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Caries Experience and Severity among Students with Disabilities in Sokoto, Nigeria

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A B S T R A C T

Objectives: This study aimed to assess the caries experience and severity among students with disabilities in Sokoto, Nigeria.

Materials and Methods: This descriptive cross-sectional study was conducted on elementary and high-school students with special needs attending Abdulrasheed Adisa Raji Special School in Sokoto State, Nigeria, who were selected by a systematic random sampling method. The students were between 6 to 28 years, and had hearing, visual, intellectual, or physical disabilities. Data regarding their sociodemographic characteristics were collected using a questionnaire, and their dental caries experience was determined by using the decayed, missing, and filled teeth (DMFT) index. SPSS version 23 was used for data analysis with a statistical significance set at 0.05.

Results: Sixty-nine females (29.2%) and 167 males (70.8%), totaling 236 students, with disabilities participated in this study. The mean DMFT score was 0.72±1.32. Children between 6-12 years had the highest caries experience (mean DMFT=0.92±1.17). Among different disability groups, those with intellectual disability had the highest rate of caries experience (mean DMFT=0.98±1.61). Males had a higher rate of dental caries experience than females (P=0.006). The decayed component (DT) had by far the highest mean score (0.66±1.26) compared to other DMFT components.

Conclusion: The caries experience of the study population was low. Nonetheless, the severity of caries was high in those who had caries experience.

Keywords: Dental Caries; Nigeria; Persons with Disabilities; Students

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INTRODUCTION

Dental caries is the most prevalent disease of the oral cavity [1-3]. It is considered the most important global oral health burden [4,5]. Its impact may lead to serious undesirable economic and social consequences [4-6]. Dental caries has been implicated as the leading cause of tooth loss and severe infection of fascial spaces in the head and neck region with associated morbidity, mortality, poor quality of life, and decrease in productivity [3,5].

According to the United Nations, "persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others" [7]. In brief, disabled individuals are those who are unable to perform at the level their peers due to impairment(s). Disability is broadly

classified into hearing disability, visual disability, physical disability, mental disability, learning disability, and intellectual disability [8]. Approximately 15% of the world's population lives with some form of disability [9]. Nigeria has about 20% prevalence of people living with moderate to severe disabilities among its general population according to the World Health Organization (WHO) [10].

Individuals with disabilities who have dental caries may suffer more than others due to the additional challenges posed by their disabilities [11,12]. They reportedly have higher caries experience and/or severity than those without disabilities [11,13,14]. Oliveira et al, [14] in their paired study in Brazil on the intellectually disabled individuals and their siblings without intellectual disability as controls reported a mean decayed, missing, and filled teeth (DMFT) score of 6.36 for the intellectually disabled individuals and a mean DMFT score of 5.06 for their siblings without disabilities. Their results supported the hypothesis that intellectually disabled individuals have a worse oral health status compared to their healthy siblings. The authors proposed some reasons for higher caries experience among individuals with disabilities as compared to those without disabilities. Some of these reasons included the exclusive focus of some parents and/or caregivers on children's disabilities at the expense of their oral health and the prolonged intake of sweetened medications [13]. Hindrance in routine daily oral care due to challenges with muscle and digit control associated with some types of disabilities is another suggested reason [13]. Other reported reasons include lack of cooperation in toothbrushing causing plaque buildup and inadequate topical fluoride exposure, and also inability of some disabled individuals to cope with prophylactic oral health measures and their resistance to such measures/treatments [15-17].

In addition to the increased risk of dental caries, disabled individuals have also been reported to have more severe caries/unmet caries treatment needs [18,19]. This may be due to the inability of some disabled individuals to report pain due to caries, leading to an increase in severity [19], or the inability of some children with disabilities to access oral health services because parents or caregivers, influenced by social stigma and cultural beliefs, may avoid seeking dental care [20]. The inability of some families to cope with the high financial burden of managing these individuals such as regular specialist visits, more hospital days, and emergency room visits [21] are among other reasons reported in the literature.

Several studies on caries experience and/or severity among disabled individuals are available in the published literature [6,11,15,22-25]. There are, however, no such studies in the northern region of Nigeria, including Sokoto State. Considering the increased risk of caries development and severity among disabled individuals, there is a need for such a study in this region. This would be helpful in designing relevant oral health programs customized for them. Therefore, the present study aimed to determine the caries experience and severity among students with disabilities in Sokoto State, Nigeria, using the DMFT index.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted among disabled elementary and high-school students attending Abdulrasheed Adisa Raji Special School, Sokoto State, Nigeria. The participants were between 6 to 28 years of age. This school is the only special needs institution in the state. The recruited participants for the study gave consent/assent and submitted signed parental/guardian informed consent certificates. Those who submitted signed informed consent certificates but were critically ill, very uncooperative, unwilling to participate, or unavailable during the period of the survey were excluded. Ethical clearance was obtained from the Ethics Committee of Usmanu Danfodiyo University Teaching Hospital (UDUTH/HREC/2019/No.790). The state office of the Ministry of Education gave permission for the use of the school.

The stratified random sampling method (with proportional allocation) was used for selection of the group of disabled individuals while systematic random sampling was used for selection of each participant.

The sample size was calculated to be 212

individuals using the Yamane's (1967) formula [26] who were recruited from an initial population of 448 students. Considering 10% non-respondents, the final sample size was calculated to be 236. A stratified random sampling method with proportional allocation was employed to calculate the required sample size for each of the 4 established disability groups of the school (physical, visual, hearing, and intellectual disabilities).

$$Disability\ group's\ sample\ size = \frac{Each\ disability\ group's\ population}{Total\ study\ population} \times sample\ size$$

Accordingly, the required number of participants for each disability group was 124 for hearing disability, 41 for visual disability, 54 for intellectual disability, and 17 for physical disability.

To select each participant, a systematic random sampling method was employed using the formula:

$$Sampling\ interval = \frac{population\ size}{sample\ size}$$

to obtain an approximated sampling interval of 2. Thus, with the register of each disability group obtained from the school records, a randomly selected number was used as the starting point for the respective disability group, and every second student from the group was chosen until the required sample size for the respective disability group was achieved.

Dental caries examination was done by one single examiner using a periodontal probe and a dental mirror. It was done in the school field in broad daylight with the participant sitting on a school chair or a wheelchair, and the examiner standing in front of the chair or behind it. Prior to this examination, the examiner was calibrated for dental caries diagnosis using a periodontal probe and a plane mouth mirror under natural light. Calibration was conducted on 25 subjects (not included in the study sample), with a wide range of levels of the disease condition. Each subject was examined twice on successive days, and intra-examiner agreement was assessed using the kappa statistic. A kappa value of k=0.83 indicated excellent reproducibility.

To determine if a tooth was decayed, missing, or filled (DMFT), the WHO criteria were followed [27]. It was also used to determine the caries experience with a mean DMFT > 0 indicating caries experience.

The mean number + standard deviation of the selected indicators of caries severity namely DT, MT, and FT were used to determine the severity of dental caries [27]. The participants' caries experience was also analyzed by percentage for each disability group by gender.

Data analysis was done using SPSS version 23 (IBM, Armonk, New York, USA). Chi-square test (χ^2) was used to test for association between the study variables. The participants' socio-demographic characteristics were reported using descriptive statistics. Dental caries experience and severity were determined using bivariate analysis. A P value ≤ 0.05 was considered significant.

RESULTS

Of a total 236 participants in this study, 69 (29.2%) were females, and 167 (70.8%) were males. The Hausa-Fulani ethnic group was the majority ethnic group accounting for 90.3% (n=213) of the study participants; the other participants were from the Ibo (n=4; 1.7%), Yoruba (n=14; 5.9%) and 'other' ethnic groups (n=5; 2.1%). Figure 1 shows that the majority of the participants were from the hearing disability group, representing 52.5% (n=124) of the overall participants.

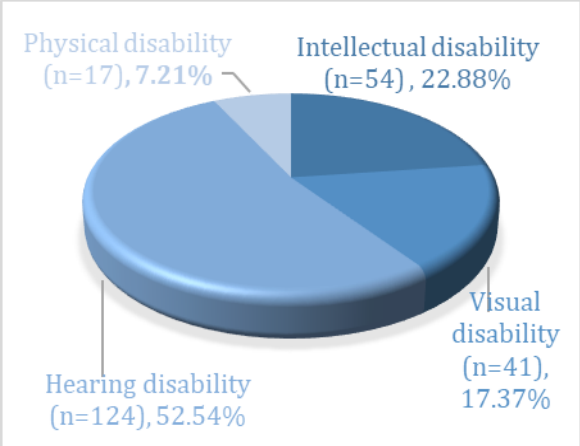

Fig 1. Distribution of study participants by disability type in a sample of disabled students in Abdulrasheed Adisa Raji Special School, Sokoto (n=236)

The participants were between 6-28 years of age with a mean age of 14.6±3.7 years. Figure 2 shows that the age group of 13-19 years had the highest frequency (n=147), representing 62.3% of the study participants. The mean DMFT in the present study was 0.72±1.32.

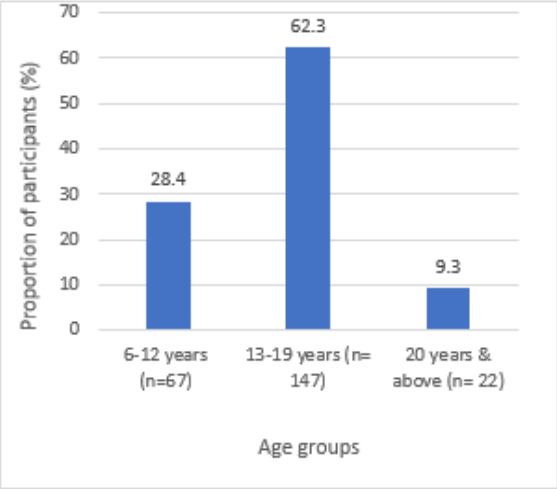

Fig 2. Frequency distribution of study participants by age group

Table 1 shows that the highest caries experience among different age groups was recorded in the 6-12-year-old age group (mean DMFT=0.92±1.17), while the highest caries experience for an individual was observed in the 13-19-year-old age group (DMFT=9, range= 0-9).

In the disability group, the highest caries experience was observed in the intellectual disability group (mean DMFT=0.98±1.61). This group also showed the highest caries experience for an individual (DMFT=9).

Table 1. Mean DMFT by age group and disability group in a sample of disabled students in Abdulrasheed Adisa Raji Special School, Sokoto (n=236)

Variable	Max. DMFT	Mean DMFT ± SD
Age group (years)		
6-12	5	0.92 ± 1.17
13-19	9	0.61 ± 1.37
20 & above	4	0.82 ± 1.10
Type of disability		
Intellectual disability	9	0.98 ± 1.61
Visual disability	4	0.54 ± 1.02
Hearing disability	6	0.69 ± 1.30
Physical disability	4	0.59 ± 1.00

Max: Maximum; SD: Standard deviation

Table 2 shows that there was a statistically significant difference in the dental caries experience amongst the male disability group (P=0.006). The intellectual disability group had the highest percentage of caries experience for the male gender (n=22; 55.0%), while the highest percentage of caries experience for the female gender was 50% (this was observed in both the visual disability and the physical disability groups).

The mean and standard deviation values of selected indicators of caries severity were as follows:

The mean DT score (overall mean number of decayed teeth) was 0.66±1.26.

The mean MT score (overall mean number of missing teeth due to caries) was 0.06±0.28.

The mean FT score (overall mean number of filled teeth) was 0.00±0.07.

As shown, untreated dental caries i.e., the decayed component (DT) had the highest mean

Table 2. Percentage of caries experience per disability group by gender in a sample of disabled students in Abdulrasheed Adisa Raji Special School, Sokoto (n=236)

Disability type	Male N(%)		Female N(%)	
	Caries free	With caries experience >0	Caries free	With caries experience >0
Intellectual disability	18 (45.0)	22 (55.0)	9 (64.3%)	5 (35.7)
Visual disability	25 (80.6)	6 (19.4)	5 (50.0%)	5 (50.0)
Hearing disability	61 (71.8)	24 (28.2)	24 (61.5%)	15 (38.5)
Physical disability	7 (63.6)	4 (36.3)	3 (50.0%)	3 (50.0)
Statistics: Fisher-Freeman-Halton exact significance (2-sided)	P=0.006		P= 0.839	

score (0.66±1.26) by a wide margin when compared to other components of DMFT.

Table 3 shows the percentage of contribution of each indicator of caries severity to the total caries experience among the disability groups and also within age groups. The decayed component had by far the highest percentage of contribution to the total caries experience across all disability groups. The filled component had the lowest contribution across all disability groups (only one participant in the study had a filling due to caries). A similar pattern was observed when analyzed for the age group.

Table 3. Percentage of contribution of each indicator of caries severity to total caries experience among disability groups and within an age group in a sample of disabled students in Abdulrasheed Adisa Raji Special School, Sokoto (n=236)

Variable	D/DMFT (%)	M/DMFT (%)	F/DMFT (%)
Type of disability			
Intellectual disability	90.82	9.18	0.00
Visual disability	94.44	5.56	0.00
Hearing disability	91.30	7.25	1.45
Physical disability	89.83	10.17	0.00
Age group (years)			
6-12	91.16	7.16	1.68
13-19	94.41	5.59	0.00
20 & above	93.90	6.10	0.00

D: Decayed; M: Missing; F: Filled

DISCUSSION

The aim of the present study was to determine the caries experience and severity (using DMFT and its components) among students with disabilities in Sokoto, Nigeria. In general, while the caries experience was low, a look at the selected indicators of caries severity showed that the decayed component made up the bulk of the total caries experience. The contributions from the missing and filled components to the total caries experience were very minimal.

In several variables in our study, the standard deviation exceeded the mean, a statistically valid outcome when variability is large relative to central tendency. Except for skewness, this study met all the typical conditions for such a pattern, such as small mean values and considerable heterogeneity. Thus, the relatively large standard deviations observed reflect the inherent nature of the dataset rather than a reporting error. The female participants were in the minority in the present study, accounting for 29.2% (n=69) of the study population. This was in agreement with the results of previous studies [18,22,28], and may be related to the generally lower literacy rate of females than males in Nigeria, particularly in the northern part of Nigeria, [29] or it may be due to the higher likelihood of disabilities in males than in females as reported by Newacheck et al [30]. This finding was, however, in contrast to the results of Uwayezu et al, [31] who reported that male participants were in the minority.

The caries experience (mean DMFT index) in the present study was low according to the WHO criteria [27]. This was in concordance with the low caries experience reported by several other authors, such as Oredugba and Akindayomi [22], Eigbobo et al, [24] Akinwonmi and Adekoya-Sofowora [32], and Oredugba [11,13] in studies conducted in Nigeria. When compared to foreign studies, the caries experience of the present study was lower than those reported in studies carried out in the upper-middle and high-income economies, such as Albania (Europe) [2], Brazil (South America) [14], and Malaysia (Asia) [6]. This could be due to the normally greater exposure of young individuals in richer economies to sugary foods compared to those of lower-income economies [31] including Nigeria. The increased quantity and regularity of sugar consumption have been implicated in caries occurrence [15,33].

In the present study, assessment of caries experience based on age group showed that the 6-12-year-old age group had the highest caries experience among the different age groups. This was in tandem with the results of studies conducted by Oredugba and

Akindayomi [22] in Nigeria, Mokhtar et al, [6] in Malaysia, and Liu et al, [34] in China, in which the highest caries experience was also observed among those in the primary and early mixed dentition periods. A possible reason for this may be related to the fact that younger children may be less capable of maintaining good oral health compared to teenagers and young adults; hence, they may be more prone to dental caries. The present finding was, however, in contrast to that of Jain et al, [23] in India who observed the highest caries experience among the older age group of 19-23 years.

The intellectual disability group had the highest caries experience among the different disability groups in the present study; this group also included the individual with the highest caries experience. This was in agreement with the findings of Mehta et al, [28] in their study carried out in India, in which the intellectual disability group also had the highest caries experience among the different disability groups. Similarly, Altun et al, [35] in a study in Turkey observed the highest caries experience among participants with intellectual disability (mental retardation). A possible explanation for the higher caries experience recorded among participants with intellectual disabilities in the present study may be the decreased capacity of those with intellectual disabilities to comprehend instructions on appropriate oral hygiene practices and the need for such practices, leading to their increased susceptibility to caries.

The pictures painted from the indicators of caries severity were worrisome. This is because the decayed component was by far the major contributor to the mean DMFT value. The missing component had a very minimal contribution while the filled component contribution was largely insignificant. In terms of percentage, the decayed component contributed more than 85% across all disability groups and age groups. This finding signifies that whilst the overall caries experience of the study population was not high, there was, however, a high number of untreated dental caries and therefore, high severity of dental caries. This is quite unfortunate since the challenges and complications of dental caries are mostly from untreated decayed teeth and less likely from missing or filled teeth. Interestingly, only one participant had a restoration (filling) due to caries in the present study and none of the study participants had pits and fissure sealant. These might be an indication of the neglect of the oral healthcare of this population, and highlights a general lack of dental treatment for the population. These findings agreed with several other studies that also reported a high decayed teeth components compared to other components of DMFT [18,22,28,32]. Similar to our findings, some authors also reported either the absence of restorations due to caries or very few participants with restorations due to caries in their studies [15,23-25,32]. This was, however, in contrast to findings by Liu et al, [34] who observed restorations due to caries in quite a significant number of the disabled participants in their study.

The strength of the present study was its novelty, being the first published study to determine the severity of caries experience among students with disabilities in the whole northern region of Nigeria. As such, it will help bridge the knowledge gap in the literature and serve as a foundation for further research. One limitation of the present study was that it was restricted to only school-attending persons with disabilities in the community. Therefore, its findings should be cautiously applied to the general disabled community.

Public enlightenment campaigns on the oral health needs of students with disabilities with additional focus given to those with intellectual disabilities are highly recommended for this region. Appropriate caries-preventing measures such as fissure sealant, topical fluoridation, and plaque control measures should be encouraged along with urgent treatment of established dental caries.

CONCLUSION

While the caries experience of the present study population was low, the severity of caries was, however, high among those who

had caries experience. The worst caries experience and severity were observed in the intellectual disability group.

CONFLICT OF INTEREST STATEMENT

None declared.

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