

The Prevalence and Pattern of Retained Primary Teeth among Children and Adolescents in a Tertiary Institution

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Abstract

Retained primary tooth/teeth are common clinical findings encountered by orthodontists. This study aimed to assess the prevalence and patterns of retained primary teeth among orthodontic patients. A seven-year retrospective study, with data obtained from patients' records who attended the Child Dental Health Departmental clinic from 2019 to 2025. Information collected included age, sex, molar relationship, skeletal pattern, and retained teeth. Data were analyzed using IBM SPSS Version 26, with a significance level set at p-value < 0.05. The study involved 366 children and adolescents, 157 males (42.9%) and 209 females (57.1%). A total of 109 retained primary teeth were found in 58 subjects (15.9%), 38 females (65.5%) and 20 males (34.5%), with a mean age of 12.4 ± 3.6 years. Retained primary teeth were more common in the 10-19-year age group, 45 (77.6%). Most, 66.1%, were in the maxillary arch, maxillary canines most frequently affected, 30 (27.5%). A single retained tooth was more frequently observed in the 0-9-year age group (53.8%), whereas multiple ones were more common among adolescents, (55.6%). There were no statistically significant association between the number of retained teeth and age, sex, molar relationship, or skeletal pattern ($p > 0.05$). However, there was a significant association between the number of retained teeth and orthodontic treatment ($p=0.01$). Overall, retained primary teeth were common findings among the studied children and adolescents, more frequently occurring in females and adolescents, especially in the maxillary arch, with maxillary canines mostly involved. The significant association with orthodontic treatment highlights their clinical importance.

Keywords: Prevalence, Retained primary teeth, Orthodontic patients, Pattern, Adolescents.

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INTRODUCTION

Humans develop two successive dentitions; the primary and the permanent dentitions. Eruption of the primary dentition typically begins at approximately six months of age, with exfoliation occurring around six years as the permanent dentition gradually emerges. The transition to permanent dentition is regulated by root resorption of primary teeth and the eruptive forces of their permanent successors [Caley A *et al.*, 2022]. Disruption of this sequence may result in the prolonged retention of primary teeth beyond their expected exfoliation period, a condition commonly referred to as retained primary teeth [Alizar Jain R *et al.*, 2024].

Retained primary teeth are often encountered in paediatric populations and may be associated with a variety of local and systemic factors. They may be

classified according to their underlying aetiology and clinical presentation. The most common type is associated with congenital absence of the permanent successor, particularly involving mandibular second premolars and maxillary lateral incisors, allowing the primary tooth to remain functional for an extended period [Mohammed D *et al.*, 2018; Iraqi G *et al.*, 2019].

Retention may also occur when the permanent successor is present but impacted or ectopically positioned or when physiologic root resorption is delayed or disturbed despite the presence of a successor [Iraqi G *et al.*, 2019]. Ankylosed primary teeth represent another important category, characterized by fusion to the alveolar bone and often presenting with infra occlusion [Zou J *et al.*, 2018]. Additionally, retained primary teeth may result from trauma or local pathology that interferes with normal eruption or be associated with

systemic genetic conditions that affect dental development and exfoliation.

While some retained primary teeth may remain asymptomatic and functional for extended periods, others can contribute to malocclusion, altered eruption patterns, periodontal complications, dental caries and aesthetic concerns when it affects anterior teeth. The clinical implications of retained primary teeth therefore vary widely depending on the underlying aetiology, timing and individual patient characteristics [Mohammed D *et al.*, 2018; Iraqi G *et al.*, 2019; Zou J *et al.*; 2018, Jiang & Huang, 2025].

Studies across different populations show that retained primary teeth are a relatively common dental finding in children and adolescents. Reported prevalence varies widely depending on the study design, age range and diagnostic criteria used. In a paediatric dental anomaly survey in Lagos, Nigeria, retained primary teeth were observed in about 8.8% of the subjects [Olatosi O *et al.*, 2022]. A study from India, reported a prevalence of 4.5% for prolonged retained primary teeth among 6- to 12-year-olds [Chauhan S *et al.*, 2025]. In another clinic sample, the prevalence was 16.6% of orthodontic patients [Onyeaso C, 2005]. Among German children, 59.8% had at least one retained primary tooth associated with delayed eruption of permanent successor [Henklein S *et al.*, 2024]. In Saudi Arabia, a prevalence of 23.4% of retained primary teeth among dental anomalies in children evaluated using panoramic radiographs [Marra P *et al.*, 2024]. In Iran, a study found that approximately 20.85% of children had prolonged retention of primary teeth, with the highest prevalence among 10-year-old children [Leung & Leung, 2024]. In Italy, the presence of retained primary teeth is documented at 16.5% in patients with compound/complex odontomas [Polder B *et al.*, 2004]. In China, the prevalence of retained primary teeth among adolescents aged 12–15 years is 11.74% [Jiang & Huang, 2025].

Early diagnosis and appropriate management of retained primary teeth are essential to ensure optimal occlusal development and long-term oral health [Leung & Leung, 2024]. Though studies have been done on retained primary teeth, the prevalence is not known among orthodontic patients in Port Harcourt, Nigeria. The objective of this study was to assess the prevalence and pattern of retained primary teeth. Also, to determine

any association between retained primary teeth and occlusal characteristics.

MATERIAL AND METHODS

This was a seven-year, retrospective study design. Data were obtained from patients' records who attended the Child Dental Health clinic of the University of Port Harcourt Teaching Hospital from January 2019 to December 2025. Information required for the study were the age as the last birthday. This was further categorized into 0 to 9 years age group and 10 to 19 years age group. The sex was also noted as either male or female.

Occlusal characteristics such as molar relationships was noted as Angles's malocclusion, Class I, Class II and Class III. The skeletal pattern was also noted as either Class 1, Class 2 or Class 3.

The number and location of the retained teeth were noted. Only patients' records with the complete required information were enrolled into the study. The data obtained were imputed into a spreadsheet, and were analyzed using Statistical Package for the Social Sciences (SPSS) Version 26, IBM, Inc., Armonk, NY, USA. The statistics employed in this study were descriptive ones where frequencies and percentages were determined, as well as inferential statistics using Chi-square test. The test of significance was set at p-value < 0.05. Prior to commencement of the study, ethical clearance was obtained from the Ethics and Research Committee of the University of Port Harcourt Teaching Hospital with number UPTH/ADM/90/S.11/VOL.XI/1986.

RESULTS AND DISCUSSION

The study had 366 children and adolescents, comprising of 157(42.9%) males and 209 (57.1%) females and a mean age of 11.9 (± 3.6) years old.

Retained primary teeth was found in 58 (15.9%) subjects; 38 (65.5%) females and 20 (34.5%) males. The prevalence of over retained primary teeth was 12.7% in males and 18.2% in females.

The mean age of those affected was 12.4(± 3.6) years. It was commoner among the 10- 19 years age group, 45 (77.6%). The majority of those that had retained primary teeth had (89.7%) Angles Class I malocclusion (Figure 1) and 79.3% had skeletal pattern I relationship (Figure 2).

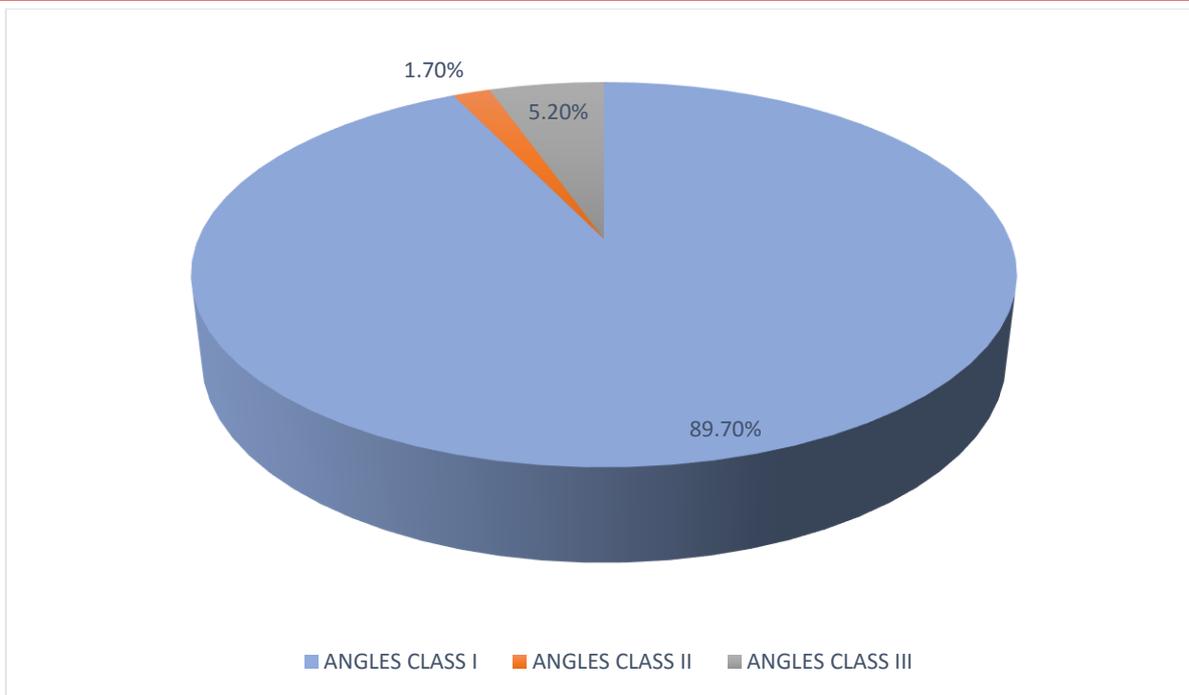


Figure 1: Occlusal characteristics of the subjects with retained primary teeth

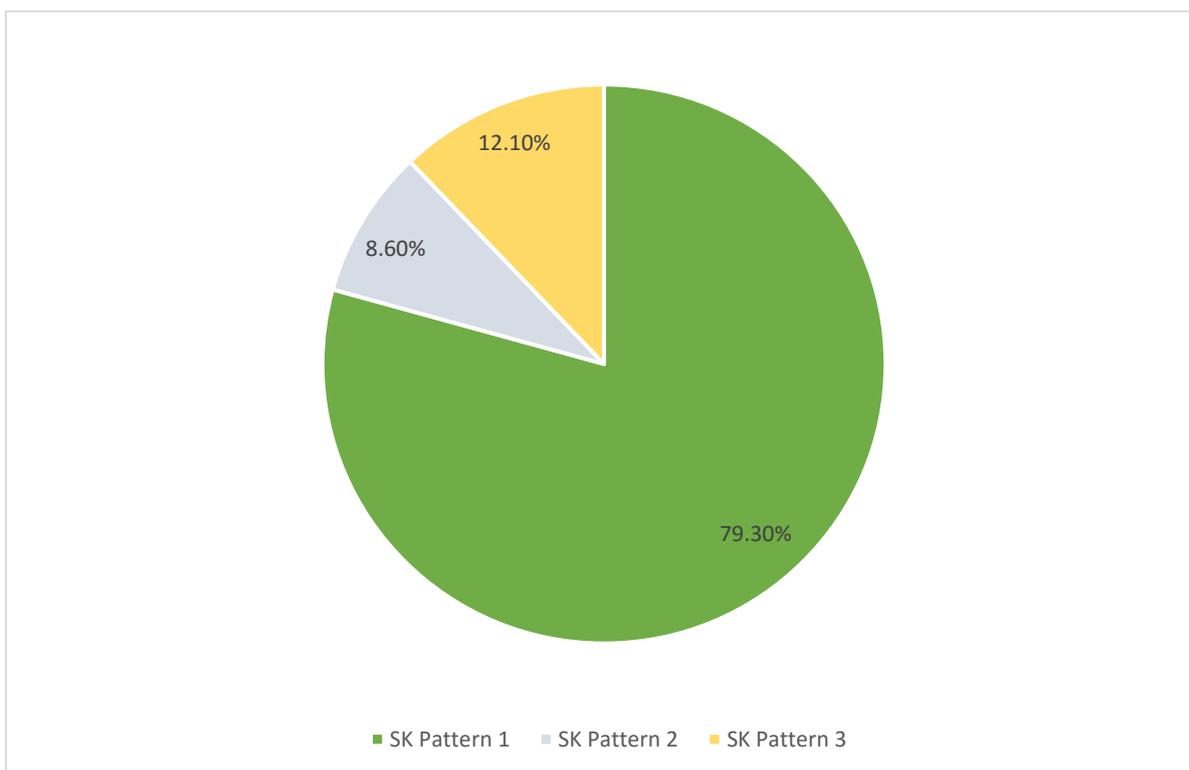


Figure 2: The Skeletal pattern of subjects with retained primary teeth

There were 109 retained primary teeth in 58 children and adolescents. Seventy-two (66.1%) were on the maxillary arch and 33.9% were in the mandibular arch. Thirty-one (54.4%) had multiple retained primary teeth. Single retained tooth was found more (53.8%) in

the 0-9 years old, while multiple retained teeth were found more in the adolescents (55.6%). Equal number of unilateral or bilateral presentations of retained primary teeth. Majority [30 (27.5%)] of the retained primary teeth were maxillary canines (Figure 3).

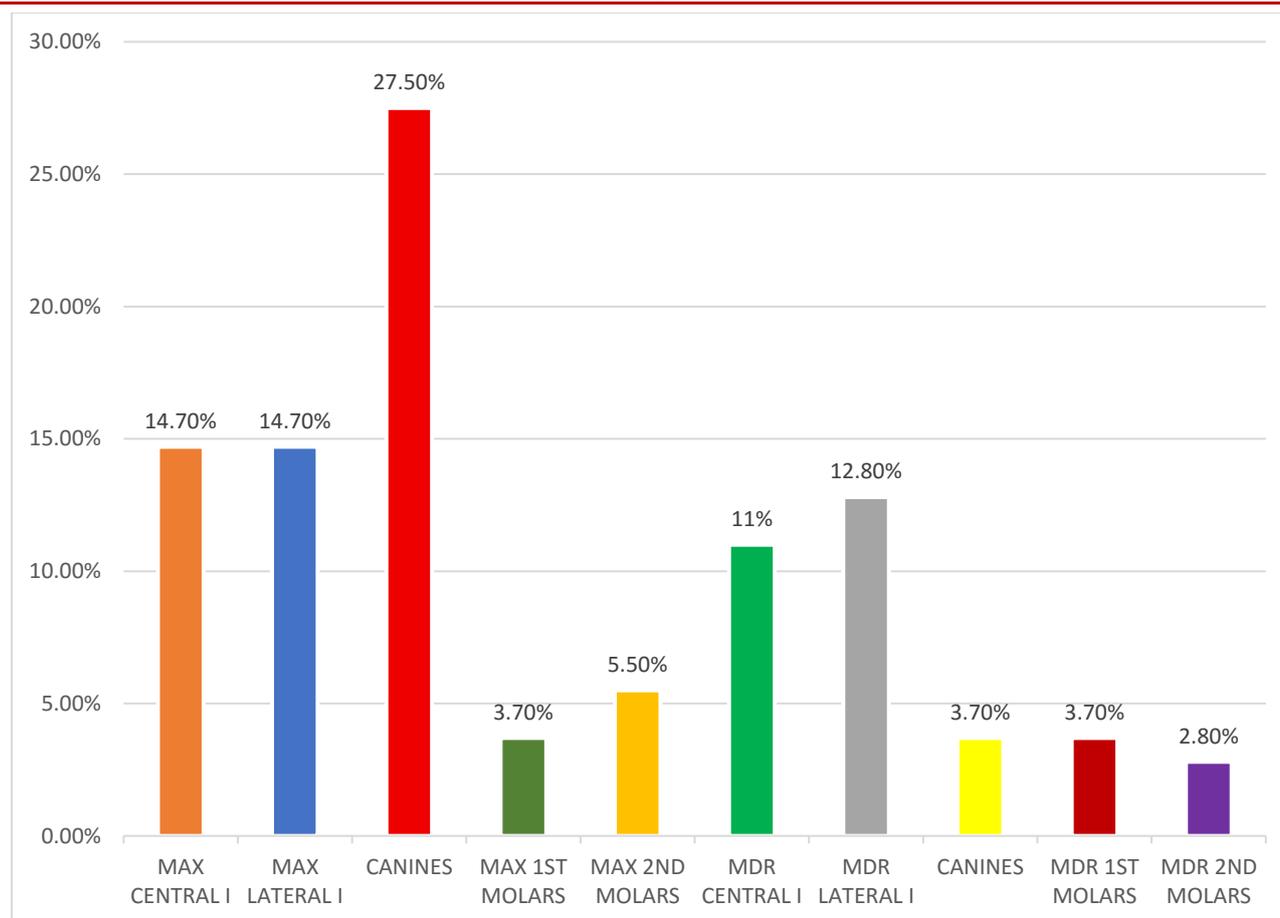


Figure 3: The distribution of the types of retained teeth in the subjects

The association between the number of retained teeth and age, sex, molar relationship and skeletal pattern showed no statistical significance ($p > 0.05$). However,

there was an association between the number of retained teeth and orthodontic treatment ($p = 0.01$). (Table 1)

Table 1: the association of numbers of retained teeth and age, sex and occlusal characteristics

	Single retained tooth	Multiple retained teeth	p value
Age group (years)			
0 – 9	7 (25.9)	6 (19.4)	
10 -19	20 (74.1)	25 (80.6)	$p = 0.55$
Sex			
Males	12 (44.4)	8 (25.8)	
Females	15 (55.6)	23 (74.2)	$p = 0.14$
Past Orthodontic treatment			
Yes	1 (3.7)	0	
No	26 (96.3)	31 (100)	$p = 0.47$
Current Orthodontics treatment			
Yes	17 (63.0)	21 (71.0)	$p = 0.01^*$
No	10 (37.0)		
Molar relationship			
Angles class I	26 (96.3)	26 (83.9)	
Angles class II sub div 1 left	1 (3.7)	0	
Angles class III	0	3 (9.7)	$p = 0.12$
Angles class III sub div right	0	2 (6.4)	
Skeletal pattern			
Class I	23 (85.2)	20 (71.4)	
Class II	3 (11.1)	2 (7.1)	
Class III	1 (3.7)	6 (21.4)	$P = 0.08$

This study assessed the prevalence and pattern of retained primary teeth among children and adolescents and found an overall prevalence of 15.9%. This falls within the range reported in previous studies, although variations exist due to differences in age groups studied, diagnostic criteria and population characteristics. [Onyeano, 2005] reported a lower incidence in a Nigerian population, while more recent institutional and hospital-based studies have shown higher prevalence rates similar to the findings of the present study [Chauhan S *et al.*, 2025]. A higher proportion of females were affected compared to males, with prevalence rates of 18.2% and 12.7%, respectively. This female predominance has also been reported by [Iraqi G *et al.*, 2019; Jiang and Huang, 2025; Polder B *et al.*, 2004; Hashim R *et al.*, 2020] and may be related to earlier dental maturation in females, leading to increased detection of eruption discrepancies during mixed dentition [Iraqi G *et al.*, 2019; Jiang & Huang, 2025; Polder B *et al.*, 2004; Hashim R *et al.*, 2020]. Conversely, in previous studies, there were no significant gender predominance [Silva Miza R *et al.*, 2003; Chung C *et al.*, 2008; Jamilian A *et al.*, 2015]. However, the lack of a statistically significant association between sex and number of retained teeth in this study suggests that gender may not be an independent risk factor, supporting observations by Henklein S *et al.*, 2024.

The mean age of affected subjects was 12.4 years with the majority occurring in the 10- 19 years age group. This is consistent with the transitional and early permanent dentition periods, when exfoliation of primary teeth should normally be complete. Persistence beyond this age often indicates underlying aetiological factors such as delayed root resorption, ectopic eruption or absence of permanent successors [Caleya A *et al.*, 2022; Mohammed D *et al.*, 2018; Jiang & Huang, 2025]. Caleya A *et al.*, 2022, emphasized that delayed physiological resorption of primary teeth is closely related to discrepancies between dental and chronological age, which may explain the clustering of retained teeth in adolescents observed in this study.

Most subjects with retained primary teeth exhibited Angle's Class I molar relationship and skeletal Class I pattern. This finding suggests that retained primary teeth can occur even in otherwise normal occlusal and skeletal relationships, and are not exclusively associated with severe malocclusion. Similar observations were reported by [Zou J *et al.*, 2018; Olatosi O *et al.*, 2022], who noted that dental anomalies frequently coexist with apparently normal occlusal relationships. The absence of a significant association between retained teeth and skeletal pattern or molar relationship in this study further supports this view.

A greater proportion of retained primary teeth were found in the maxillary arch compared to the mandibular arch. Maxillary predominance has been consistently reported in previous studies, particularly

involving canines and second primary molars [Iraqi G *et al.*, 2019; Henklein S *et al.*, 2024; Hashim R *et al.*, 2020]. The maxillary primary canine was the most commonly retained tooth in this study. This aligns with reports that maxillary canines have a long and complex eruption path, making them particularly susceptible to eruption disturbances and prolonged retention of their predecessors [Alizar Jain R *et al.*, 2024; Jiang & Huang, 2025].

However, this finding contrast that of Hashim R *et al.*, 2020, which found the primary second molar most commonly retained followed by lateral incisor and that from a previous Nigerian study [Ize-Iyamu I, 2011] which found the lower lateral primary incisor the most frequently retained tooth. Multiple retained primary teeth were more common in adolescents, while single retained teeth were more frequent in the younger children. This pattern reflects cumulative effects of delayed exfoliation and untreated eruption disturbances over time. Mohammed D *et al.*, 2018; Jiang & Huang, 2025, highlighted that multiple retained teeth are often associated with systemic or local developmental factors, including agenesis of permanent successors and abnormal resorption patterns [Mohammed D *et al.*, 2018; Jiang & Huang, 2025].

No significant association was found between the numbers of retained teeth and age, sex, molar relationship or skeletal pattern. However, a statistically significant association was observed between the number of retained teeth and orthodontic treatment. This finding is clinically relevant as retained primary teeth often complicate orthodontic diagnosis and treatment planning

Alizar Jain *et al.*, 2024; Henklein S *et al.*, 2024, similarly reported that retained primary teeth are frequently detected during orthodontic assessment and may necessitate extraction, space management or monitoring depending on the presence and position of permanent successors.

Overall, the findings of this study reinforce the importance of early diagnosis and routine dental assessment during the mixed dentition period. Retained primary teeth remain a common finding with potential implications for occlusion eruption of permanent teeth and orthodontic treatment needs. Improved dental awareness and timely intervention may reduce the prevalence and complications associated with retained primary teeth, particularly in adolescent populations.

CONCLUSION

Retained primary teeth were a common finding among the children and adolescents studied. The condition occurred more frequently in females and adolescents, with the maxillary arch, particularly the maxillary canine most frequently affected. Most subjects exhibited Angle's Class I molar relationship and Skeletal Class I pattern. A significant association with

orthodontic treatment underscores their clinical importance.

RECOMMENDATION

Early diagnosis and timely intervention during mixed dentition period are essential to prevent occlusal complications and reduce orthodontic treatment complexity.

REFERENCES

- Caleyá, A. M., Gallardo, N.E., Feijoo, G., Mourelle-Martínez, M. R., Martín-Vacas, A., & Maroto, M. (2022). Relationship between Physiological Resorption of Primary Molars with Its Permanent Successors, Dental Age and Chronological Age. *Children (Basel)*, 9(7), 941-946.
- Alizar Jain, R., S., Pankey, N., & Paul, P. (2024). Retained Primary Teeth and Their Complication and Treatment: A Case Report. *Cureus*, 16(8), 197- 204.
- Mohammed, D., R., Hashim, R., S., & Al-Essa, H., S. (2018). Retention of Primary Second Molars without a Permanent Successor: A Review Article. *International Journal of Medical Research Health Sciences*, 7(7), 80-89.
- Iraqi, G., Helal, N., Arafa, A., & Helal F. (2019). Retained primary molars and related reasons in Umm Al-Quora University, Makkah: A retrospective study. *The Open Dentistry Journal* 13, 190-195
- Zou, J., Meng, M., Law, C., Rao, Y., & Zhou, X. (2018). Common dental diseases in children and malocclusion. *International Journal of Oral Science*, 10(1), 7-14.
- Jiang, R., & Huang, R. (2025). Retained deciduous teeth: the epidemiology, etiology and treatment plans. *Journal of Clinical Pediatric Dentistry*, 49(2), 51-58.
- Olatosi, O., O., Oyapero, A., Akinwande, K., O. Ayedun, O., S., Aladenika, E., T., & Obe, O., I. (2022). Pattern and Prevalence of Dental Anomalies among a Paediatric Population in Lagos, Nigeria. *Nigerian Postgraduate Medical Journal*, 29(2), 167-172.
- Chauhan, S., P., Saxena, A., Singh, S., & Thukral, R. (2025). Assessment of prevalence of over retained primary teeth in 6-12 years old children: an institutional study. *Journal of Advanced Medicine Dental Science Research*, 13(9), 25-29.
- Onyeaso, C., O. (2005). Incidence of retained deciduous teeth in a Nigerian population: an indication of poor dental awareness/attitude. *Odontostomatologie Tropicale*, 28(111), 5-9.
- Henklein, S., D., K uchler, E., C., Proff, P., Lepri, C., P., Baratto-Filho, F., & Mattos, N., H., R. (2024). Prevalence and local causes for retention of primary teeth and the associated delayed permanent tooth eruption. *Journal of Orofacial Orthopaedics*, 85(1), 73-78.
- Marra, P.,M, Nucci, L., Itr , A., Santoro, R., Marra, A., Perillo, L., & Grassia V. (2021). Prevalence of retained/transmigrated permanent and persistence of primary teeth associated with odontomas in young children. *European Journal of Paediatric Dentistry*, 22(3), 215–218.
- Leung, C.,W., M., & Leung, T., F. (2024). Retained primary teeth: A clinical complaint not to be dismissed. *Paediatrics & Child Health*, 29(3), 133–134.
- Polder, B.,J., Van't Hof, M., A., Van der Linden, F., P., Kuijpers- Jagtman, A.,M., A. (2004). Metaanalysis of the prevalence of dental agenesis of permanent teeth. *Community Dental Oral Epidemiology*, 32(3), 217-226.
- Hashim, R., S., Mohommed, D., R., Refaat, M., M. (2020). Prevalence of retained primary teeth without permanent successors among orthodontic Patients in Basrah City/ Iraq. *Systemic Reviews in Pharmacy*, 11(10), 94-99.
- Silva Miza, R. (2003). Radiographic assessment of congenitaaly missing teeth in orthodontic patients. *International Journal Paediatric Dentistry*, 13(2), 112-116.
- Chung, C., J., Han, J., H., Kim, K., H. (2008). The pattern and prevalence of hypodontia in Koreans. *Oral Diseases*, 14(7), 620-625.
- Jamilian, A., Perillo, L., Rosa, M. (2015). Missing upper incisors: a retrospective study of orthodontic space closure versus implant. *Progress in Orthodontics*, 16(1), 2-7.
- Ize-Iyamu, I., N. (2011). Prevalence of retained primary teeth among children with anterior arch crowding in Benin City, Nigeria. *Annals of Biomedical Science*, 10, 18-28.