1.12)	0.001	1.09 (1.03-1.14)	0.001
Ethnicity/skin colour					
White	17.90 (5.59)	1.07 (1.02-1.13)	0.007	-	-
Non-white	16.67 (5.94)	1.00		-	-
Position in family					
Only child	20.83 (6.43)	1.21 (0.96-1.52)	0.102	-	-
Oldest child	17.38 (5.73)	1.01 (0.95-1.06)	0.724	-	-
Middle child	16.05 (6.00)	0.93 (0.87-0.99)	0.042	-	-
Youngest child	17.21 (5.84)	1.00		-	-
Mother's schooling					
≤8 years of study	15.46 (5.97)	1.00		1.00	
>8 years of study	19.24 (4.96)	1.24 (1.18-1.30)	<0.001	1.16 (1.10-1.22)	<0.001
Caregiver's age					
≤38 years	16.24 (5.95)	1.00		1.00	
>38 years	17.94 (5.72)	1.09 (1.04-1.15)	<0.001	1.07 (1.02-1.13)	0.004
Number of residents in home					
≤5	17.39 (5.74)	1.10 (1.03-1.18)	0.005	-	-
>5	15.75 (6.21)	1.00		-	-
Caregiver's marital status					
Married	17.79 (5.79)	1.10 (1.05-1.16)	<0.001	-	-
Single/divorced/widowed	16.09 (5.79)	1.00		-	-
Social class					
Class A	19.06 (3.64)	1.31 (1.17-1.46)	<0.001	-	-
Class B1-B2	18.86 (4.66)	1.29 (1.20-1.39)	<0.001	-	-
Class C1-C2	17.41 (5.62)	1.19 (1.11-1.28)	<0.001	-	-
Class D-E	14.52 (6.54)	1.00		-	-
Type of dental service used					
Public	16.41 (5.90)	1.00		1.00	
Private	18.37 (5.30)	1.11 (1.05-1.18)	<0.001	1.06 (1.01-1.12)	0.024
Family cohesion					
Enmeshed	17.86 (7.89)	1.09 (0.87-1.37)	0.428	1.13 (0.95-1.33)	0.145
Connected	18.89 (4.70)	1.15 (1.08-1.23)	<0.001	1.12 (1.05-1.20)	<0.001
Separated	17.30 (5.57)	1.06 (1.01-1.12)	0.03	1.05 (0.99-1.11)	0.067
Disengaged	16.29 (6.17)	1.00		1.00	
Family adaptability					
Rigid	18.28 (5.58)	1.14 (1.05-1.24)	0.001	1.14 (1.04-1.25)	0.003
Structured	18.01 (5.57)	1.12 (1.05-1.20)	<0.001	1.11 (1.04-1.20)	0.002
Flexible	16.47 (5.70)	1.03 (0.96-1.10)	0.376	1.04 (0.97-1.12)	0.179
Chaotic	15.95 (6.27)	1.00		1.00	

*Independent controlling variables defined using directed acyclic graph (DAG): mother's schooling, caregiver's marital status, number of residents in the home and adolescent's ethnicity; Unadjusted Poisson regression for oral health literacy and associated factors in preadolescents. RR=rate ratio. †Variables incorporated into multivariate model (p<0.20): sex, ethnicity/skin color, position in family, mother's schooling, caregiver's age, caregiver's marital status, social class, type of dental service used, family cohesion and family adaptability. (-): Variables not selected for or retained in final adjusted model (p>0.20 in bivariate analysis or p>0.05 in multivariate analysis).

Source: Elaborated by the authors.

health-related habits and a reduction in situations of vulnerability[37,39].

Likewise, the type of family adaptability or flexibility was associated with OHL among the participants of this study. Adolescents with rigid and structured families had a higher level of OHL. The establishment of good communication between parents and children is essential to maintaining good family functioning[40]. It is likely that a family environment with fewer changes in power relations and stable rules favoured the education of the children. This finding may be related to a more attentive attitude on the part of parents with regards to the education of their children. In contrast, other studies have found that a low degree of family flexibility may increase the prevalence of behavioural problems and inadequate oral hygiene in children[41,42]. However, the studies cited involved preschool children. No previous reports have addressed this issue in 12-year-old adolescents.

It is important for the OHL of early adolescents to be studied more, as personal perceptions of health and the processing of information challenge adolescents to act with autonomy and make decisions at an early age[33,43].

The major limitation of the present study was the cross-sectional design, which avoids the establishment of causal relations among the variables studied. It is also important to highlight that BREALD-30 is a health literacy instrument designed only for word recognition and reading ability as it does not obtain the understanding of each other. However, it is a simple and fast instrument to obtain a reliable measure of functional OHL among adolescents[16]. However, the representative sample of students demonstrated important associations to be investigated in future studies with a longitudinal design. Moreover, methodological care was taken, such as the execution of a pilot study prior to the data collection process, the training and calibration of the examiners and the use of questionnaires that have been validated for the target population. The uniqueness of this investigation resides in the fact that it is the first representative study to evaluate socio-demographic factors, family characteristics and types of dental service that exert an influence on OHL at the onset of adolescence.

In conclusion, female early adolescents, those whose mother/caregiver had a higher level of schooling and an older age, those with families that had connected, rigid and structured characteristics and those who made use of private dental services had better oral health literacy.

Collaborations

RT Lopes, ETB Neves, MC Gomes, SM Paiva, FM Ferreira and AF Granville-Garcia worked on the conception and design or analysis and interpretation of data. RT Lopes, ETB Neves, AF Granville-Garcia and FM Ferreira worked on drafting the article or revising it critically. ETB Neves, AF Granville-Garcia, FM Ferreira and SM Paiva worked on the research and the methodology. RT Lopes, ETB Neves, MC Gomes, SM Paiva, FM Ferreira and AF Granville-Garcia approved the final version to be published.

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