Oral Health Status, Behaviour and Treatment Needs Among 2–5-year-old Children in Selected Nursery Schools in Maiduguri, Borno State.

Taofeek Olalekan LIGALI*, Akinwumi Emmanuel OROMAKINDE *, Kwari KANADI**
*Department of Child Dental Health, Faculty of Dentistry, College of Medical Sciences, University of Maiduguri,
**Faculty of Dentistry, College of Medical Sciences, University of Maiduguri.

Correspondence
Dr Taofeek O. Ligali
Department of Child Dental Health, Faculty of Dentistry, College of Medical Sciences, University of Maiduguri
Email Address: drlekanligali@yahoo.com

ABSTRACT

Objective: To determine the oral health status, behaviour and treatment needs among 2 to 5-year-old children in selected nursery schools in Maiduguri, Borno State.
Methods: This was a cross-sectional study of two hundred and thirty-nine children aged 2-5 years old and selected by simple random sampling from three private nursery schools. An interviewer-administered questionnaire was used to obtain information on children's oral health behaviour and practices from their parents. A modified WHO assessment form was used to assess oral health status and treatment needs. Descriptive statistics and Pearson Chi-square were used for data analysis on SPSS 23.0 at P<0.05.
Results: The sample exhibited a male-to-female ratio of 1.2:1, an age range of 2-5 years, modal age of 5 years, 57.0% (n = 136). The prevalence of early childhood caries was 20.1% (n = 48), standard error (SE) = 0.03, mild to moderate gingivitis was 36.8% (n = 88), SE = 0.04, anterior tooth fractures was 2.1% (n = 5), SE = 0.01; hypoplastic teeth was 4.2% (n = 10), SE = 0.01; tooth wear lesions in 6.3% (n = 15); and malocclusion in 4.5% (n = 11), SE = 0.04. The mean DMFT score was 0.72 and the significant caries (SiC) index was 5.6. Most of the participants (53.6%, n = 128, SE = 0.123) consumed sugary diets, 78.2% (n = 187) had never visited a dentist and 29.3% (n = 70) of the participants required restorative dental treatment (SE = 0.10).
Conclusion: The burden of early childhood caries and the prevalence of gingivitis were considerable in this study. Oral health behaviour was poor and might have had an impact on their unmet treatment needs. Oral health promotion should be targeted at the caregivers of this vulnerable population to ensure improvement in their oral health behaviour and ultimately translate to better oral health status.

Keywords: oral health status, behaviour, treatment needs, preschool children, Maiduguri

Taofeek O. Ligali
https://orcid.org/0000-0002-6679-9252
Akinwumi E Oromakinde
https://orcid.org/0000-0002-1320-5588
Kwari Kanadi
https://orcid.org/0000-0002-7280-0619

Received: 16-July, 2024
Revision: 9 Nov, 2024
Accepted: 9 Nov, 2024

Citation: Ligali TO, Oromakinde ***AE, Kanadi K. Oral health status, behaviour and treatment needs among 2–5-year-old children in selected nursery schools in Maiduguri, Borno State. J Paediatr Dent Res Pract 2024; 5(2): 52-59. https://dx.doi.org/10.4314/jpdrp.v5i2.2***

INTRODUCTION

Children in their early years can experience oral health issues such as early childhood caries, traumatic dental injuries, and soft tissue diseases, primarily plaque-induced gingivitis, oral ulcers, and dental abscesses, which cause pain, discomfort, and loss of function[1-3]. These conditions significantly impact growth and development[4]. Untreated dental caries and traumatic dental injuries have profound effects on children[5]. As a vulnerable population, children heavily rely on others for self-care and oral health behaviour, affecting both oral and general health[6]. Consequently, they are predisposed to varying treatment needs.

Parental perception of children's oral health status is insufficient, as oral health conditions often go unnoticed until accompanied by pain[7]. Other conditions, such as uncomplicated dental injuries and malocclusion, may not attract parental attention until complications arise. This underscores the importance of assessing preschool children's oral health status and treatment needs.

Previous studies have reported varying prevalence rates of oral health conditions among preschool children. A household survey in Ile-Ife found a low prevalence (6.6%) of early childhood caries (ECC) [8]. Consuming sugary diets more than three times a day was identified as a predictable risk factor for ECC. A study in Ibadan found malocclusion to be the most common oral health condition (59.3%) among children between 3 and 5 years old[9]. The mean DMFT was 0.25±0.9, with children in private schools exhibiting better oral hygiene.

In low-income areas of the United States, there is a report of a high rate of unmet early childhood caries treatment needs among children between 0-5 years[10]. A Nigerian study in Ile-Ife found associations between developmental dental anomalies (DDA), ECC, and poor oral hygiene status among 3 to 5-year-old children, reporting prevalence rates of 8.2%, 4.7%, and 4.1%, respectively[11]. A recent study in Ibadan reported malocclusion as the most common oral condition among 3 to 5-year-old children[12].

Data are scarce on the oral health status, behaviour, and treatment needs of preschool children in Maiduguri. Such data are crucial for developing effective management protocols and public health strategies to improve dental care among children. This study aimed to determine the oral health status, behaviour, and treatment needs among preschool Children in Maiduguri.

MATERIALS AND METHODS

This cross-sectional study was conducted in Nov 2020 among 2 to 5-year-old preschool-age children in Jere Local Government Area of Maiduguri

Sample Selection

Two hundred and thirty-nine students were selected from three private nursery schools, chosen by convenience sampling due to their proximity to the tertiary hospital. Since no similar study had been conducted in Maiduguri, the minimum sample size was calculated based on a previous study in Ibadan[12], which involved 430 children in both public and private schools. This current study involved only private schools; no previous study has been done in this region. Thus, 50% of the sample size of this previous study (215) was used, with an additional 24 samples added to account for attrition.

A pre-test was conducted among 10% of the children's parents, who completed the questionnaire while their children underwent oral examination. This was to assess the comprehension and reliability of the questionnaires and oral examination methods. The pretest showed 100% comprehension of the questionnaires by the children's parents, while there was a Kappa score of 0.75 for interexaminer reliability for determining occlusion by oral examination. There was re-training and re-calibration of examiners who could not accurately determine occlusion, resulting in 100% accuracy. Sixteen participants were randomly selected from five classes in each of the selected three private schools. There were approximately 30 students in each class.

The study included children who were between 2 and 5 years old and those whose parents or legal guardians provided written informed consent indicating a voluntary agreement to participate in the study; and excluded children who had systemic illness that may impact their oral health status and children whose parents or legal guardians did not provide written informed consent.

The Socioeconomic status was assessed using a validated composite index that considered the mother's level of education and the father's occupation[7].

The mother's educational level was categorised into four distinct levels: 1. No formal education: Mothers with no prior schooling or formal education, 2. Primary education: Mothers who completed primary education, 3. Secondary education: Mothers who completed secondary education, 4. Tertiary education: Mothers who pursued higher education beyond secondary school, including university or college degrees.

The father's occupational status was categorized as low, middle and high.

Data collection was conducted through interviewer-administered questionnaires to parents or caregivers by trained research assistants. The questionnaire aimed to gather comprehensive information on the participating children's oral health behaviours and practices.

The questionnaire sought specifically to collect data on the following key aspects:

The frequency of daily refined sugar intake between meals, the children's oral hygiene practices, including frequency of toothbrushing and use of fluoridated toothpaste.

The research assistants also inquired about non-nutritive habits such as thumb-sucking. Information was also collected on the children's dental visit history, including frequency and regularity of visits to dental care providers.

Trained and calibrated dental students conducted thorough oral examinations to assess the oral health status of the participating children. The examinations followed the standardised World Health Organisation (WHO) oral health pro forma. The key indicators of oral health status examined by the students included:

The presence and extent of dental caries, gingival status and dental injuries such as fractures or trauma. The examiners also checked for hypoplastic teeth, which are teeth with defective enamel. Tooth wear lesions, including erosion or tooth surface wear, were also assessed. The dental students also evaluated the children's occlusion, checking for signs of malocclusion.

Visual inspection was conducted using tongue depressors and cotton rolls with tweezers under natural light. The mean DMFT (the sum of the individual decayed, missing and filled teeth divided by the sum of the population) and significant caries (SiC) index (the mean DMFT for the third of the population with the highest caries experience) were calculated to assess dental caries prevalence and severity respectively. Gingival status was measured using modified Loe and Silness's method[13] and was assessed. This assessment categorized the health of the gums into four distinct levels:

1. Healthy gingiva: This category indicated no visible changes in gum colour and no bleeding, suggesting optimal gingival health.
2. Mild inflammation: Gums exhibited a slight change in colour and mild swelling, but no bleeding was observed upon probing.
3. Moderate inflammation: Characterized by noticeable redness of the gingiva and bleeding upon probing.
4. Severe inflammation: Marked by pronounced redness and spontaneous bleeding, indicating significant gingival disease.

Assessment of presence/absence of dental injury, hypoplastic teeth, tooth wear lesions (erosion, attrition, abrasion), and occlusion (where the upper and lower second primary molars contact in centric occlusion using the classification by Baume in 1950) [14] was done. Where the distal surface of the mandibular second primary molar was ahead of or mesial to the distal surface of the maxillary second primary molar, it was recorded as a mesial step. Where the distal surface of the mandibular second primary molar was distal to the distal surface of the maxillary second primary molar, it was recorded as a distal step. Where the distal surface of the mandibular second primary molar was at the same vertical plane as the distal surface of the maxillary second primary molar, it was recorded as a flush terminal.

Infection Control

Cross-infection control measures were observed throughout the oral examination procedure, using sterile materials and proper waste disposal.

The treatment needs of the participating children were categorized into five distinct levels:

1. Regular check-up: Children who require routine dental examinations and monitoring but no immediate treatment.
2. Preventive therapy: This category includes children who need interventions to prevent oral health issues, such as fluoride applications, sealants, or oral hygiene instructions.
3. Restorative therapy: Children who require treatments to repair or restore damaged or decayed teeth, including fillings, crowns, or other restorative procedures.
4. Surgical therapy: This category is comprised of children needing surgical interventions, such as extractions, biopsies, or other oral surgical procedures.
5. Orthodontic therapy: Children requiring treatments to address malocclusion or misalignment of teeth and jaws, including braces or other orthodontic appliances.

Where treatments overlap, the treatment of greatest need was recorded. Participants with oral problems were referred to the University of Maiduguri Teaching Hospital for further investigation and treatment.

Ethical considerations

Ethical approval was obtained from the University of Maiduguri Teaching Hospital Research and Ethics Committee with approval number UMTH/REC/601. Permission was granted by the school authorities and written consent from parents/caregivers.

Data Analysis

Data was analysed using the software Statistical Package for Social Sciences version 23 (SPSS Inc., Chicago, Illinois, USA). Frequency distribution was assessed using descriptive statistics, and associations between variables were evaluated using Pearson Chi-square. Statistical significance was set at a 95% confidence interval, $P \leq 0.05$.

RESULTS: Table 1 presents the demographic characteristics of the 239 participants. The sample exhibited a male-to-female ratio of 1.2:1. Notably, 57.0% (n = 136) of the participants were 5 years old. Additionally, the mothers' educational background revealed that 7.9% (n = 19) had no formal education. Regarding socioeconomic status, 25.9% (n = 62) belonged to the middle class. The predominant ethnic group represented was the Kanuri tribe, accounting for 44.4% (n = 106) of the participants.

Table 1 Demographic distribution of participants in Maiduguri

Variables		Frequency n	Percentage %
Age (in years)	2	2	0.8
	3	18	7.5
	4	83	34.7
	5	136	57.0
Gender	Male	131	54.8
	Female	108	45.2
Socio-economic status	Low	16	6.7
	Middle	62	25.9
	High	33	13.8
	No response	126	52.7
Mother's level of education	No formal	19	7.9
	Primary	34	14.2
	Secondary	32	13.4
	Tertiary	35	14.6
	No response	119	49.8

Table 2 shows the prevalence of various oral health conditions among the 239 participants. The results show:

A prevalence of early childhood caries of 20.1% (n = 48), with a standard error of 0.026. Mild to moderate gingivitis was prevalent in 36.8% (n = 88) of the sample, SE = 0.038. Anterior tooth fractures occurred in 2.1% (n = 5) of participants, SE = 0.009. Developmental defects, specifically hypoplastic teeth, were found in 4.2% (n = 10) of participants, SE = 0.013. Tooth wear lesions affected 6.3% (n = 15) of participants. Malocclusions, including anterior open bite, crossbite and deep overbite, were observed in 4.5% (n = 11) of participants, SE = 0.042.

Table 2 Oral health status among preschool age participants in Maiduguri

Oral health conditions	Frequency(n)	Percentage (%)	Standard Error
Early childhood caries			**0.026**
Present	48	20.1	
Absent	191	79.9	
Gingival status			**0.038**
Healthy	151	63.2	
Mild gingivitis	76	31.8	
Moderate gingivitis	12	5.0	
Traumatic dental injury			**0.009**
Present	5	2.1	
Absent	234	97.9	
Hypoplastic teeth			**0.013**
Present	10	4.2	
Absent	229	95.8	
Tooth wear lesions			**0.016**
Present	15	6.3	
Absent	224	93.7	
Malocclusion			**0.042**
None	228	95.4	
Anterior open bite	2	0.8	
Deep overbite	1	0.4	
Crossbite	8	3.3	

The significant caries index is shown in Table 3 with the participants' mean DMFT score of 0.72. The Significant Caries index was 5.6.

Table 3 Significant caries index

Highest caries scores	DMFT scores

9	3
14	4
15	5
36	7
24	9
50	2
23	1

The frequency of oral health behaviour and practice is seen in Table 4. Frequent sugary diet consumption was seen in 53.6% (n = 128/239) of participants who consumed sweets, sugary drinks, or candy 1-3 times daily (SE = 0.123). Inadequate oral hygiene: 60.3% (n = 144/239) brushed their teeth only once daily. Fluoridated toothpaste usage: 64% (n = 153/239) used fluoridated toothpaste (SE = 0.073). Neglect of oral hygiene: 10.9% (n = 27/239) never cleaned their teeth, primarily due to lack of motivation or financial constraints (SE = 0.082 and SE = 0.188, respectively). Limited dental care access: 78.2% (n = 187/239) of participants had never visited a dentist

Table 4 Frequency of oral health behaviour and practices among preschool children in Maiduguri

Oral health behaviour	Frequency (n)	Frequency (%)
Average daily intake of refined sugar between main meals		
None	4	1.7
1-3 times	128	53.6
> 3 times	11	4.6
Occasionally	6	2.5
Rarely	6	2.5
No response	84	35.1
Tooth brushing		
Never cleaned the teeth	27	11.3
Once daily cleaning	144	60.3
Twice or more daily	24	10.0
No response	44	18.4
Use of toothpaste		
None	24	10.0
Non-fluoridated	4	1.7
Fluoridated	153	64.0
No response	58	24.3
Non-nutritive habit (sucking)		
Present	4	1.7
Absent	197	82.4
No response	38	15.9
Dental visits		
Never	187	78.2
1-2 times	3	1.3
No response	49	20.5

Table 5 represents the treatment needs of the preschool age participants. The participants exhibited significant dental treatment needs, primarily requiring restorative care. Specifically, 29.3% (n = 70/239, SE = 0.10) of the participants required restorative treatment.

Table 5 Treatment needs of preschool age participants in Maiduguri

Treatment need	Frequency (n)	Frequency (%)
Regular routine check	128	53.5
Preventive therapy	34	14.2
Restorative therapy	70	29.3
Orthodontic therapy	7	3.0
Total	239	100.0
Standard Error of Mean		**0.10**

The association between demographic variables and oral health status among preschool age participants in Maiduguri is represented in Table 6. The prevalence of dental caries increased significantly with age: 0% at 2 years, 16.7% (3/18) at 3 years, 24.1% (20/83) at 4 years, and 35.3% (48/136) at 5 years (P = 0.40). The highest caries prevalence was observed among 5-year-olds. Caries prevalence was higher among participants from lower socioeconomic status (SES) backgrounds, although this difference was not statistically significant (P = 0.62).

In contrast, the prevalence of gingivitis decreased with age (P = 0.32). No significant association was found between SES and gingival status (P = 0.78). Dental injuries were more common among females than males (P = 0.50), primarily affecting children aged 4 and 5 years (P = 0.65). Although not

statistically significant, dental injuries were more prevalent in higher socioeconomic classes (P = 0.90). Hypoplastic teeth were more prevalent among females than males (P = 0.76), with the highest prevalence observed among 5-year-olds (6.61%, 9/136, P = 0.12).

Tooth wear lesions were significantly more prevalent among females (10.2%, 11/108) than males (3.1%, 4/131, P = 0.02) and more common in higher socioeconomic classes (P = 0.06).

Malocclusion was most prevalent among 5-year-olds (7.4%, P = 0.93) and more common among males (6.9%, 9/131, P = 0.16). The highest prevalence of malocclusion was observed in the low socioeconomic status group (12.5%, 2/16, P = 0.10).

Table 6. Association between demographic variables and oral health status among preschool age participants in Maiduguri

Demographic variables	Oral health conditions											
	Dental caries		**Gingivitis**		**Dental injury**		**Hypoplastic teeth**		**Tooth wear lesion**		**Malocclusion**	
	%	**P - value**	**%**	**P-value**	**%**	**P-value**	**%**	**P-value**	**%**	**P-value**	**%**	**P-value**
Age (years)		**0.40**		**0.32**		**0.65**		**0.12**		**0.57**		**0.93**
2	0.0		100.		0.0		0.0		0.0		0.0	
3	11.1		0.0		0.0		5.6		0.0		0.0	
4	16.9		39.0		3.6		0.0		8.4		1.2	
5	23.5		31.3		1.5		6.6		5.9		7.4	
Gender		**0.82**		**0.78**		**0.50**		**0.76**		**0.02**		**0.16**
Male	20.6		38.2		1.5		3.8		3.1		6.9	
Female	11.2		35.2		2.8		4.6		10.2		1.9	
Socio economic status		**0.62**		**0.78**		**0.90**		**0.84**		**0.06**		**0.10**
Low	31.3		31.3		0.0		6.3		0.0		12.	
Middle	21.0		37.1		1.6		4.8		1.6		5	
High	15.2		33.3		3.0		6.1		3.0		6.5	
											3.0	

DISCUSSION

This study on the oral health status, behaviour, and treatment needs of preschool children in Maiduguri, North-Eastern Nigeria, is crucial due to the region's high levels of poverty and malnutrition, exacerbated by the insurgency.[15] This situation predisposes to health inequality caused by inaccessibility and unaffordability compared to other parts of the country. The educational levels of mothers were generally low, contributing to poor oral health in children.

The caries prevalence in this current study can be considered as high when compared to other published studies in Nigeria, although the mean DMFT was low. Published literature reports early childhood caries prevalence in Nigeria to range from 4.3% to 23.5% [8, 16, and 17]. The current study's findings fall within this range. A hospital-based study in Lagos reported a similar mean deft of 0.735 among preschool-age children[17]. The risk factors identified in this study were bottle feeding at night and use of non-fluoridated cleaning aids. The World Health Organization targets a significant caries (SiC) index of less than 3 DMFT among 12-year-old children[18]. However, there is no target level for 0–5-year-old children. The SiC index was high among study participants, indicating a need for targeted oral health promotion.

Early childhood caries prevalence increased with age, from 0% at age 2 to 35.3% at age 5. Similar findings were reported in Lagos[17] and Dar es Salaam, Tanzania[19]. Improving oral health awareness among parents regarding risk factors, such as refined sugars and poor oral hygiene, is necessary. Oral health promotion should target women at antenatal and immunization centres and caregivers in nursery schools.

Malocclusion was common among preschool-age children, with a prevalence of 63.3% reported in China[20] Increased overjet was the most prevalent

malocclusion, followed by posterior and anterior crossbite. Digit sucking was the most common oral habit in this study. In another study in Ile-Ife, Nigeria[21], oral habits were associated with the severity of malocclusion, though most of the children did not need any treatment. Malocclusion was more prevalent among low and middle-socioeconomic status groups in this current study, with anterior crossbite being the most common. This may have financial implications for affected participants. Interceptive orthodontic treatments may be necessary to prevent further worsening and reduce future costs.

Tooth wear lesions were reported to be associated with intrinsic or extrinsic factors, with a prevalence of 50% among 5-year-old children[22]. A population study reported a prevalence of erosive tooth wear lesions of 3.3%, which was associated with acidic food consumption[23]. The current study's prevalence was lower than these reported studies. Associated factors were not considered in this study. Sex differences in tooth wear lesion prevalence are inconsistent in literature; however, females had a higher prevalence in this current study.

Parents' attitudes and behaviours towards oral health directly influence their children's oral health[24]. A study in Lagos reported that adequate knowledge of oral health among children was related to adequate oral health behaviour[25]. The low level of education among mothers may have contributed to poor oral health behaviour in this study. Improving oral health awareness among mothers and advocating for affordable toothbrushes and fluoridated toothpaste may be necessary.

Participants had varied treatment needs, primarily restoration of dental caries. Oral health education through caregivers, early preventive therapies, and minimal intervention techniques using fluorides and fluoride-releasing restorative materials are necessary. This can be achieved through consistent school visits.

The strength of this study was the opportunity to have access to the study participants who were just recovering from the impact of insurgency. Parents were anxious and had to be convinced that there would be no harm done to their children. Inadequate parental participation was a challenge, resulting in underrepresentation of the socio-demographic status of participants. Future studies should aim at improved parental participation through adequate enlightenment.

CONCLUSION

This study found a considerable burden of early childhood caries and the prevalence of gingivitis. Oral health status was associated with socioeconomic status and increasing age. Poor oral health behaviour impacted treatment needs. Targeted oral health education and promotion are necessary to improve oral health behaviour and status.

ACKNOWLEDGMENT

We acknowledge the parents of the children and school authorities for granting permission for this study.

Source of Support

Nil

Conflict of Interest

None declared

REFERENCES

1. Shalan HM, Abobakr RM. Oral Health Status among Egyptian Preschool Children. EDJ 2018; 64(2):875–882.
2. Kumar V, Ankola A, Sankeshwari R, Jalihal S, Atre S, Mallineni SK. Determination of the oral health status and behaviors, treatment needs, and guardians' perception of oral health among preschool children attending Integrated Child Developmental Scheme Anganwadi centers of Belagavi, South India: A cross-sectional study. J Clin Transl Res 2021; 7(4):436–42.
3. Ligali TO, Orenuga OO. Oral health and nutritional Status of Preschool-Aged Children in Maiduguri, North-East, Nigeria. West Afr J Med 2023; 40(11):1173–80.
4. El Tantawi M, Folayan MO, Bhayat A. Oral Health Status and Practices, and Anthropometric Measurements of Preschool Children: Protocol for a Multi-African Country Survey. JMIR Res Protoc 2022; 11(4):e33552. doi: 10.2196/33552.
5. Gomes MC, Pinto-Sarmento TC, Costa EM, Martins CC, Granville-Garcia AF, Paiva SM. Impact of oral health conditions on the quality of life of preschool children and their families: a cross-sectional study. Health Qual Life Outcomes. 2014; 12:55.
6. Bagattini A. Children's well-being and vulnerability. Ethics and Social Welfare. 2019; 13(3):211–5.
7. Gomes MC, Clementino MA, Pinto-Sarmento TC, Costa EM, Martins CC, Granville-Garcia AF, Paiva SM. Parental Perceptions of Oral Health

Status in Preschool Children and Associated Factors. Braz Dent J. 2015; 26(4):428–434.
8. Folayan MO, Kolawole KA, Oziegbe EO, Oyedele T, Oshomoji OV, Chukwumah NM et al. Prevalence and early childhood caries risk indicators in preschool children in suburban Nigeria. BMC Oral Health. 2015; 15:72.
9. Okeigar AT, Akinyamoju CA, Okeigar JO, Denloye OO. Normative oral health status and behaviour of 3-5 years old in public and private schools, Ibadan. **AJOH** 2022; 11(2): 20–33.
10. Isong I, Dantas L, Gerard M, Kuhlthau K. Oral Health Disparities and Unmet Dental Needs among Preschool Children in Chelsea, MA: Exploring Mechanisms, Defining Solutions. J Oral Hyg Health. 2014; 2:1000138. doi: 10.4172/2332-0702.1000138.
11. Folayan MO, Alade M, Adeniyi A, El Tantawi M, Finlayson TL. Association between developmental dental anomalies, early childhood caries and oral hygiene status of 3-5-year-old children in Ile-Ife, Nigeria. BMC Oral Health. 2019; 20(1):1. doi: 10.1186/s12903-019-0991-2.
12. Okeigar AT, Akinyamoju CA, Okeigar JO, Denloye OO. Normative oral health status and behaviour of 3-5 years olds in public and private schools, Ibadan. **AJOH 2024;** 11, (2):20–33.
13. Ciancio SG. Current status of indices of gingivitis. Journal of Clinical Periodontology 1986; 13(5):375–378.
14. Sriram CH, Priya VK, Sivakumar N, Reddy KR, Babu PJ, Reddy P. Occlusion of primary dentition in preschool children of Chennai and Hyderabad: A comparative study. Contemp Clin Dent. 2012; 3(1):31–7.
15. Hamidu JL, Salami HA, Ekanem AU, Hamman L. Prevalence of protein-energy malnutrition in Maiduguri, Nigeria. AJBR 2003; 6(3). doi:10.4314/ajbr.v6i3.54039.
16. Onyejaka NK, Njokanma AR, Ehizele A, Adewale A. Overview of Early Childhood Caries in Nigeria and Global Recommended Treatment Guidelines. West Afr J Med 2023 30; 40(11):1232–1239.
17. Olatosi OO, Inem V, Sofola OO, Prakash P, Sote EO. The prevalence of early childhood caries and its associated risk factors among preschool children referred to a tertiary care institution. Niger J Clin Pract. 2015; 18(4):493–501.
18. Bratthall D. Introducing the Significant Caries Index together with a proposal for a new global oral health goal for 12-year-olds. Int Dent J 2000; 50(6):378–384.
19. Maro D, Kahabuka FK. Prevalence of early childhood caries among 2-6 years old underprivileged and privileged children in Dar es Salaam. Tanz Dent J 2007; 14(2): 54–60.
20. Zhou Z, Liu F, Shen S, Shang L, Shang L, Wang X. Prevalence of and factors affecting malocclusion in primary dentition among children in Xi'an, China. BMC Oral Health. 2016 Sep 2; 16(1):91. doi: 10.1186/s12903-016-0285-x.
21. Kolawole KA, Folayan MO, Agbaje HO, Oyedele TA, Onyejaka NK, Oziegbe EO. Oral habits and malocclusion in children resident in Ile-Ife Nigeria. Eur Arch Paediatr Dent. 2019 Jun; 20(3):257–265.
22. Maharani DA., Pratiwi, AN, Setiawati F, Zhang S, Gao SS, Chu CH et al. Tooth wear among five-year-old children in Jakarta, Indonesia. BMC Oral Health 2019; 19(192):1–7.
23. Pereira AS, Lima LRS, Lima MDM, Lima CCB, Paiva SM, Moura LFAD, et al. Consumption of Acidic Beverages is a Predisposing Factor for Erosive Tooth Wear in Preschool Children: A Population-based Study. Oral Health Prev Dent. 2020 Dec 14; 18:1061-1067.
24. Nepaul P, Mahomed O. Influence of Parents' Oral Health Knowledge and Attitudes on Oral Health Practices of Children (5-12 Years) in a Rural School in KwaZulu-Natal, South Africa. J Int Soc Prev Community Dent 2020; 10(5):605–612
25. Nzomiwu CL, Ayedun OS, Orenuga OO. Oral health knowledge and behaviour among public primary school children in Lagos, Nigeria. Niger J Med 2022; 31:383–389.