Treatment Needs for Dental Caries and Restorative Care Index on the Permanent Dentition of Nicaraguan Children

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ABSTRACT

Objective: *To determine the treatment needs for dental caries and the restorative care index on the permanent dentition of Nicaraguan children.*

Subjects and Methods: *In a cross-sectional study, 1379 schoolchildren aged 6 to 12 years old were evaluated clinically to determine the decay, missing and filled teeth (DMFT) index and to calculate the need for dental caries (TNI) and care indices (CI). Sociodemographic, socio-economic and behavioural data were collected using questionnaires.*

Results: *The mean age was 9.04 ± 1.98 years and 50.2% were female. A relatively higher percentage of TNI was observed in the following groups: younger children (78.0%), males (60.1%), children of higher birth order (69.1%), the children of older mothers (56.7%), having a negative attitude toward oral health (59.9%), with preventive dental care in the past year (94.2%), less frequent tooth brushing (66.3%), with greater presence of plaque (53.9%), larger family (56.3%), higher socio-economic position [SEP] schooling (60.9%) and lower SEP occupation (58.9%). In addition, we observed a higher percentage of CI amongst the following: older children (52.2%), females (49.9%), those of a lower birth order (47.7%), children of young mothers (47.2%), those with a positive attitude toward oral health (48.6%), receiving preventive/curative dental care in the past year (74.3%), most frequently brushing teeth (51.9%), less presence of plaque (50.0%), small family (45.9%), lower SEP school (53.5%) and higher SEP occupation (52.9%).*

Conclusions: *We show that Nicaraguan children have high treatment needs for dental caries but had little experience of restorative care.*

Keywords: Nicaragua, oral health, school, treatment needs

Necesidades de Tratamiento para caries Dental e Índice de Cuidados Restauradores en Dentición Permanente de Niños Nicaragüenses de 6 a 12 Años de Edad

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RESUMEN

Objetivo: *Determinar las necesidades de tratamiento para caries dental y el índice de cuidados restauradores en dentición permanente de niños nicaragüenses.*

Material y Métodos: *En un estudio transversal, 1379 escolares de 6 a 12 años de edad fueron evaluados clínicamente para determinar el índice de dientes cariados, perdidos y obturados (CPOD) y calcular con*

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sus componente las necesidades de tratamiento (INT) para caries dental así como el índice de cuidados (IC). Los datos sociodemográficos, socioeconómicos y conductuales fueron recolectados utilizando cuestionarios.

Resultados: *El promedio de edad fue de 9.04 ± 1.98 años y las mujeres fueron el 50.2%. Se observó mayor porcentaje del INT entre, los de menor edad (78.0%); los varones (60.1%); los de mayor orden de nacimiento (69.1%); los hijos de madres con más edad (56.7%) y con actitud negativa hacia la salud bucal (59.9%); con atención dental preventiva en el último año (94.2%); con menor frecuencia de cepillado dental (66.3%); con mayor presencia de placa dentobacteriana (53.9%); de familia más numerosa (56.3%); de PSE (escolaridad) más alta (60.9%); y de PSE (ocupación) más baja (58.9%). Por otro lado, observamos mayor porcentaje del IC entre, los de mayor edad (52.2%); los mujeres (49.9%); los de menor orden de nacimiento (47.7%); los hijos de madres jóvenes (47.2%) y con actitud positiva hacia la salud bucal (48.6%); que recibieron atención dental preventiva/curativa en el último año (74.3%); con mayor frecuencia de cepillado dental (51.9%); con menor presencia de placa dentobacteriana (50.0%); de familia pequeñas (45.9%); con PSE escolaridad más baja (53.5%); y con PSE ocupación más alta (52.9%).*

Conclusiones: *Se demuestra que los niños nicaragüenses presentan altas necesidades de tratamiento para caries dental. Contrariamente, esta muestra de escolares presentó poca experiencia de cuidados restauradores.*

Palabras clave: salud bucal, necesidades de tratamiento, escolares, Nicaragua

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INTRODUCTION

Dental caries is a complex disease and a real public health problem caused by variability of physiological balance between tooth minerals and biofilm liquid (1). Dental caries is a chronic disease that causes pain and suffering from physical, psychological and economic implications. Due to its high prevalence and incidence, it is considered the main problem in oral public health in Latin America; in addition, it requires a greater need for care and is mainly concentrated among the most vulnerable people (2−8). Although reversible in its early stages, once established it slowly progresses, causing the destruction of tooth hard tissues and, if it is not restricted through proper treatment, it becomes a principal tooth mortality cause (9). Although dental caries is preventable with minimal protective actions, it shows a high prevalence and incidence and is one of the principal oral health needs in the Latin American population (2−8, 10).

The majority of health workers consider healthcare needs according to the services they can provide and these are usually defined by regulatory norms. Patients, however, may have a different view of what would be healthier. The population's healthcare needs are constantly changing and many of these needs are not susceptible to medical intervention (11, 12). Thus, healthcare service offerings should be informed by analyses that include knowledge and opinion at the technical level, as well as the demographic and epidemiologic characteristics of the population and the population's perceived needs (13). As such, the "healthcare needs" concept is broad and can be defined as the health-sickness degree that potential healthcare service users experience, which is given by the close relationship between basic individual needs and intermediate needs; which are conditioned and defined by the socio-political and cultural circumstances of each population, and incorporate social and environmental determinants, such as deprivation, living conditions, food, education and employment. Therefore, this concept has important implications for establishing priorities in planning and decision-making about providing healthcare services, as well as determining the goals and priorities of the health service. This wider concept allows us to look beyond the limits of medical models based on health services and to include wider influences on health (11, 12, 14). Relative to past decades, in general, Latin America now has stronger and more integrated economies, less poverty, more stable democracies and governments that have assumed greater responsibilities in social protection. However, Nicaragua remains one of the least developed countries in Latin America. According to the latest report from the United Nations Development Program 2014 (UNDP), the Human Development Index places the country in the penultimate place among Latin American countries, above only Haiti. Poverty, although it has steadily declined in recent years, remains high. More than 80% of the poor people in Nicaragua live in rural areas, with the greater part in distant communities where access to basic services, including health services, is limited (15, 16). The objective of this study was to determine the treatment needs for dental caries and the restorative care index on the permanent dentition of Nicaraguan children.

SUBJECTS AND METHODS

Study design and sample selection

Secondary analyses of data from a cross-sectional study on dental caries and oral health services were used (17−20). The study population consisted of 18 574 children from 6 to 12 years of age from elementary schools of León, Nicaragua. The

inclusion criteria were healthy children from 6 to 12 years old, registered in elementary schools, with parental informed consent, not using orthodontic devices, showed no systemic diseases affecting the mouth and did not refuse to be examined. A total of 25 schools were selected from all schools in León, Nicaragua, through a simple random sampling approach. Using a sampling strategy similar to World Health Organization's [WHO] (21), four boys and four girls were included from each of the seven age groups, leading to 56 children groups in each of the 25 schools. In this way, children were distributed equally by age and gender, giving a final sample of 1400 students, of which 21 showed no permanent teeth and were not included in this analysis.

Variables and data collection

The dependent variables were treatment needs for dental caries and restorative care-index calculated by DMFT (decayed, missing and filled permanent teeth index). Clinical oral inspection probe and mouth mirrors were employed, working under daylight. Children were examined on site at each school, avoiding possible interference with the school's own educational activities. All subjects were clinically examined by one of two trained and standardized examiners (Kappa > 0.85) in diagnostic criteria. Results of clinical variables were settled on a format designed specifically for the study containing an odontogram. The treatment needs (TNI) were calculated by the following ratio: $TNI = \frac{decayed\ \ teeth}{decayed\ \ teeth + filled\ \ teeth}(100)$ (22).

While the rate of restorative care (Care index) shows the proportion of the population that has been exposed to treatments and was obtained by the formula: $CI = \frac{filled\ \ teeth}{DMF}(100)$ (23).

Questionnaires were distributed to mothers through the schools and collected later in the same way. The included variables in the study were as follows: the child's age, gender, birth order, frequency of toothbrushing, presence of dental plaque, and dental care utilization of the child in the last year; the mother's age, and attitude towards the importance of the oral health of the child; we also collected data for family size, occupation and maximum level of formal education of the mother and father, which were used to calculate socio-economic position (SEP).

Dental plaque was recorded (visible: presence or absence) using the modified Silness and Löe index (24), by introducing a probe tip, smoothly sliding the tip into the gingival sulcus of all teeth and recording the extent of dental plaque (number of teeth with presence of dental plaque divided by total number of teeth present in the mouth, multiplied by 100). The extent of dental plaque was coded as 0 = low presence of dental plaque (subjects that presented an extent lower than 20%) and 1 = high presence of dental plaque (subjects that presented a dental plaque extent greater than 20%). The importance ascribed by the mother/caregiver to the child's oral health was derived from the following questions: 1) *Is it important that your child keeps his/her teeth in good condition?* and 2) *Have you ever examined his/her teeth to ascertain if they are healthy?* Responses were aggregated into a positive attitude (1) if "*yes*" was answered to both questions, or a negative attitude (0) if "*no*" was answered to any of them. This variable has been described previously (5, 25, 26). Socio-economic position was assigned to a group according to the maximum level of schooling and occupation of both parents. To assign a group of poverty and social exclsion (PSE), a principal components analysis was used to generate two indicators, one for parental schooling and other for occupancy (27). With the generated variables, 80.2% and 55.8% of the variability was explained, respectively. Following this analysis, the component generated was divided into SEP tertiles; the first tertile represented the group with the lowest SEP and the third tertile represented the highest SEP.

Data analysis

The independent variables in the analysis were categorical and frequencies. Using the DMFT components, the treatment needs index for dental caries and the care index and percentages were calculated. The software used for statistical procedures were Excel and Stata 11.0.

Ethics

The implementation of this study fulfilled the specifications to protect research participants and adhered to ethical research and regulations in effect at the National Autonomous University of Nicaragua (Leon campus) and the Autonomous University of Campeche. Parents or guardians of schoolchildren provided informed consent and the information was treated as confidential.

RESULTS

Table 1 presents the descriptive results from the 1379 schoolchildren included in this study.

Table 1: Univariate results describing Nicaraguan schoolchildren sample

Variable	Frequency	Percentage
Age		
6 – 7 years old	379	27.5
8 – 10 years old	600	43.5
11 – 12 years old	400	29.0
Gender		
Men	687	49.8
Women 692	50.2	
Birth order		
First to third	1150	83.4
Fourth or more	229	16.6
Mother´s age		
20 – 34 years old	855	62.0
35 – 52 years old	524	38.0
Mother's attitude towards oral health		
Negative	593	43.0
Positive	786	57.0
Dental care utilization (last year)		
None	995	72.2
Preventive	43	3.1
Curative	250	18.1
Both	91	6.6
Frequency of tooth brushing		
Less than seven times/week	662	48.0
At least one-time per day	717	52.0

Table 1 cont'd: Univariate results describing Nicaraguan schoolchildren sample

Variable	Frequency	Percentage
Dental plaque		
Low presence	30	2.2
High presence	1349	97.8
Family size (number of children)		
1 − 3	974	70.6
Four and more	405	29.4
SEP (occupation)		
Low	552	40.0
Medium	517	37.5
High	310	22.5
SEP (schooling)		
Low	499	36.2
Medium	430	31.2
High	450	32.6

The average age was 9.04 ± 1.98 years old with close to equal numbers of males and females (50.2% female). The majority of mothers (62%) were between 20 and 34 years-of-age and more than half (57.0%) had a positive attitude towards their children's oral health. We note that 70.6% of households had between one and three children and that the majority of children included were the first-to-third born (83.4%). Very few students had received preventive care in the last year (3.1%). Just over half (52.2%) of the children reported that they brushed their teeth at least once a day and the majority had dental plaque (97.8%). As mentioned in the methodology, the variables of SEP were divided into terciles. The overall TNI was 53.9% and the CI was 44.6%.

Table 2 shows the distribution of treatment needs index through included variables, while Table 3 shows the distribution of the restorative care index. We observed that while age increases, the TNI decreases (78.0% to 45.8%) and CI increases (21.5% to 52.2%).

Table 2: Distribution of treatment needs index for dental caries in Nicaraguan schoolchildren where it relates:

Variable	decayed	filled	TNI
Age			
6 − 7 years old	0.092	0.026	78.0
8 − 10 years old	0.358	0.220	61.9
11 − 12 years old	0.550	0.652	45.8
Gender			
Men	0.339	0.225	60.1
Women	0.342	0.358	48.9
Birth order			
First to third	0.317	0.309	50.6
Fourth or more	0.458	0.205	69.1
Mother´s age			
20 − 34 years old	0.272	0.259	51.2
35 − 52 years old	0.452	0.345	56.7
Mother's attitude towards oral health			
Negative	0.347	0.232	59.5
Positive	0.335	0.337	49.9
Dental care utilization (last year)			
None	0.314	0.134	70.1
Preventive	0.372	0.023	94.2
Curative	0.424	0.596	41.6
Both	0.384	1.307	22.7
Frequency of tooth brushing	0.339	0.172	66.3
Less than seven times/week	0.341	0.403	45.8
At least one time per day	0.341	0.403	45.8

Table 2 cont'd: Distribution of treatment needs index for dental caries in Nicaraguan schoolchildren where it relates:

Variable	decayed	filled	TNI
Dental plaque			
Low presence	0.033	0.033	50.0
High presence	0.347	0.299	53.9
Family size (number of children)			
1 − 3	0.306	0.277	52.5
Four and more	0.422	0.328	56.3
SEP (occupation)			
Low	0.288	0.355	52.5
Medium	0.363	0.247	59.5
High	0.396	0.254	60.9
SEP (schooling)			
Low	0.352	0.246	58.9
Medium	0.362	0.251	59.1
High	0.306	0.382	44.5

TNI: treatment needs index; SEP: socio-economic position

Table 3: Distribution of care index in Nicaraguan schoolchildren where it relates:

Variable	filled	DMF	CI
Age			
6 – 7 years old	0.026	0.121	21.5
8 – 10 years old	0.220	0.591	37.2
11 – 12 years old	0.652	1.250	52.2
Gender			
Men	0.225	0.589	38.2
Women	0.358	0.718	49.9
Birth order			
First to third	0.309	0.648	47.7
Fourth or more	0.205	0.681	30.1
Mother´s age			
20 – 34 years old	0.259	0.549	47.2
35 – 52 years old	0.345	0.824	41.9
Mother's attitude towards oral health			
Negative	0.232	0.648	38.5
Positive	0.337	0.693	41.9
Dental care utilization (last year)			
None	0.134	0.461	29.1
Preventive	0.023	0.396	5.80
Curative	0.596	1.064	56.0
Both	1.307	1.758	74.3
Frequency of tooth brushing			
Less than seven times/week	0.172	0.521	33.0
At least one time per day	0.403	0.776	51.9
Dental plaque			
Low presence	0.033	0.066	50.0
High presence	0.297	0.667	44.5
Family size (number of children)			
1 − 3	0.277	0.604	45.9
Four and more	0.328	0.772	42.5
SEP (occupation)			
Low	0.355	0.664	53.5
Medium	0.247	0.640	38.6
High	0.254	0.658	38.6
SEP (schooling)			
Low	0.246	0.609	40.4
Medium	0.251	0.634	39.6
High	0.382	0.722	52.9

DMF: Decayed missing filled; CI: care index; SEP: socio-economic position

Men showed a greater TNI (60.1% *vs* 48.9%) and lower CI (38.2 %*vs* 49.9%) than women. Those who were first-to-third born had lower TNI (50.6% *vs* 69.1%) and greater CI (47.7% *vs* 30.1%) than children who were fourth born (or higher).On the other hand, children born from younger mothers had lower TNI (51.2% *vs* 56.7%) and greater CI (47.2% *vs* 41.9%) than children from older mothers. Children whose mothers had a positive attitude toward oral health had lower TNI (49.9% *vs* 59.9%) and greater CI (48.6% *vs* 38.5%) than those with moth-ers with a negative attitude towards oral health.

Subjects who had a preventive dental care in the last year showed high levels of TNI and lower levels of CI than those who did not receive dental care or curative care. Children who reported brushing their teeth with more frequency have smaller TNI percentages (45.8% *vs* 66.3%) and greater CI (51.9% *vs* 33.0%) than those who brushed with less frequency. A slightly higher TNI was observed between those who had more dental plaque (53.9% *vs* 50.0%) and smaller CI (44.5% *vs* 50.0%) than those with less bacterial plaque. The variables related to socio-economic position yielded the following results: children in large families have greater TNI percentage (56.3% *vs* 52.5%) and lower CI (42.5% *vs* 45.9%) than children with smaller families. Interestingly, SEP related to schooling gave different results to SEP related to occupation; when schooling was used as a measure of SEP the TNI was higher and the CI lower in those with greater SEP, whereas when the occupation was used, lower TNI and greater CI were found with greater SEP.

DISCUSSION

This study aimed to determine the treatment needs for dental caries and experience with restorative dental treatments (CI) in a sample of Nicaraguan schoolchildren; observing that more than 50% of caries lesions needed dental attention, while less than 45% has been restored. From the oral epidemiology view, studies of health requirements presented by different population groups allow the focus of human and financial resources toward solving those health problems that most require attention (4). There are several factors that contribute to people presenting dental caries lesions without treatment. One such factor is the concept that dental caries is not a real health problem, meaning that some subjects with this condition do not assume the sick role.

In this sense, the disease perception is a consequence of several factors related to individual bio-psychosocial elements. Thus, the subjective disease experience is influenced by sociocultural factors; the subject receives guidelines about what to do when they feel pain or discomfort, how to express these feelings verbally and nonverbally, who should require assistance, and what to expect about roles and rules of behaviour according to cultural requirements. However, because oral health problems are generally non-fatal, they often occupy a lower priority (28).

Health needs measurements make it possible to assess the effectiveness of current interventions and to monitor the epidemiological trends of health problems (29). Although there are few studies on this topic, there are several sociodemographic and socio-economic characteristics that have greater oral health needs and treatments to which the population has been exposed. Health requirements can vary between countries, within a country, or within a community; variations are determined by demographic, social, cultural, economic and political characteristics. Results of treatment needs for dental caries in several Latin American countries generally indicate high levels, which focus also on more socially disadvantaged populations (2−8, 10, 30−32).

To determine the health needs of a group, indicators are important to observe the distribution of the sociodemographic variables (*eg*, age, gender, *etc*). Sociodemographic differences can thus, help to determine the population epidemiological profile related to needs and healthcare. In this way the disease profile can be used to adequately organised responses and plan services (33). Although social epidemiology studies have identified health inequalities (*ie*, people of higher socioeconomic position generally have better health), the exact mechanism of this connection is not well understood (34).

This study also found that people with higher SEP (measured by family size and occupation SEP, but not for schooling SEP) had fewer treatment needs for dental caries and a higher restorative care-index. Several variables related to oral health showed an impact on the treatment requirements and experience of restorative treatment. People with better attitudes or behaviours toward oral health generally required less treatment and showed a higher rate care. However, in the variable "type of dental attention received in the last year", we found that those that used preventive dental care had higher TNI and lower CI values. Moreover, we also found that the situation was opposite in those receiving curative care; however, we should emphasize that people that were receiving both types of care (preventive and curative) had more decayed and more filled teeth; for this reason, they were more likely to receive dental care and therefore, to also have treatment needs.

In a study by Johnson *et al* (35), they propose that, when considering dental requirements, the presence of dental disease is a poor indicator of the need for care because it ignores the complexity and difficulties involved in providing dental care. Moreover, the use of the DMFT index does not consider the subjective perception regarding oral health, *ie*, DMFT is unlikely to reflect how oral health affects the daily lives of the subjects, as has been previously suggested by several researchers (12).

This study shows that Nicaraguan children had high treatment needs for dental caries but showed little experience of restorative care. Certain socio-economic inequalities in oral health were observed. To better satisfy the oral health needs of students, it will be necessary for oral health programmes in Nicaraguan schools to also include a curative component (in addition to preventive elements).

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