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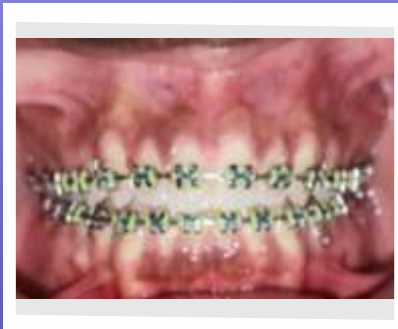
Dental and Occlusal anomalies in
Paediatric Patients with Endocrine
Disorders

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Prevalence and Distribution of Dental and Occlusal Anomalies in Paediatric Patients with Endocrine Disorders at The Lagos University Teaching Hospital, Nigeria.

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Abstract

Background. Dental anomalies involve abnormalities in the number, size, and shape of teeth, as well as structural defects or disruptions in the eruption pattern. Genetic and epigenetic defects throughout the stages of tooth development have been the main aetiological factors. Occlusal anomalies, such as crowding, spacing, deep bite, open bite, and crossbite, are deviations from the normal alignment of teeth and jaws. Endocrine disorders such as hypothyroidism, growth hormone deficiency, and acromegaly are associated with various dental anomalies, including enamel defects, delayed tooth eruption, changes in tooth size, and position. The identification of dental and occlusal anomalies is important since they can cause disturbances such as malocclusion, increased susceptibility to caries, and aesthetic concerns.

Aim. To determine the prevalence and distribution of dental and occlusal anomalies amongst paediatric patients in the paediatric endocrinology clinic, LUTH.

Methods. This is a Hospital-based Cross-Sectional study conducted at the Paediatric Endocrinology clinic, LUTH. Informed consent and assent were obtained. Ethical approval was obtained. Participants were recruited via a convenient sampling technique, until 50 participants aged 7-18 years, were obtained with a confirmed diagnosis of an endocrine disorder by the physician. Clinical examination was done with dental examination sets. Data was analysed using SPSS version 26 with a p value set at <0.05.

Results. A total of fifty participants with 54.0% females and 46.0% males participated in the study with a mean age of 11.52 ± 4.9 years. The prevalence of dental and occlusal anomalies was 56.0%. The frequencies of the various occlusal and dental anomalies included Crowding 16.0%, Crossbite 16.0%, Open bite 16.0%, Missing teeth 8.0%, Enamel defects 16.0%, and Microdontia 2.0%.

Conclusion. Dental and occlusal anomalies are prevalent and commonly distributed amongst paediatric patients with endocrine disorders. Timely identification can minimise complications by enabling early treatment planning, less extensive interception, and a more favourable prognosis.

Keywords: Dental and Occlusal Anomalies, Endocrine Disorders

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Introduction

Endocrine disorders are rare causes of oral diseases.¹ Therefore, oral changes could sometimes raise suspicion of these conditions. Various endocrine disorders that can occur in children include Type 1 diabetes mellitus

(T1DM), hyperthyroidism, hypothyroidism, and growth hormone deficiency¹, among others. A Nigerian study conducted in a teaching hospital in Lagos, on the pattern and burden of paediatric endocrine disorders, noted that Diabetes mellitus, pubertal, and thyroid disorders constituted the commonest paediatric endocrine disorders encountered.² Dental anomalies involve abnormalities in the number, size, and shape of teeth, structural defects, or eruption pattern disruptions. Genetic and epigenetic defects throughout the stages of tooth development have been the main aetiological factors.³ Environmental factors occurring during the pre and post-natal developmental phases could also play a role in triggering dental anomalies.³ Occlusal anomalies such as crowding, spacing, deep bite, open bites, and crossbites are deviations from normal alignment of teeth and jaws.⁴ Endocrine disorders

such as hypothyroidism, growth hormone deficiency and acromegaly, are associated with various dental anomalies including enamel defects, delayed tooth eruption, changes in tooth size and position.⁵ The identification of dental and occlusal anomalies are important since they can cause disturbances such as malocclusion, increased susceptibility to caries and aesthetic concerns.⁵ Oral features associated with hypopituitarism include delayed eruption rate, retained deciduous teeth, small clinical crowns, small roots, small arches, retarded growth of maxilla and mandible and crowding of teeth resulting in malocclusion. The permanent teeth show a delayed pattern of eruption.⁶ Dentists should be aware of the risks and difficulties that may arise in the management of patients with endocrine disorders.⁷

Gigantism: Excess growth hormone in children is characterised by the general symmetrical overgrowth of the parts of the body. Oral features include prognathic mandible, malocclusion, interdental spacing, and hypercementosis of the roots.⁸

Hyperparathyroidism: Malocclusion due to the drifting of teeth resulting in spacing of teeth could be one of the first signs of the disease with panoramic radiographs revealing rarefaction of the jaws.¹

Hypothyroidism: Malocclusion and delayed eruption of teeth can also occur with thickening of the lips and macroglossia.⁹ The long-term effects of severe hypothyroidism on craniofacial growth and dental development have also included impaction of the mandibular second molars^{9,10}

There is a paucity of knowledge of the prevalence and distribution of dental and occlusal anomalies amongst paediatric patients with endocrine disorders. It is important for every dentist to be aware of the oral manifestations of endocrine disorders to avoid the resulting complications. This study aims to determine the prevalence and distribution of dental and occlusal anomalies among patients attending the paediatric endocrinology clinic at the Lagos University Teaching Hospital (LUTH).

Dental and occlusal anomalies form an important oral manifestation of endocrine disorders, which help

dental surgeons and orthodontists to diagnose and treat the patients appropriately.

Timely identification can minimise complications by enabling early treatment planning, less extensive interception, and a more favourable prognosis.

The objectives of this study were to determine the prevalence and distribution of dental anomalies of endocrine disorders among paediatric patients aged 7 years and above in LUTH, and to determine the prevalence and distribution of occlusal anomalies of endocrine disorders among paediatric patients aged 7 years and above in LUTH. Finally, to determine the frequency of distribution of the different types of endocrine disorders with dental and occlusal anomalies among children aged 7 years and above, attending the LUTH paediatric endocrinology clinic.

Materials and Methods

The study design was a descriptive cross-sectional study of paediatric patients aged 7-18 years. The research was conducted at the Lagos University Teaching Hospital, Idi -Araba, Lagos State South-West, Nigeria. The study population comprised patients aged 7-18 years old attending the Paediatric Endocrinology Clinic in LUTH. A participant was recruited into the study if they were paediatric patients aged 7-18 years with endocrine conditions who were willing to participate in the study and whose parents had given written informed consent. A participant was excluded if they were paediatric patients with other co-morbidities such as cancer, mental health disorders, chronic heart disease, and other health conditions with oral manifestations.

A convenient sampling technique was used to recruit the participants. The paediatric endocrinology unit runs two clinics on Thursdays for children with diabetes and on Fridays for other endocrine conditions. Participants were recruited from these two clinics.

Recruitment was done consecutively after obtaining written informed consent from parents/ caregivers and assent from the children aged 7 years and above. Both previously and newly diagnosed cases were

recruited consecutively as they presented to the outpatient clinic once consent and assent were obtained. The study was conducted over three months.

Sample Size Determination

This was determined by applying the formulae for sample size determination by Leslie Kish [1965]

$$n = z^2 pq / d^2$$

Based on the assumption that the researcher desires to have a 95% confidence interval. [z value of 1.96, where. n=the estimate of the population size, z=critical value at the level of the chosen confidence level [z=1.96], d²=the precision level set at 0.05, p=estimated proportion of an attribute that is present in the population=%, 95% confidence level, 10% margin of error, population proportion, p= 3% (0.03) based on previous study on proportion of children with posterior cross bite suffering from thyroid disorders.

$$1.96^2 \times 0.03 \times (1 - 0.03) / 0.05^2$$

$$= (3.84 \times 0.03 \times 0.97) / 0.0025$$

$$= 0.111744 / 0.0025$$

$$= 44.7 \text{ (approx. 45), Addition of 10\% for non-response: } 45 + 4.5 = 49.5 \text{ (approx. 50)}$$

Data Collection and Analysis

Data collection tools such as questionnaires, gloves, and examination sets were used to collect the required data. Relevant clinical and demographic data were obtained by interviewing each caregiver via questionnaires and physically examining each child. Extraoral and intraoral examinations were carried out to assess the oral cavity for any dental anomaly and occlusal anomaly associated with different types of endocrine conditions. Questions on awareness of oral conditions specific for their endocrine conditions were assessed through the research proforma. The available clinical notes and investigations of each participating child were also reviewed and information such as age at diagnosis, sex, presenting clinical features, drug history and other relevant clinical information were retrieved and filled into a research proforma.

The data contained in the questionnaires were classified and transformed into tables. Descriptive statistics was used.

Data processing and analysis were carried out using Statistical Package for Social Sciences (SPSS version 21). The statistical significance was determined by the Chi-square test and the confidence interval was set as $p < 0.05$. Chi-square analysis was used to compare the differences between proportions, while the student's t-test was used to compare differences between means, as applicable. A probability {p value} of < 0.05 was taken as statistically significant.

Ethical approval (ADM/DSCST/HREC/APP/7375) for the research was obtained from the Health Research Ethics Committee of the Lagos University Teaching Hospital, Idi-Araba, Lagos before commencement of the study. Written informed consent from parents and assent from children aged 7yrs and above were obtained after explaining in detail and in simple language, both verbally and in a leaflet, what the study was all about. Any information that was not clear was further explained.

Assent was obtained from each child who was old enough to give it (7 years and above). The purpose of the research, the procedures involved, and how the information obtained would be handled were explained to both the parents/caregiver and the child (according to the child's age of comprehension).

Participants were made to understand that participation in the research was entirely voluntary and that refusal to participate would not affect the treatment of the child. They were also made to understand that at any point of the research, if they no longer felt like continuing with the study, they were free to withdraw without any retribution, and the usual treatment of the child would not be affected by the decision. The privacy of the subjects and confidentiality of the information obtained from them were strictly ensured. The data collected was safeguarded and coded. The tests were at no financial cost to the subjects. The principal investigator bore the cost of the investigations. Information on how and where to reach the principal investigator was

provided to the parents and the children.

The benefit of the research to the participating subjects is that if oral manifestations of complications were detected, steps would be taken to institute timely intervention and treatment to prevent further complications by the dental team. Additionally, necessary information at the point of transition to adult care beyond 18 years was obtained so that monitoring of the oral cavity is incorporated with the other essential aspects of the care of the patient. The results of the dental examination were communicated to the parents/caregivers, and the study participants were treated with utmost respect, no bodily harm/injury resulted from the study. All the data gathered were treated with utmost

confidentiality. The privacy of the subjects was respected during the research. Informed consent was sought from patients and parents/caregivers.

Results

A total of 50 participants were recruited with a mean age of 11.52 ± 4.9 years, as shown in **Table 1**. Gender distribution showed that a larger proportion of participants were female (27, 54.0%) compared to males (23, 46.0%). For the educational level of the informants, the majority had secondary (26, 52.0%) or tertiary (23, 46.0%) education, with only a small minority (1, 2.0%) having primary education (Table 1).

Table 1: Socio-demographic characteristics of participants

Variable	Frequency (n=50)	Percentage
Age (Mean $\pm$ SD)	11.52 $\pm$ 4.9	
Sex of patients		
Male	23	46.0
Female	27	54.0
Educational level of informant		
Primary	1	2.0
Secondary	26	52.0
Tertiary	2	46.0

Table 2 details the endocrine abnormalities among the 50 participants. Type 1 Diabetes Mellitus was the most frequent condition, affecting 27 individuals (54.0%). Hypothyroidism was the second most common, present in 7 participants (14.0%), followed by congenital adrenal hyperplasia, identified in 6 participants (12.0%). Type 2 Diabetes Mellitus was

found in 3 participants (6.0%). The remaining abnormalities were less common, each affecting 1 participant (2.0% for each condition): adrenal insufficiency, Turner syndrome, diabetes insipidus, Cushing syndrome, metabolic syndromes, retarded penile growth, hyperthyroidism, and juvenile idiopathic short stature.

Table 2: Endocrine abnormality among participants

Variable	Frequency (n=50)	Percentage
Type of endocrine abnormality		
Type 1 DM	27	54.0
Type 2 DM	3	6.0
Hypothyroidism	7	14.0
Congenital adrenal hyperplasia	6	12.0
Adrenal insufficiency	1	2.0
Turner syndrome	1	2.0
Diabetes insipidus	1	2.0
Cushing syndrome	1	2.0
Metabolic syndrome	1	2.0
Retarded penile growth	1	2.0
Hyperthyroidism	1	2.0
Juvenile idiopathic short stature	1	2.0

Table 3 details the dental and occlusal anomalies (hard tissue) assessment findings among the 50 participants. Several occlusal and dental anomalies were equally prevalent, each affecting 8 (16.0%) individuals: crowding, crossbite, open bite, enamel

defects, and missing teeth were observed in 4 (8.0%) participants. Microdontia was found in 1 (2.0%) participant. Notably, no cases of macrodontia or malformed teeth were reported among the participants (0, 0.0% for both).

Table 3: Dental and occlusal anomalies(Hard tissue) assessment

Variable	Frequency (n=50)	Percentage (%)
Crowding	8	16.0
Crossbite	8	16.0
Open bite	8	16.0
Missing teeth	4	8.0
Enamel defects	8	16.0
Microdontia	1	2.0
Macrodontia	0	0.0
Malformed teeth	0	0.0

Occlusal and dental manifestations were also commonly observed in 28 participants (56%), while

22 participants (44%) did not present with such issues.

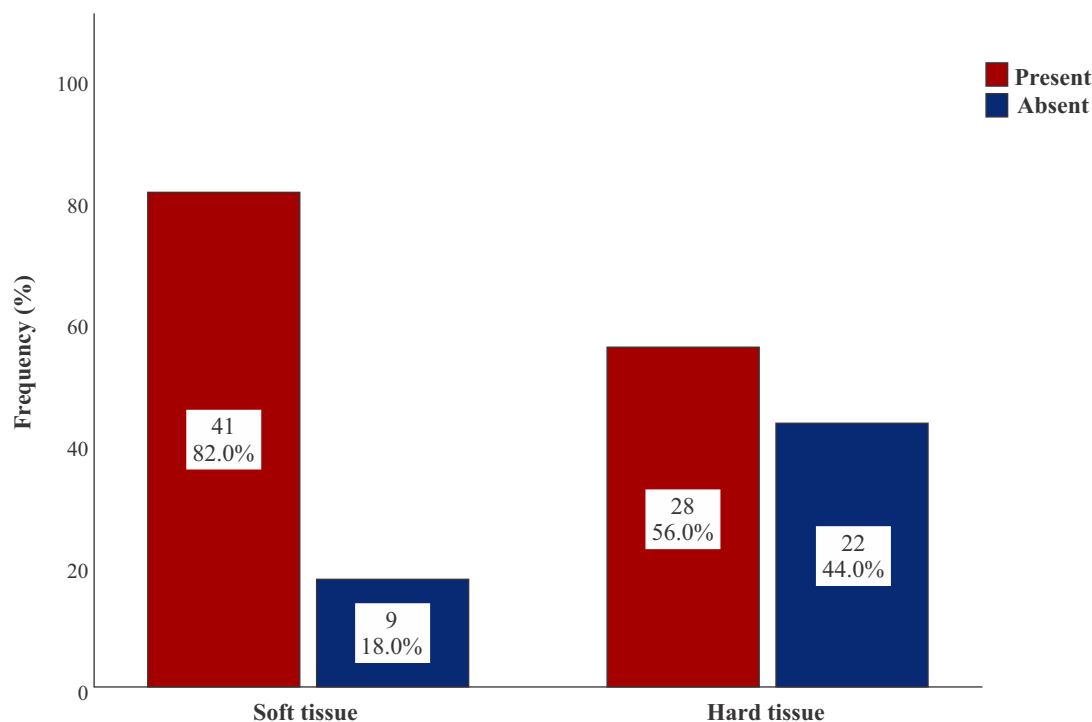


Figure 1: Prevalence and distribution of occlusal and dental anomalies(Hard tissue) of endocrine disorders among paediatric patients in LUTH

Discussion

Endocrine disorders are associated with various dental and occlusal anomalies which include delayed eruption of teeth, enamel hypoplasia, variation in tooth size, number, and shape which may be noted by dentists before the endocrinologist's diagnosis^{1,2}.

Tooth development could be delayed in conditions like hypothyroidism, macroglossia, and mandibular or maxillary prognathism causing malocclusion, which could be seen in acromegaly. Enamel hypoplasia due to chronic hypocalcaemia can be noted in Hypothyroidism.⁹ Dentists can prompt interdisciplinary collaboration with endocrinologists to manage these systemic conditions through early identification of the anomalies.⁷

The clinical manifestations of dental anomalies include different degrees of severity, ranging from mild to severe cases, represented by disturbances in the number, size, shape, position, and structure of the teeth.¹¹ Its prevalence can range from 5.46% to

74.7%,¹¹ because of different ethnicities and diagnostic criteria.¹² Different frequencies are reported in the literature for dental anomalies.¹³ Some authors attribute these conflicting results to differences in ethnicity, diagnostic criteria,¹³ and environmental and nutritional factors.¹² The prevalence of dental anomalies was greater in males than in females in a study done by Clarissa et al.¹⁴ This study noted a higher prevalence of females with endocrine disorders compared to males.

A Nigerian study conducted in a teaching hospital in Lagos, on the pattern and burden of paediatric endocrine disorders noted that Diabetes mellitus, pubertal, and thyroid disorders constituted the commonest paediatric endocrine disorders encountered.²

In this study, Type I diabetes mellitus emerged as the predominant endocrine disorder, affecting 61.9% of participants, with hypothyroidism constituting the second most common condition. This distribution

mirrors findings from Benin City, Nigeria, where diabetes mellitus similarly dominated the paediatric endocrine disease spectrum.¹⁵

Enamel defects emerged as the predominant finding, documented in 10 participants (23.8%). These structural enamel irregularities, including hypoplastic formations and opacity variations, have been consistently identified as primary dental anomalies in hypoparathyroid patients according to systematic review findings.^{15 16 17} Similarly, research conducted in India examining oral health patterns among children with thyroid dysfunction reported enamel defects as the second most common dental abnormality observed.¹⁷ The prevalence of enamel defects in our cohort suggests a significant relationship between endocrine dysfunction and tooth development processes. This finding indicates that hormonal imbalances during critical periods of amelogenesis (enamel formation) may disrupt normal mineralisation patterns, resulting in structural defects that persist throughout the patient's lifetime.¹⁷ The consistency of these findings across different endocrine conditions (hypoparathyroidism and thyroid disorders) implies a broader mechanism whereby endocrine dysregulation interferes with calcium metabolism and protein synthesis essential for proper enamel formation.

Additional prevalent findings encompassed anterior open bite in 16.7%, and posterior crossbite in 14.3% of cases. The occurrence of open bite demonstrates concordance with Indian research examining children with thyroid dysfunction, which documented anterior open bite in 23% of subjects.¹⁸ However, a notable discrepancy exists regarding posterior crossbite prevalence, as the referenced Indian study reported this malocclusion in only 3% of their paediatric cohort,¹⁶ substantially lower than our observed frequency. The substantial occurrence of malocclusions, particularly open bite patterns, suggests that endocrine disorders may significantly influence craniofacial growth and development trajectories.^{17,18}

The consistency in open bite prevalence across different populations indicates a possible causal relationship between endocrine dysfunction and vertical growth disturbances affecting jaw development and tooth eruption patterns.¹⁵ Conversely, the marked difference in posterior crossbite frequency between studies may reflect population-specific genetic factors, varying severity of endocrine conditions, treatment protocols, or methodological differences in malocclusion assessment.

Conclusion

This study demonstrates that children with endocrine disorders attending the Lagos University Teaching Hospital paediatric endocrinology clinic exhibit occlusal and dental anomalies. Dental and occlusal anomalies are 56.0% prevalent and commonly distributed amongst paediatric patients with endocrine disorders in LUTH, with type 1 DM being the most predominant endocrine disorder in this study. The findings from this study highlights the need for coordinated interprofessional management involving endocrinologists, paediatric dentists, and orthodontists.

Recommendations

It is therefore recommended that timely identification of occlusal and dental anomalies is necessary to minimise complications by enabling early treatment planning, less extensive interception and more favourable prognosis.

Future research should focus on longitudinal studies to better understand the relationship between endocrine control and the development of dental and occlusal anomalies in Nigerian children.

Authors' Contribution: AAY and EEO conceptualized the study, AAY was involved in the proposal which was reviewed by ILU and EEO, IBF and AAY structured the questionnaire. AAY, IBF, IVN and OMA were involved in data collection. AAY was involved in data analysis and discussion. ILU and EEO reviewed the whole manuscript.

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Conflict of Interest - None to declare

References

1. Irimia Sieira P, Mínguez Olaondo A, Martínez-Vila E, Rutledge M. Neurological Manifestations of Endocrine Disorders. 2019;5(2):1–29.
2. Akinola IJ, Afemo AO, Ubuane PO, Odusote OA. Paediatric endocrine disorders at a tertiary hospital in Lagos, Nigeria. Niger J Paediatr. 2022;49(1):69–74.
3. Wagner VP, Arrué T, Hilgert E, Arús NA, da Silveira HLD, Martins MD, et al. Prevalence and distribution of dental anomalies in a paediatric population based on panoramic radiographs analysis. Eur J Paediatr Dent. 2020;21(4):292–8.
4. De Ridder L, Aleksieva A, Willems G, Declerck D, de Llano-Pérula MC. Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review file:///C:/Users/WASIF KHAN/Downloads/7416076.pdf. Int J Environ Res Public Health. 2022;19(12).
5. Atreja G, Atreja S, Jain N, Sukhija U. Oral manifestations in growth hormone disorders. Indian J Endocrinol Metab. 2012;16(3):381.
6. Bigeard L, Sommermater J. [Dental delay and microdontia in children with somatotropin hormone deficiency]. J Biol Buccale. 1991 Dec;19(4):291–6.
7. Prabhu HS, Premkumar B. Oral Manifestations Endocrine Disorders. Oral Medicine & Radiology Vinayaka Missions Dental College, Puducherry Oral & Maxillofacial Surgery Vinayaka Missions Dental College, Puducherry. 2016;7:13697–9.
8. Chandna S, Bathla M. Oral manifestations of thyroid disorders and its management. Indian J Endocrinol Metab. 2011 Jul;15(Suppl 2):S113–6.
9. Venkatesh Babu NS, Patel PB. Oral health status of children suffering from thyroid disorders. J Indian Soc Pedod Prev Dent. 2016;34(2):139–44.
10. Altug-Atac AT, Erdem D. Prevalence and distribution of dental anomalies in orthodontic patients. Am J Orthod Dentofacial Orthop. 2007;131:510–514
11. Küchler EC, Risso PA, Costa MC, Modesto A, Vieira AR. Studies of dental anomalies in a large group of school children. Arch Oral Biol. 2008;53:941–946.
12. Fernandez CCA, Pereira CVCA, Luiz RR, Vieira AR, De Castro Costa M. Dental anomalies in different growth and skeletal malocclusion patterns. Angle Orthod. 2018;88:195–201.
13. Onyiriuka A, Kouyaté M. Paediatric endocrine disorders as seen at the University of Benin Teaching Hospital over a ten-year period. Niger J Paediatr. 2014;41(4):316.
14. Aitafo J, Briggs DC. Prevalence and Pattern of Paediatric Endocrine Disorders in Rivers State University Teaching Hospital: A Cross-Sectional Study . Asian J Res Reports Endocrinol. 2023;6(1):18–29.
15. Narcis MB, Mara C, Loredana ES, Albulescu DM, Mihaela JT, Smaranda AP, et al. New Approach to Addison Disease : Oral Manifestations Due to Endocrine Dysfunction and Comorbidity Burden. Diagnostics. 2022;12:1–18.
16. Venkatesh BN, Purna BP. Oral health status of children suffering from thyroid disorders. Indian Soc Pedod Prev Dent. 2016;34(2):139–44.

