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Dental Caries, Traumatic Dental Injuries and Gingivitis among Street-Children in Kano, Nigeria

Caries Dentaires, Traumatismes Dentaires et Gingivite chez les Enfants de la Rue à Kano, Nigeria

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ABSTRACT

BACKGROUND: Street-children (Almajirai) constitute a significant proportion of the adolescent population in northern Nigeria. They face health challenges, especially oral health, from being inadequately protected, supervised or directed by responsible adults.

OBJECTIVES: The objective of the study was to determine the prevalence of dental caries, dental trauma, gingivitis and oral hygiene scores in street-children.

METHODOLOGY: Three hundred and sixty-six school-aged children were selected through a multi-stage sampling of 10 to 12-year-old children from four modern and traditional qur'anic schools, and examined for oral conditions using the WHO protocol. The DMFT index, the modified Ellis criteria, the Gingival Bleeding Index and the Oral Hygiene Index-Simplified (OHI-S) were used to assess dental caries, traumatic dental injuries, gingivitis and oral hygiene scores respectively. Chi-squared tests and Odds Ratio were used to compare the difference and test the association between Almajirai groups. Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS version 20). Statistical significance was considered when $p < 0.05$.

RESULTS: One hundred and sixty eight (45.9%) traditional Almajirai and 198 (59.4%) modern-type Almajirai, participated in the study. Their mean age was 10.8(±0.8) years. The prevalence of dental caries was 25.4% with mean DMFT and SiC scores of 0.6 (±1.3) and 1.7 respectively. DMFT scores ranged from 0 to 12. The prevalence of traumatic dental injuries and gingivitis were 8.7% and 82.2% respectively, while the OHI-S score was 3.0. The odds for traumatic dental injuries were 41% less in the modern-type Almajirai (p=0.02); the modern-type Almajirai were twice as likely to develop gingivitis (aOR 95%CI =2.0, p=0.01). OHI-S scores showed poorer oral hygiene levels in the modern Almajirai (p=0.02).

CONCLUSION: Dental caries, traumatic dental injuries, gingivitis and poor oral hygiene were prevalent among street-children in Kano. There is a high level of untreated dental disease in the study population. **WAJM 2022; 39(10): 1040–1044.**

Keywords: Caries, Street-children, Almajirai, Adolescents, Oral hygiene, Gingivitis.

RÉSUMÉ

CONTEXTE: Les enfants des rues constituent une proportion importante de la population adolescente du nord du Nigeria. Ils sont confrontés à des problèmes de santé, notamment de santé bucco-dentaire, du fait qu'ils ne sont pas suffisamment protégés, supervisés ou dirigés par des adultes responsables.

OBJECTIFS: L'objectif de cette étude était de déterminer la prévalence des caries dentaires, des traumatismes dentaires, de la gingivite et des scores d'hygiène buccale chez les enfants des rues.

MÉTHODOLOGIE: Trois cent soixante-six enfants d'âge scolaire ont été sélectionnés par un échantillonnage à plusieurs degrés d'enfants de 10 à 12 ans dans quatre écoles qur'aniques modernes et traditionnelles, et ont été examinés pour les conditions bucco-dentaires en utilisant le protocole de l'OMS. L'indice CAOD, les critères d'Ellis modifiés, l'indice de saignement gingival et l'indice d'hygiène buccale simplifié (IOB-S) ont été utilisés pour évaluer les caries dentaires, les lésions dentaires traumatiques, la gingivite et les scores d'hygiène buccale, respectivement. Les tests du chi carré et l'Odds Ratio ont été utilisés pour comparer les différences et tester l'association entre les groupes Almajirai. L'analyse des données a été réalisée à l'aide du progiciel statistique pour les sciences sociales (SPSS version 20). La signification statistique a été considérée lorsque p < 0,05.

RÉSULTATS: Cent soixante-huit (45,9%) Almajirai traditionnels et 198 (59,4%) Almajirai de type moderne ont participé à l'étude. Leur âge moyen était de 10,8 (±0,8) ans. La prévalence de la carie dentaire était de 25,4 % avec des scores moyens de CAOD et de SiC de 0,6 (±1,3) et 1,7 respectivement. Les scores CAOD variaient de 0 à 12.

La prévalence des lésions dentaires traumatiques et de la gingivite était de 8,7 % et 82,2 % respectivement, tandis que le score OHI-S était de 3,0. Les risques de lésions dentaires traumatiques étaient 41 % moins élevés chez les Almajirai de type moderne (p=0,02) ; les Almajirai de type moderne étaient deux fois plus susceptibles de développer une gingivite (aOR 95%CI =2,0, p=0,01). Les scores OHI-S ont montré des niveaux d'hygiène buccale plus faibles chez les Almajirai de type moderne (p=0,02).

CONCLUSION: Les caries dentaires, les lésions dentaires traumatiques, les gingivites et une mauvaise hygiène bucco-dentaire étaient prévalentes chez les enfants des rues de Kano. Il existe un niveau élevé de maladies dentaires non traitées dans la population étudiée. **WAJM 2022; 39(10): 1040–1044.**

Mots clés: Caries, enfants des rues, Almajirai, Adolescents, Hygiène buccale, Gingivite.

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INTRODUCTION

The Commission on Human Rights in 1994 described the street child as "any girl or boy who has not reached adulthood, for whom the street (in the widest sense of the word, including unoccupied dwellings, wasteland) has become his or her habitual abode and/or source of livelihood, and who is inadequately protected, directed, and supervised by responsible adults".[1] This implies that all children who spend a substantial amount of their time in or on the street would fit into this description. The *Almajirai* of northern Nigeria have the characteristics of street-children. They are male children who have left their rural dwellings and distant cities in search of sound Islamic and Qur'anic education in urban cities. There are approximately 10 million Almajirai in the cities of northern Nigeria who roam the streets without adult-supervision, beg for alms or perform menial tasks for members of the society in exchange for food and money in-between lessons.[3] A previous study observed that over 80% of the Almajirai were between the ages of 5 and 15 years old.[4]

In a recent effort to take some of these children off the streets, the Federal Government of Nigeria established several Almajirai Integrated boarding-schools across northern Nigeria. The Centres were to provide education, food and accommodation at public expense, to keep the Almajirai away from the streets. The category that benefitted from this intervention became known as the "modern-type" Almajirai, as distinct from their non-benefitting peers: the "traditional Almajirai".[5]

Oral health of these children is usually suboptimal. Unsupervised children typically make poor and unhealthy dietary and life-style choices that can prove detrimental to their general and oral health. Homeless children are ten times more likely to have a poorer oral health as a consequence of poor hygiene, smoking, alcohol use, and lack of regular dental care.[6] Idowu, *et al*, reported that the Almajirai fared poorly in terms of important oral health parameters.[7] Long street-hours and the male gender have been associated with increased risk of traumatic dental injuries.[8] Physical violence and harassment from peers and significant adults, including parents and police officers are common in street-children.[1]

There is a dearth of literature on the oral health challenges of the Almajirai, who constitute a significant proportion of the school-aged population in northern Nigeria.[7,9] It is imperative to appraise the baseline oral health data in order to quantify the public health problem and evolve evidence-based interventions. This study was undertaken to determine the oral health status of Almajirai aged 10 to 12-years old in Kano, Nigeria by assessing dental caries, traumatic dental injuries, gingivitis and the oral hygiene scores.

MATERIALS AND METHODS

This was a cross-sectional study of male, school-aged children who either attend the traditional or modern Almajirai qur'anic schools in Kano, Nigeria. Two "traditional" and two "modern" qur'anic schools from two Local Government Areas (Kano Municipal and Gwarzo) were selected by systematic random sampling from a list of qur'anic schools and Local Government Areas in Kano State. The list was obtained from the Kano State Qur'anic and Islamiyya Schools Board (KSQISMB).

The approval for this study was granted by the Committee for Research and Ethics, Kano State Ministry of Health (MOH/Off/797/T.I/1774). Written consents were obtained from the schools' authorities, parents and the caregivers of the Almajirai. With assured confidentiality, all participants gave verbal assent in accordance with the principles outlined in the Declaration of Helsinki. All the children benefitted from a free dental education and consultation.

Sample Size Determination

The sample size was calculated using the formula for descriptive cross-sectional studies:[10]

$$n = \frac{Z^2 p(1-p)}{e^2}$$

Where

n = minimum sample size

Z = standard normal deviate at 95% confidence interval =1.96

p = prevalence of dental caries from a previous study =33%[9]

e = the degree of precision (5%).

The minimum sample size (including provision for non-response) was determined to be 341 children.

Study Protocols

Dental examinations were conducted using individually wrapped and sterilized sets of reusable plain mouth mirrors, disposable wooden spatula, dental explorers and dry disposable gauze-pads and in accordance with the guidelines of the World Health Organisation.[11] The children were examined while comfortably seated on a chair in their class-rooms, using a Light Emitting Diode (LED) light bulb coupled to the Investigator's head and directed towards the participants' mouth to provide proper illumination.

Each child was examined for the presence of dental caries, traumatic dental injuries, gingivitis and the level of oral hygiene using the DMFT index, the modified Ellis classification, the Gingival Bleeding Index (GBI) and the Oral Hygiene Index-Simplified (OHI-S) Greene and Vermillion 1964, respectively.[12] The DMFT scale indicates very low prevalence when the DMFT is between 0 and 1.1; low prevalence between 1.2 and 2.6; moderate prevalence between 2.7 and 4.4; high prevalence between 4.5 and 6.5; and very high prevalence when the DMFT is greater than or equal to 6.6.[12]

The modified Ellis classification indicates no trauma when the score is 0, simple crown fracture when the score is 1; extensive crown fracture involving the dentine when the score is 2; extensive crown fracture involving the dentine and exposing the pulp when the score is 3; nonvital tooth, without loss of crown fracture when the score is 4, and total tooth loss when the score is 5.[12]

Gingival Bleeding Index is recorded as 0 when there is no bleeding, and 1 to indicate bleeding. OHI-S has two components, the debris index-simplified and the calculus index-simplified, both of which is calculated separately and is added to get the OHI-S score for an individual. OHI-S scores may be interpreted as: good (0–1.2), fair (1.3–3.0) and poor (3.1–6.0).[12]

Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS version 20). The distributions of the common oral conditions were represented by tables and graphs; chi-squared tests were used to compare the difference between groups, while the strength of the association was quantified by odds ratios. Statistical significance was considered when $p < 0.05$.

RESULTS

A total of three hundred and sixty-six adolescents participated in this study: one hundred and sixty-eight (45.9%) traditional Almajirai and 198 (54.1%) modern-type Almajirai. Their mean age was 10.8(±0.8) years (Table 1).

The prevalence of dental caries, mean DMFT/dmft and SiC scores for the population were 25.4%, 0.6 (±1.3) and 1.7 respectively. The prevalence of dental caries, mean DMFT and SiC scores for the traditional and modern-type Almajirai were 26.2%, 0.6 with 1.5 and 24.7%, 0.5 with 2.0, respectively (Table 2). The highest distribution of DMFT/dmft scores >0 is DMFT/dmft of 1. DMFT/dmft scores for the population ranged from 0 to 12 (Figure 1).

Dental trauma occurred in 32 children (8.7% of the study population), composed of 21 (12.5%) traditional-type and 11 (5.6%) modern-type Almajirai respectively. The odds for dental trauma were 41% less in the modern-type Almajirai than for their traditional-type peers with a statistically significant difference (p=0.02) between them. Single tooth and multiple teeth trauma occurred more in the traditional Almajirai group (Table 3).

Gingivitis occurred in 301 children (82.2% of the study population); the modern Almajirai were twice as likely to develop gingivitis as did the traditional Almajirai, with a statistically significant difference between them (p=0.01). The OHI-S scores for the traditional and modern-type Almajirai were 2.9 (± 1.1) and 3.1 (± 0.82) respectively, with a statistically significant difference (p=0.02) between them (Table 3).

DISCUSSION

This study provides information on the oral health status of street-children

Table 1: Demographic Characteristics of the Almajirai (N=366)

Almajirai	Traditional-Type n (%)	Modern-Type n (%)	Total n (%)
	168 (45.9)	198 (54.1)	366 (100.0)
Age (years)			
10	166 (100.0)	0	166 (100.0)
11	2 (1.8)	112 (98.2)	114
12	0	86 (100.0)	86 (100.0)
Mean age (±SD)	10.0 (±0.1)	11.4 (±0.5)	10.8 (±0.8)

Table 2: Distribution of Caries Experience Scores among the Almajirai

	N	CP (%)	DMFT	Mean DMFT	N/3	SiC	p-value
Almajirai	366	93 (25.4)	207	0.6	122	1.7	
Type of Almajirai							
Modern	198	49 (24.7)	99	0.5	49	2.0	0.09
Traditional	168	44 (26.2)	108	0.6	73	1.5	

CP, Caries Present; DMFT, Decayed, Missing and Filled Teeth; SiC, Significant Caries Index.

Table 3: Distribution Pattern of TDI, Gingivitis and Oral Hygiene Scores among the Almajirai

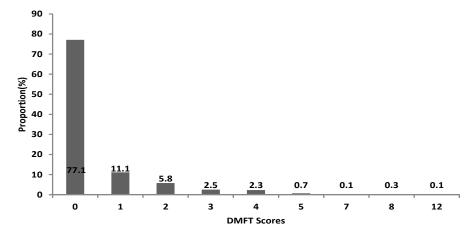|	Total (n=366)	Almajirai		p-value
Traumatic Dental Injuries		Traditional (n=168)	Modern (n=198)	
TDI present	32	21	11	0.02*
Prevalence	8.7	12.5	5.6	
aOR (95% CI)		1.0	0.41	
Trauma experience				
Single tooth trauma	27	18	9	1.0
Multiple teeth trauma	5	3	2	
Number of Traumatized Teeth (%)	**39 (100)**	**25 (64.1)**	**14 (35.9)**	
Gingivitis				
Prevalence (%)	82.2	76.8	86.9	0.01*
aOR (95% CI)		1.0	2.0	
Oral Hygiene Score	3.0 (±0.94)	2.9 (±1.1)	3.1 (±0.82)	0.02*

aOR, adjusted Odds Ratio

Fig. 1: Proportion of DMFT Scores among the Almajirai.

in a representative sample of 10 to 12-year old Almajirai in Kano, northern Nigeria. Participants were composed of an almost equal number of children from the traditional and modern-type qur'anic schools, to create a balanced representation of the Almjirai population in Kano state. The mean age of the population supports the observation of previous studies on the young age of the Almajirai.[5,7]

The prevalence of dental caries in the population was "very low" (using mean DMFT) and "low" (using the SiC criteria); the findings of this study were comparable with those of other adolescent populations in Nigeria and other developing countries.[13–17] Some researchers had previously reported that dental caries prevalence is low in Nigeria.[17,18] The mean DMFT and SiC scores of this population were however lower than the findings in school-children in Enugu, Turkey, Saudi Arabia, Puerto Rico and India.[17,19–22] The limited access to cariogenic snacks and beverages, often regarded as luxuries above the means of the Almajirai, may have accounted for the relatively lower dental caries experience.[23]

In this study, the SiC scores (the measure of the prevalence of severe dental caries) of the Almajirai population were within the limits of the current global oral health goal of SiC $\leq$3 by 2015.[24] The comparatively lower mean DMFT, yet higher SiC scores of the 'modern' over the 'traditional' Almajirai amplifies the call to combine both indices in order to make meaningful interpretations of caries distribution data.[25,26] The findings of the present study provides with baseline information needed to monitor and prioritize future caries prevention and treatment interventions to this population.

The wide range of DMFT $\geq$1 scores highlights the magnitude of the disease in this population: up to 12 out of the 24 to 28 teeth present in this age-group are affected by caries in some of them. Since early dental disease is a predictor for future disease, the likelihood of a future edentulous state is high, unless drastic lifestyle changes are commenced. Early tooth loss is associated with consequential short and long-term deficits, including nutritional, developmental and quality of life impairments for the growing child.[27]

The prevalence of traumatic dental injuries in this population is comparably low with most local studies.[28–30] This finding supports the assertion by DaCosta, *et al,* that the favourable facial-skeletal profile of northern Nigerian adolescents reduces their lowered risk for traumatic dental injuries.[31] The modern-type Almajirai exhibited comparatively reduced odds for dental injuries than their peers who remained on the streets. While this may highlight some of the inherent benefits of the government's initiative in keeping the Almajirai away from the streets, it also supports the finding of some studies in that regard.[8]

The high prevalence of gingivitis in this population compares with the findings of similar local and global studies.[32,33] This study further found a relationship between the level of oral hygiene and the prevalence of gingivitis between both sub-groups, as also supported by previous studies.[34,35] Poor oral hygiene in the Almajirai may be a reflection of the consequences of limited access to professional dental care, poor knowledge of oral hygiene and unsupervised oral hygiene routines. Previous studies have identified insufficient adult supervision and the non-provision of dentifrices as an enabler of oral diseases among institutionalized children.[6,36]

CONCLUSION

The Almajirai have low caries prevalence and the SiC scores are within the WHO recommended thresholds. The "modern-type" Almajirai are associated with a significantly lower risk for traumatic dental injuries. Both groups of Almajirai have high levels of gingivitis and poor oral hygiene.

Conflict of Interest

All authors declare that they have no conflicts of interest and that they received no financial support.

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