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Access to Oral Health Actions According to Social and Individual Determinants

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Abstract

Objective: To investigate the socioeconomic, demographic and health needs that influence the access to oral health actions. **Material and Methods:** The sample consisted of 609 individuals who lived in areas covered by the Family Health Strategy in a city of the Northeast of Brazil. All individuals living in areas covered by the FHS with age equal to or higher than six years were included. Data analysis included descriptive, bivariate and multivariate statistics using decision-tree based Chi-squared automatic interaction detection (CHAID). **Results:** Most participants were female, aged 25-34 years, ranging in age from 6 to 87 years. It was evidenced that, among the studied variables, the most relevant for understanding the access to oral health actions were: age (p<0.001), educational level (p-value in Node 1 = 0.009; p-value in Node 7 = 0.005) and self-perception of oral health (p=0.001). **Conclusion:** The results suggest that access to oral health actions is influenced by several social and individual factors, and it is marked by inequalities that favor individuals with higher educational level, better self-perception of oral health and lower age groups.

Keywords: Health Services Accessibility; Social Determinants of Health; Dental Health Services.

Introduction

Access to health services, that is, the entry in the system, is one of the biggest challenges of public health, especially for the practice of equity. This is because, despite advances in recent years, inequalities present in Brazil are reflected in the precarious health conditions of the population, influencing access to health actions and services, including oral health [1-3]. Access to oral health services was guaranteed by the Brazilian Constitution of 1988, being recognized as an important component of an individual's health [4]. However, the expansion of these services in the Unified Health System (SUS) has faced barriers, such as scarce resources and limited supply [1].

The federal government has made efforts to prioritize and expand investments in oral health, for example, through the institution of the National Oral Health Policy (NOHP) and the increase of oral health teams in the Family Health Strategy (FHS) [5]. Notwithstanding the efforts, these actions did not bring effective changes in the work process, and have failed in the planning and organization of teams to determine priority groups [6,7]. Access to oral health services has not been completely consolidated in the country, and it is rather characterized by inequalities, where smaller age groups and higher social classes are prioritized [6,8-11].

Living and working conditions, as well as economic, social, cultural and behavioral factors can influence an individual's health status and the way the services are used, being defined, therefore, as social health determinants [12]. The literature points to several theoretical models that present the access and use of health services as a result of the interaction between social, individual and health system contextual determinants [13,14].

Previous studies made at national [3,8,15,16] and regional level [2,7,11] identified an association between access to oral health services and socioeconomic and demographic factors such as age, sex, marital status, educational level, income and health needs. Families in a situation of social exclusion are more vulnerable to precarious health conditions. Therefore, it is necessary that oral health actions be based on the evaluation of the living conditions and health of the population, allocating resources to groups with greater needs and difficulties of access [1,2].

After a critical review of the literature, it was observed that the majority of studies on access to oral health services [2,8,15,16] analyzed the theme from the perspective of service utilization but did not investigate factors associated with full access to oral health actions, which include oral health promotion and prevention of oral diseases. This study has the goal of creating subsidies for analyzing the impacts, strengths and weaknesses of oral health policies in the country and contribute to the strategic planning and redesign of care practices and development of oral health actions.

Therefore, considering the importance of this type of assessment and its impact on directing oral health actions, the objective of this study was to investigate the socioeconomic and demographic factors and health needs that influence the access to oral health actions through the application of Multivariate Decision Tree modeling, which proved to be promising for public health approaches.

Material and Methods

Study Design and Sampling

This was a quantitative and analytical study with a cross-sectional and population-based design carried out in a city in the Northeast region of Brazil. The Human Development Index (HDI) of the city was estimated at 0.701 and the estimated population is of 100.674 inhabitants [17]. The city has 40 Family Health

Teams (FHSt), with a percentage of coverage of 100%. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for observational studies was used to help in the research and report the results obtained.

The sample was calculated considering the cross-sectional design using the following parameters: expected proportion of 50%, considering the heterogeneity of the measured variables; maximum sample error of 5%; significance level of 95%. The sample calculation for finite populations indicated the need to include 536 cases; 20% was added to this value to compensate possible losses, resulting in a final sample size of 670. To ensure representativeness, a probabilistic sampling stratified by census tract was used. Losses corresponded to individuals who refused to participate and who were not found at home after three attempts at different times and days, which included at least one visit on a weekend.

The study included all individuals living in areas covered by the FHS with age equal to or higher than 6 years, who agreed to participate in the study by signing an Informed Assent Term or an Informed Consent Term. The exclusion criterion was the diagnosis of sensory, motor, cognitive or psychic limitations that prevented the individuals from answering the questions.

Data Collection

An intensive direct observation technique was used for data collection, through a previously validated form (standardized or structured interview) and consolidated in the Application of Oral Health Services Access in Android operating system. A previous contact was made with the FHSt, to which selected census sectors are ascribed, in order to ask for the possibility of accompanying Community Health Agents (CHA) in visits. Using the software had the advantage of reducing costs, collection time and the possibility of errors in data entry. To ensure data quality and control, researchers underwent training.

Theoretical models suggest that the use of health services occurs according to predisposing factors (sociodemographic and cultural variables, individual attitudes and opinions); enabling factors (availability of health resources and services, income and health insurance); and health needs (self-perception of health) [14,18]. After a literature review on the topic, only social and individual variables were chosen for the investigation of their relationship with access to oral health services, including items of the National Household Sample Survey (NHSS) [19] and the Oral Impacts on Daily Performances (OIDP) instrument on self-perception of oral health [20], which are previously validated instruments in the country.

The response (dependent) variable of this study was "Access to oral health actions", categorized as: "Yes", when the participant had used oral health services and accessed oral health promotion and oral disease prevention actions (participation in meetings or lectures about oral health, receipt of brushing kits, use of fluoride, home visits of the oral health team) in the two years prior to interview; "No" when the participant had not received any kind of oral health action or had only used oral health services or only accessed oral health promotion and oral disease prevention actions. The other variables were considered as explanatory (independent) variables, since the main objective of the study was to investigate the socioeconomic and demographic conditions and oral health needs that influenced the access to oral health actions.

The socioeconomic and demographic variables were: sex (male/female); age group (06-14 years/15-24 years/25-49 years/50-64 years/65 years or more); marital status (single/married/divorced/widowed); educational level (illiterate/elementary school/high school/higher education); enrolled in a minimum income program (yes/no); and monthly family income (< 1 minimum wage/1 minimum wage/2 minimum wages/ 3 minimum wages or more). The independent variables of oral health needs were: self-perception of oral health

(excellent/very good/good/more or less/bad); toothache ever in life (yes/no); and toothache in the last six months (yes/no). The categorization of variables such as age, educational level and income were used as a strategy to reduce degrees of freedom during the statistical analysis and it was based on previous studies [11,21].

Regarding access to oral health actions, the variables studied were: last visit to the dentist (Less than 1 year/Between 1 and 2 years/3 years or more/Never went to a dentist); type of service most used (private service, health plan, health insurance/public service in the FHS/other public service); access to lectures or meetings on oral health (yes/no); access to brushing kits, educational material or topical application of fluoride (yes/no); visit by CHAs, oral health assistants or dentists with provision of oral health guidelines (yes/no).

Data Analysis

Initially, a descriptive statistical analysis of all variables was carried out aiming to characterize the sample. Then, bivariate and multivariate analyses were performed. The Pearson's Chi-square test or the Fisher's exact test, when appropriate, was used to identify associations between the outcome and independent variables. Subsequently, the explanatory variables with p-value < 0.25 in the bivariate analysis or those of epidemiological relevance in the case of the subject in question were incorporated into a multivariate decision tree analysis using the Chi-squared automatic interaction detection (CHAID) algorithm. This approach allows optimizing the process of prediction and identification of the most relevant factors for understanding the outcome studied and may reveal useful patterns that are generally not detected through traditional statistical analysis.

Only the variables that presented p-value < 0.05 in the chi-square test using the Bonferroni correction were retained in the final diagram of the Decision Tree. Ten subsamples were used to validate the results through the cross-validation procedure and the goodness-of-fit of the models was evaluated through the general risk estimate, which compares the difference between the expected and observed values, indicating to what extent the algorithm correctly predicts the results. All analyses were conducted using the IBM SPSS Statistics software (SPSS for Windows, IBM Corp., version 20.0, Armonk, NY, USA).

Ethical Considerations

All Brazilian (NHC Resolution/MH n° 466/2012) and international (Declaration of Helsinki) precepts on ethics of research involving human beings were respected. The research project was approved by an independent Ethics Committee (CAAE 20260313.1.0000.5187).

Results

The participation rate in the study was 90.9% (n = 609 individuals). The majority of the participants were female (74.1%) and in the age group of 25-34 years (44.4%), ranging in age from 6 to 87 years, married or living with their partners (51 9%), with primary school education level (43.3%), not a member of minimum income programs (77.5%) and the monthly family income was of three minimum wages or more (30.0 %). Regarding their oral health needs, the majority considered their oral health as good (37.8%), reported toothache ever in life (84.0%), and had had no toothache in the last six months (80.7%) (Table 1).

Table 2 shows the distribution of the sample according to access to oral health actions. Regarding the individuals who had been to the dentist some time in their lives, the majority reported to use private oral health services or health plans (50.3 %). It was noteworthy that most individuals said they had never received

educational materials or topical application of fluoride (58.5%) or a visit from the oral health team or CHAs for guidance in oral health (90.2%).

Table 1. Participants distribution according to socioeconomic characteristics, self-perception of oral health, and history of toothache.

Variables	N	%
Sex		
Male	158	25.9
Female	451	74.1
Age Group		
06-14 Years	42	6.9
15-24 Years	72	11.8
25-49 Years	270	44.3
50-64 Years	131	21.5
65 Years or More	94	15.4
Marital Status		
Single	208	34.2
Married	316	51.9
Divorced	33	5.4
Widowed	52	8.5
Educational Level		
Illiterate	20	3.3
Elementary School	264	43.3
High School	203	33.3
Higher Education	122	20.0
Enrolled in a Minimum Income Program		
Yes	137	22.5
No	472	77.5
Monthly Family Income		
<1 BMW	95	15.6
1 BMW	174	28.6
2 BMW	157	25.8
3 BMW or More	183	30.0
Self-Perception of Oral Health		
Excellent	42	6.9
Very Good	45	7.4
Good	230	37.8
More or Less	216	35.5
Bad	76	12.5
Toothache Ever in Life		
Yes	508	84.0
No	97	16.0
Toothache in the Last Six Months		
Yes	97	19.3
No	406	80.7

BMW: Brazilian Minimum Wage.

Table 2. Participants distribution according to access to oral health actions.

Variables	N	%
Last Visit to Dentist		
Less Than 1 Year	242	39.7
Between 1 and 2 Years	160	26.3
3 Years or More	202	33.2
Never went to a Dentist	5	0.8
Type of Service Most Used		
Private Service, Health Plan, Health Insurance	300	50.3
Public Service in the FHS	204	34.2
Other Public Service	93	15.6

Access to Lectures or Meetings on Oral Health		
Yes	298	49.6
No	303	50.4
Access to Brushing Kits, Educational Material or TAF		
Yes	252	41.5
No	355	58.5
Visit by the Chas, Oral Health Assistants or Dentists		
Yes	59	9.8
No	543	90.2
Full Access to Oral Health Actions		
Yes	280	46.0
No	329	54.0

TAF: Topical Application of Fluoride

Table 3 shows the results of the bivariate analysis. There was a statistically significant association between the type of access to oral health actions and age range (p<0.001), marital status (p=0.013), educational level (p<0.001), family monthly income (p<0.001), self-perception of oral health (p=0.007) and toothache ever in life (p=0.001). It was observed that the older the age, the lower the access to oral health actions. Regarding income, full access was reached by individuals with 3 minimum wages or more. As for educational level, individuals with more years of study had more access to oral health services. It was also showed an association between self-perception of oral health (p=0.028), toothache ever in life (p=0.012), and toothache in the last 6 months (p=0.023). It was found that those who considered their oral health as excellent or very good and who had never had toothache in life had greater access.

Table 3. Bivariate analysis between access to oral health actions and the independent variables.

Variables	Full Access to Oral Health Actions						p-value
	Yes		No		Total		
	N	%	N	%	N	%	
Sex							0.121[(a)]
Male	81	51.3	77	48.7	158	100.0	
Female	199	44.1	252	55.9	451	100.0	
Age Group							<0.001[(a)]*
06-14 Years	30	71.4	12	28.6	42	100.0	
15-24 Years	50	69.4	22	30.6	72	100.0	
25-49 Years	142	52.6	128	47.4	270	100.0	
50-64 Years	45	34.4	86	65.6	131	100.0	
65 Years or More	13	13.8	81	86.2	94	100.0	
Marital Status							0.013[(a)]*
Single	105	50.5	103	49.5	208	100.0	
Married	149	47.2	167	52.8	316	100.0	
Divorced	12	36.4	21	63.6	33	100.0	
Widowed	14	26.9	38	73.1	52	100.0	
Educational Level							<0.001[(b)]*
Illiterate	1	5.0	19	95.0	20	100.0	
Elementary School	97	36.7	167	63.3	264	100.0	
High School	106	52.2	97	47.8	203	100.0	
Higher Education	76	62.3	46	37.7	122	100.0	
Enrolled in a Minimum Income Program							0.558[(a)]
Yes	66	48.2	71	51.8	137	100.0	
No	214	45.3	258	54.7	472	100.0	
Monthly Family Income							<0.001[(a)]*
<1 BMW	39	41.1	56	58.9	95	100.0	
1 BMW	74	42.5	100	57.5	174	100.0	
2 BMW	56	35.7	101	64.3	157	100.0	
3 BMW	111	60.7	72	39.3	183	100.0	
Self-Perception of Oral Health							0.007[(a)]*

Excellent	23	54.8	19	45.2	42	100.0	
Very Good	28	62.2	17	37.8	45	100.0	
Good	110	47.8	120	52.2	230	100.0	
More or Less	96	44.4	120	55.6	216	100.0	
Bad	23	30.3	53	69.7	76	100.0	
Toothache Ever in Life							0.001[a]*
Yes	219	43.1	289	56.9	508	100.0	
No	59	60.8	38	39.2	97	100.0	
Toothache in the Last Six Months							0.057[a]
Yes	50	51.5	47	48.5	97	100.0	
No	166	40.9	240	59.1	406	100.0	

BMW: Brazilian Minimum Wage; [a]Pearson's Chi-square test; [b]Fischer's exact test; *Statistically Significant.

Figure 1 shows the results of the multivariate analysis using the decision-tree based CHAID for the pattern of access to oral health actions, adjusted for the factors investigated. The final model showed that the variables with the most relevant role in the access to oral health actions were: age group (adjusted p-value <0.001), educational level (adjusted p-value in Node 4 = 0.009; adjusted p-value in Node 5 = 0.005), and self-perception of oral health (adjusted p-value = 0.001).

The assessment of the root nodes until reaching the terminal nodes or leaves (where the probable decision is found) revealed two main findings: 1) there was an association between full access to oral health actions, younger age groups, higher education level, and good, very good or excellent self-perception of oral health; 2) there was an association between partial or non-existent access to oral health actions, older age groups, lower educational level and more or less or bad self-perception of oral health.
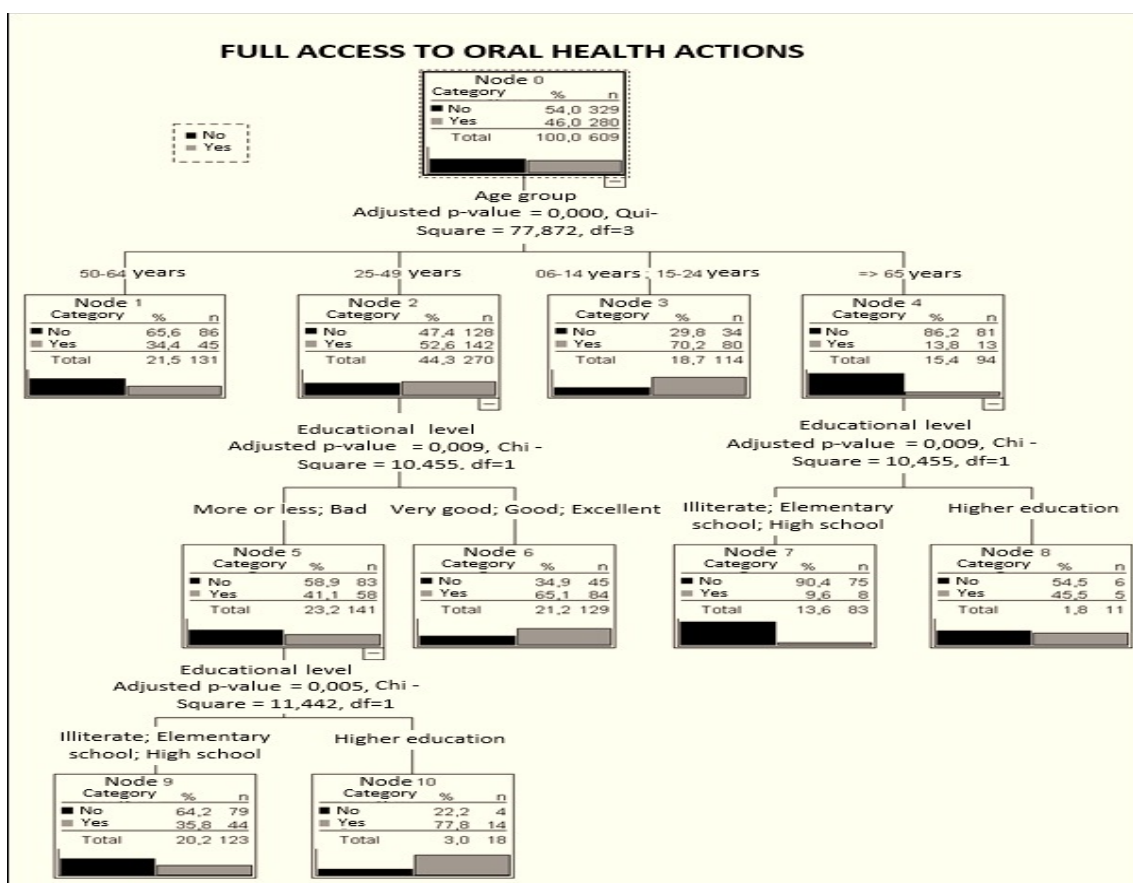

Figure 1. Multivariate analysis according to decision-tree based Chi-squared automatic interaction detection (CHAID) for the pattern of access to oral health actions, adjusted by investigated factors.

Discussion

Access to oral health services has increased in the country due to the rise of coverage and provision of private and public services and average income of the population. However, this has been preceded by historical inequalities [7,8,16] that hindered the comprehensive provision access to health care, consequently not meeting people's needs, and causing a reflection on their precarious health conditions [2,22].

Among the initiatives chosen to expand the coverage of access to public oral health services, the insertion of oral health teams in the FHS stands out as a way to reduce health inequalities, because FHSt act closer to the reality of the population served [23]. This made it possible a care proposal with a collective scope and focused on oral health promotion and disease prevention practices, contributing to integrality of health care [1,23,24].

In the present study, despite the fact that the city has 100% coverage of oral health services, a higher use of private over public services was observed, corroborating with national surveys [8,16]. Availability is one of the most important characteristics for access to health services, but it has not; however, represent changes in the care process itself. More planning and organization of teams is needed [6,7,9,23]. The literature points to several organizational barriers that can influence this access, such as travel time, days and shifts of operation, and scheduling type [25-27]. Characteristics of health services that could justify the lower utilization of public services were not analyzed in the present study.

The fact that the interviewees have low access to oral health promotion and disease prevention actions is alarming, especially because these actions must be prioritized in the scope of the FHS [28]. They should enhance the change of the care model proposed by the NOHP, guiding care towards the principle of integrality, besides providing stronger bonds between users and FHSt [29]. It should also be considered that home visits are not part of the daily routine of the City's oral health teams, a mandatory aspect for professionals of the FHS, whose proposal is to extend health practices to family's homes and communities [30].

It was proposed an explanatory model of access in which the use of services is a result of individual variables divided into factors of predisposition, enabling resources and needs [31]. According to this model, the individual variables of predisposition that influenced access were age and educational level, while self-perception of oral health was related to needs.

Regarding the association with age, the oral health care model in Brazil is markedly focused on age groups of schoolchildren. Despite the demographic transition in the country, with the increase in number of elderly people, this population has not been prioritized in the planning and execution of actions yet [13].

In the present study, the percentage of elderly people who did not have access to oral health actions was high. It is important to emphasize that elderly individuals also present a higher prevalence of oral problems and dental losses [32] that generate negative impacts on oral health. This comes also from difficulties of access and absence of specific oral health programs for this public, which can be considered a serious public health problem [33].

Research shows that the more years of schooling of the individuals or of their household heads, the greater was the use of health services [11,16,34]. Some scholars explain that income and educational level are closely related to socioeconomic characteristics, higher the educational levels are related to higher average income and better capacity to pay for services [35]. A higher educational level also increases access to information, a better understanding of needs and, therefore, more conditions to face barriers to access [2].

Regarding self-perception of oral health, it was found that individuals who showed a better perception of their teeth and mouth health had more access to actions than those who perceived it as bad. This assessment

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of health status is directly influenced by past experiences, individual habits and by the cultural and social environment in which individuals are inserted [36].

The individuals' self-perceived health is also related to perceived needs and can be an indicator of how such needs impact on access to oral health services. It is also important to understand why people seek for services, since needs are transformed into demands and these, into use of services [37].

Despite the advances related to the expansion of access to oral health services at the national level, it is still not possible to guarantee equity and integrality of care. Increasing the coverage of oral health teams does not always represent changes in the work process and much is still necessary to reduce inequities and increase the access to health promotion and disease prevention actions in the city in question.

Due to the cross-sectional nature of this investigation, reverse causality must be taken into account in the explanation of the findings, as well as the possibility of the individuals' responses being subject to memory and information bias. A series of measures were taken to try to decrease these events, such as the realization of a pilot study and use of previously validated forms. Regarding memory bias, in order to try to reduce its occurrence, access was only considered when the individuals reported the use of oral health services in the two years prior to the interview.

Although restricted to a medium-sized city, the present study allows discussing a topic of great importance to reorient oral health care practices in the FHS. It was also possible to investigate the access to oral health actions according to social and individual determinants through decision-tree based data modeling. Finally, the study was representative of the reference population, generating useful information to guide strategic planning, reformulation of care practices and development of oral health actions. Future studies must assess the association between individual factors and external factors such as availability of services and professionals, geographical barriers and the organization of services.

Conclusion

The results suggest that access to oral health actions may be associated with educational level, age and self-perception of oral health. Despite the considerable use of oral health services, much is still necessary to reduce health inequities because access to oral health actions, including promotion and prevention actions, does not occur in an equitable way. This access is marked by intense social inequalities, favoring plots of population that live better situations to the detriment of those with the greater needs, such as people with lower education level, lower income, and elderly people.

Authors' Contributions

DEWF	0000-0001-7680-0387	Conceptualization, Methodology, Investigation, Formal Analysis, Writing – Original Draft Preparation and Writing – Review and Editing.
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AMRC	0000-0002-2682-1048	Formal Analysis and Writing – Review and Editing.
ALC	0000-0003-3572-3332	Conceptualization, Methodology and Writing – Review and Editing.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

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