Research Article

Assessment of Oral Health Status Among Children With Obstructive Sleep Apnoea – An Observational Study

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Abstract

BACKGROUND

Obstructive sleep apnea (OSA) in children commonly intersects with pediatric dentistry concerns, stemming from factors like adenotonsillar hypertrophy, retrognathia, or maxillary transverse deficiency that obstruct the upper respiratory pathway in sleep, leading to habitual snoring, hypopneas, and chronic mouth breathing. This results in xerostomia, reduced salivary buffering, cariogenic plaque accumulation, gingival inflammation with increased bleeding tendencies, elevated probing depths and higher deft/DMFT caries experience, alongside dentofacial changes such as excessive overjet, Class II molar and canine relationships, narrowed intermolar widths, anterior open bite tendencies and diminished oral health-related quality of life. Routine dental assessments incorporate deft/ DMFT, OHI and gingival indices enabling early identification of this bidirectional sleep-oral health nexus.

AIM

To assess caries incidence, prevalence of gingivitis and oral hygiene status among children with obstructive sleep apnoea.

MATERIALS AND METHODS

In this observational study, 80 children aged 7 – 10 years were divided into 2 groups, namely case
(n=40) and control (n=40) based on history taking and nasal endoscopy. Intra oral findings including
Decayed, Missing and Filled Tooth (DMFT), decayed, extracted, filled (def) indices, gingival and Oral Hygiene Indices were recorded for both test and control groups, after obtaining consent from the parent and assent from the child.
All collected data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Chi-square test was applied to compare categorical variables between case and control groups, while the independent samples ttest was used to compare mean DMFT and deft scores.

RESULTS

There was no statistically significant disparity in age and gender distribution between the case and control groups. Although oral hygiene index and gingival indices were poorer for case group in contrast to control group, no statistically significant difference was observed. Regarding, occlusion and DMFT, intergroup variance was found to be highly statistically significant with case group demonstrating higher prevalence of class II malocclusion and DMFT scores. The comparison of deft scores between the groups showed no statistically significant difference.

CONCLUSION

Despite the current study's constraints, it may be inferred that while oral hygiene and gingival parameters were comparable between groups, differences were evident in occlusal characteristics and permanent dentition caries experience with Class II malocclusion and higher DMFT scores being more prevalent in the case group.

Keywords: Paediatric obstructive sleep apnoea, oral health status, observational study

Introduction

Sleep is an active physiologic and neurologic process essential for multiple restorative functions. Adequate sleep duration and continuity exert a notable effect on memory consolidation, cognitive performance, learning capacity, somatic growth, and cardiovascular health in children. Sleep disordered breathing (SDB) encompasses a spectrum of disorders characterized by increased upper airway resistance and pharyngeal collapsibility, ranging from primary snoring to obstructive sleep apnoea (OSA), which occurs irrespective of age group.[1] Sleep disorders disrupt the restorative power of nightly rest for countless people, with

one of the most common being obstructive sleep apnoea (OSA)—a condition marked by repeated breathing pauses during sleep from airway collapse, impacting health through heightened risks of cardiovascular issues, fatigue, and more.

The American Thoracic Society and the American Academy of Paediatrics define paediatric OSA as a sleep-related breathing disorder marked by recurrent partial or complete upper airway obstruction leading to disrupted ventilation and fragmented sleep.[2] Early diagnosis of OSA may reduce the occurrence of systemic complications including behavioral problems, learning difficulties, cardiovascular issues, and growth retardation over time, although the diagnosis of OSA is, unfortunately, often late.[3]

While the general ramifications of OSA are well established, the dental repercussions are less commonly addressed, although they are equally important. There is a close relationship between systemic health and oral health, as disorders in the mouth often indicate or worsen broader health issues.[4] The systemic nature pertaining to oral health is underscored by the links between OSA and different oral health disorders, including bruxism, xerostomia, periodontal and temporomandibular joint disorders, malocclusion and dysgeusia . Additionally, mouth breathing increases the likelihood of dental caries and exacerbates dry mouth. So, the aim of our study was to assess the oral health status among children with Obstructive Sleep Apnoea. The objectives were to assess caries incidence, prevalence of gingivitis and oral hygiene status in children with obstructive sleep apnoea.

Methodology

The study protocol was reviewed and approved by the Institutional Human Ethics committee, Sree Anjaneya Institute of Dental Sciences (Ref No : SAIDS/IHEC/09/2024, Date : 19.04.2024).

Children who came to Dept of Paediatric and Preventive dentistry, Sree Anjaneya Institute of Dental Sciences, Calicut, belonging to the age group of 7 – 10 years, were divided into 2 groups namely test and control based on history taking. History taking included questions regarding sleep disturbances, breathlessness and gasping for air while sleeping, mouth breathing or snoring while sleeping, excessive daytime sleepiness, inability to concentrate.

Intra oral examination was done using mouth mirror, periodontal probe and explorer. Tonsils were checked for any enlargement by asking the patient to say “aah”. Children with positive history of sleep disturbances or mouth breathing or presence of any enlarged tonsils were referred to the Dept of ENT of Malabar Medical College, Calicut for confirmation of OSA. If the child is diagnosed as having obstructive sleep apnea secondary to grade III or IV adenoid hypertrophy confirmed by nasal endoscopy, he / she was included in the test group (n = 40). Children without OSA / any signs of mouth breathing were included in control group (n = 40)

Children with systemic conditions, neurological diseases, or cognitive impairments that could compromise their ability to maintain good oral health, including asthma and diabetes mellitus, were excluded. Children receiving medications known to have adverse effects on oral health, those who had undergone active orthodontic treatment within the preceding year, and those who had previously undergone adenotonsillectomy were also excluded.

Intra oral findings including Decayed, Missing and Filled Tooth (DMFT), decayed, extracted, filled (def) indices, gingival and Oral Hygiene Indices were recorded for both test and control groups, after obtaining consent from the parent and assent from the child.

All gathered data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for all variables, with categorical data such as Debris Index, Calculus Index, OHI-S, Gingival Index, and Occlusion expressed as frequency and percentage, and continuous variables such as DMFT and deft expressed as mean ± standard deviation. The Chi-square test was utilized to compare categorical variables between case and control groups, while the independent samples t-test was used to compare mean DMFT and deft scores. A p-value of less than 0.05 was regarded statistically significant.

RESULTS

Table 1: Comparison of Age - Case vs Control

Group	Mean	SD	t-value	p-value

Case	**8.31**	**1.24**	**-2.73**	**0.06**
Control	**9.19**	**1.05**		

*Independent t test ,P<0.05 is statistically significant

The comparison of age between the case and control groups was performed using an independent ttest. The mean age in the case group was 8.31 ± 1.24 years, while in the control group it was 9.19 ± 1.05 years. The difference in mean age between the two groups was found to be 0.88 years, with a t-value of -2.73 and a p-value of 0.06. Although the control group showed a modestly increased mean age, the variation was not statistically significant (p > 0.05), indicating that both groups were comparable in terms of age.

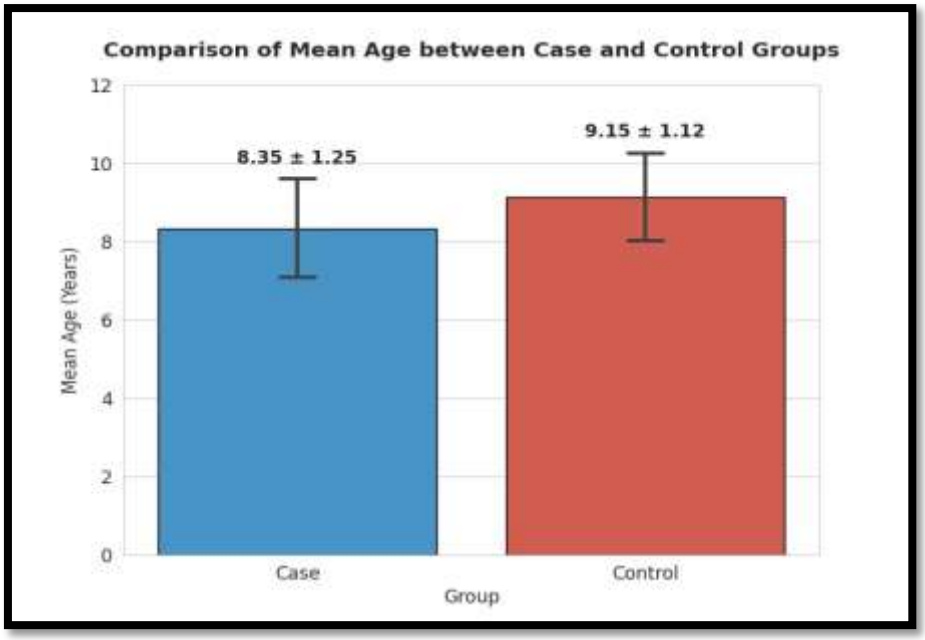


Table 2: Comparison of Gender

Group	Male (n)	Female (n)	Total	Chi-Square (χ2)	p-value
Case	**23 (57.5%)**	**17 (42.5%)**	**40**	**3.87**	**0.07**
Control	**14 (35.0%)**	**26 (65.0%)**	**40**		

*Chi square test ,P<0.05 is statistically significant

The gender distribution between the groups was analysed using the Chi-square test. In the case group, 23 (57.5%) were males and 17 (42.5%) were females, whereas in the control group, 14 (35.0%) were males and 26 (65.0%) were females. The Chi-

square value was 3.87 with a p-value of 0.07, which was not statistically significant (p > 0.05). This suggests that there was no significant difference in gender distribution across the case and control groups.

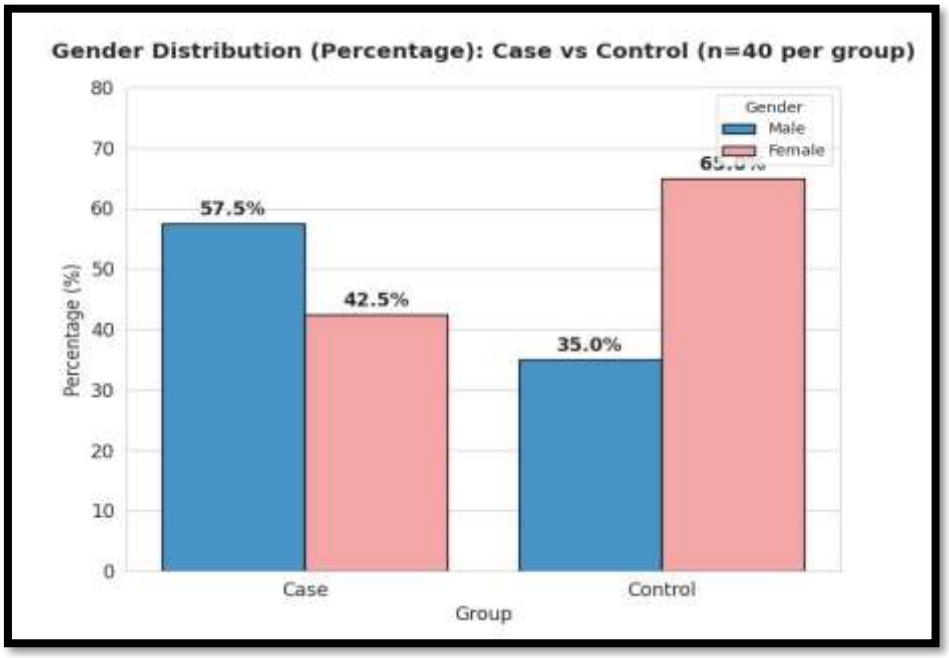


Table 3-Debris Index – Case vs Control

Debris Index	Case n (%)	Control n (%)	χ^2 value	p value
Good	13 (32.5%)	20 (50.0%)	2.58	0.108
Fair	26 (65.0%)	18 (45.0%)		
Poor	0 (0%)	1 (2.5%)		
Total	40	40		

*Chi square test, P<0.05 is statistically significant

The comparison of Debris Index between case and control groups showed that 32.5% of cases and 50.0% of controls had good debris scores, while 65.0% of cases and 45.0% of controls had fair scores.

Poor debris score was observed only in 2.5% of the control group and none in the case group. The variation between the groups was not statistically significant ($\chi^2 = 2.58$, $p = 0.108$).

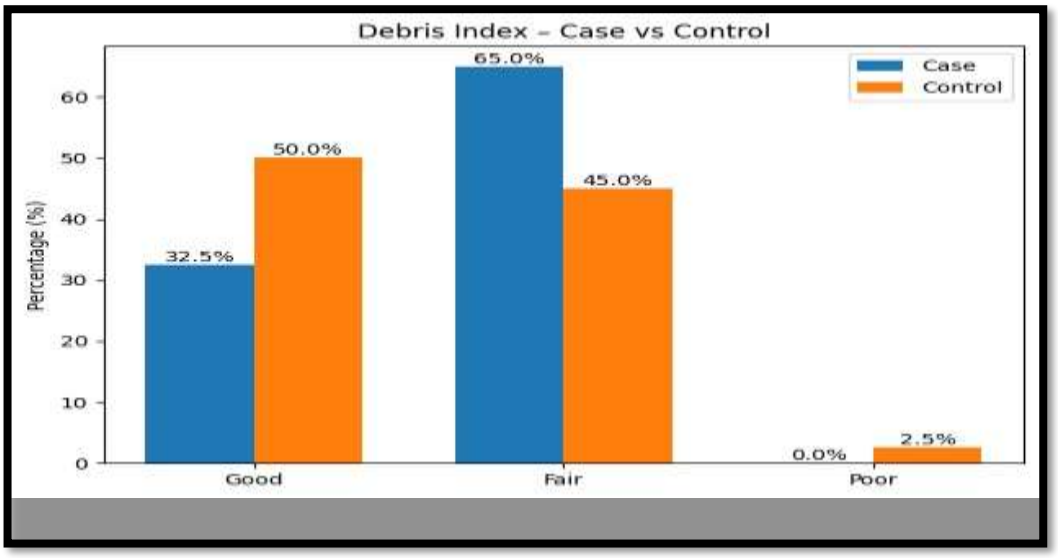


Table 4 -Calculus Index – Case vs Control

Calculus Index	Case n (%)	Control n (%)	χ^2 value	p value
Good	38 (95.0%)	36 (90.0%)	0.72	0.395
Fair	2 (5.0%)	4 (10.0%)		
Total	40	40		

In the case group, 95.0% had good calculus scores and 5.0% had fair scores, whereas in the control group, 90.0% had good scores and 10.0% had fair scores. The comparison revealed no statistically significant difference between the groups ($\chi^2 = 0.72$, $p = 0.395$).

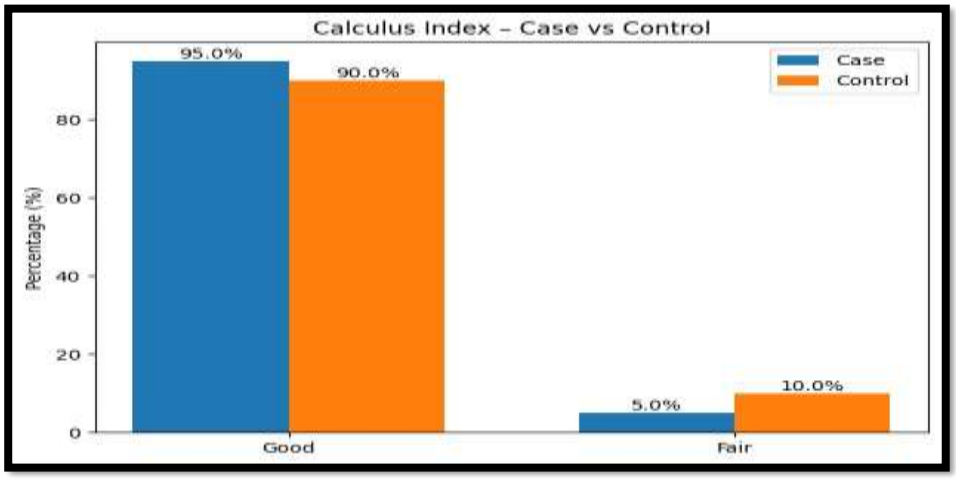


Table 5 OHI S – Case vs Control

OHI-S	Case n (%)	Control n (%)	χ^2 value	p value
Good	24 (60.0%)	29 (72.5%)	1.53	0.216
Fair	14 (35.0%)	10 (25.0%)		
Poor	2 (5.0%)	1 (2.5%)		
Total	40	40		

Regarding OHI-S, 60.0% of cases and 72.5% of controls had good oral hygiene status. Fair OHI-S was observed in 35.0% of cases and 25.0% of controls, while poor OHI-S was noted in 5.0% of cases and
2.5% of controls. The difference across the case and control groups was not statistically significant ($\chi^2 = 1.53$, $p = 0.216$).

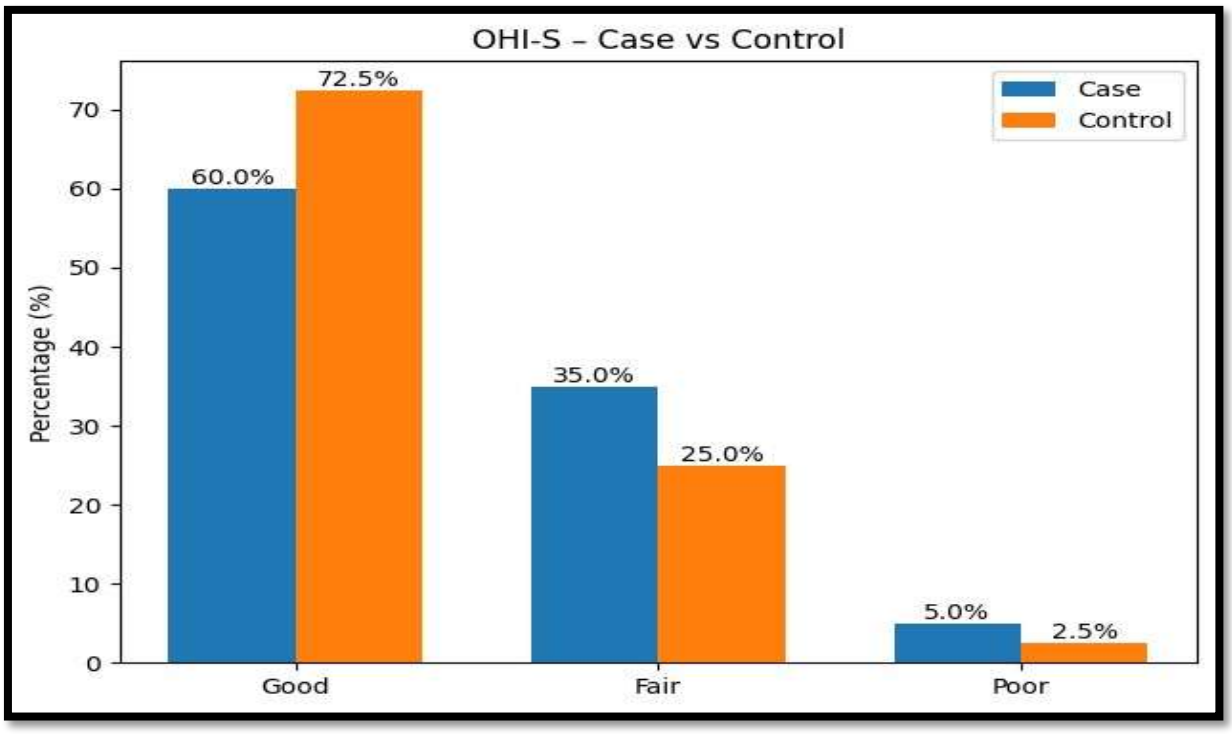


Table 6 -Gingival Index – Case vs Control

Gingival Index	Case n (%)	Control n (%)	χ^2 value	p value
Mild	34 (85.0%)	35 (87.5%)	0.11	0.741
Moderate	6 (15.0%)	5 (12.5%)		

Total	40	40		

In the case group, 85.0% exhibited mild gingivitis and 15.0% showed moderate gingivitis. Similarly, in the control group, 87.5% had mild gingivitis and 12.5% had moderate gingivitis. The comparison between the groups revealed no statistically significant difference ($\chi^2 = 0.11$, $p = 0.741$).

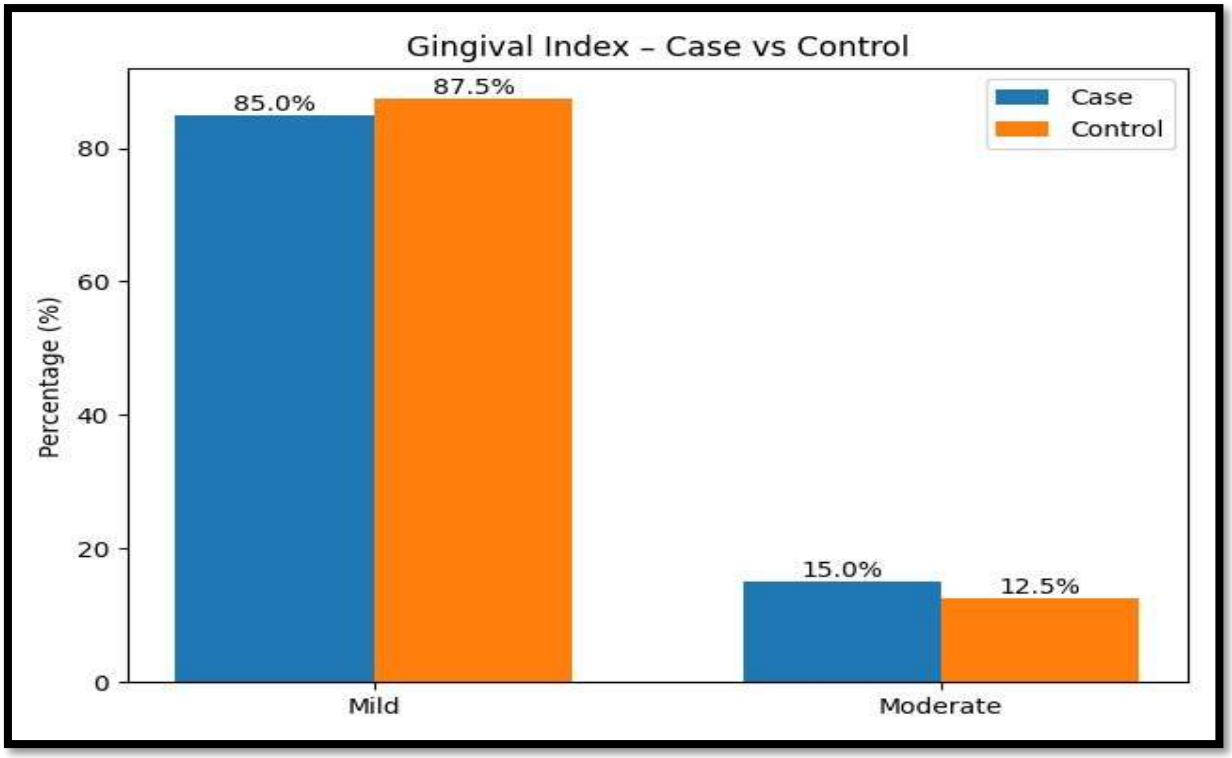


Table 7-Occlusion – Case vs Control

Occlusion	Case n (%)	Control n (%)	χ^2 value	p value
Class I	25 (62.5%)	40 (100%)	18.46	<0.001*
Class II	15 (37.5%)	0 (0%)		
Total	40	40		

In the case group, 62.5% had Class I occlusion and 37.5% had Class II occlusion. In contrast, all participants (100%) in the control group exhibited Class I occlusion, with no cases of Class II malocclusion. The difference between the groups was observed to be highly statistically significant ($\chi^2 = 18.46$, $p < 0.001$).

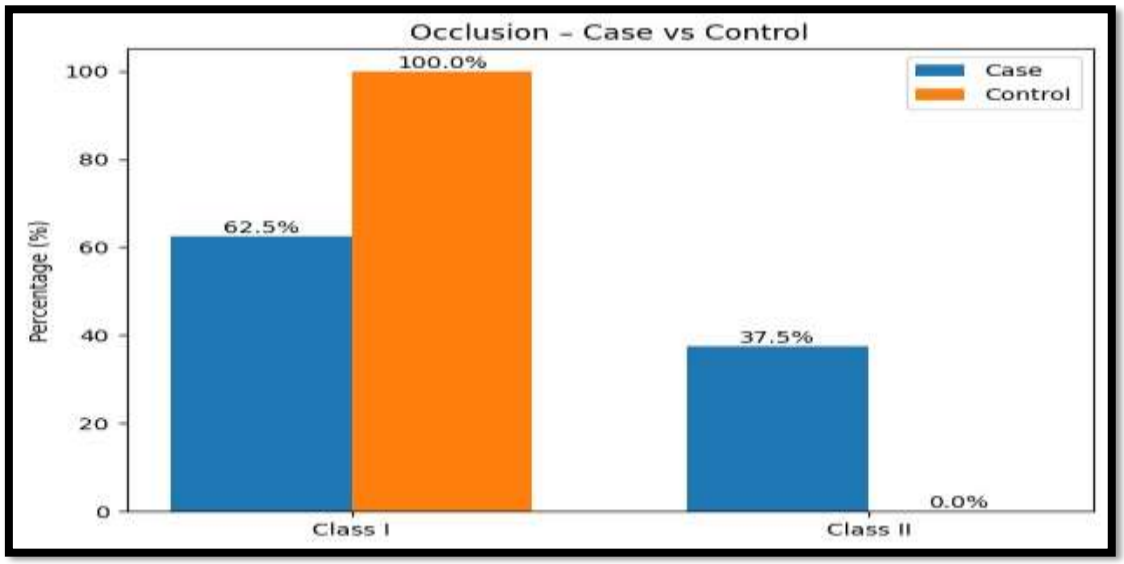


Table 8-Comparison of DMFT Between Case and Control Groups

Group	Mean ± SD	t value	df	p value
Case	3.03 ± 1.86	2.04	78	0.045*
Control	2.03 ± 2.48			

The mean DMFT score in the case group was 3.03 ± 1.86, whereas in the control group it was 2.03 ± 2.48. The comparison using an independent samples t-test revealed a statistically significant difference between the groups (t = 2.04, df = 78, p = 0.045), indicating higher DMFT scores in the case group in contrast to the control group.

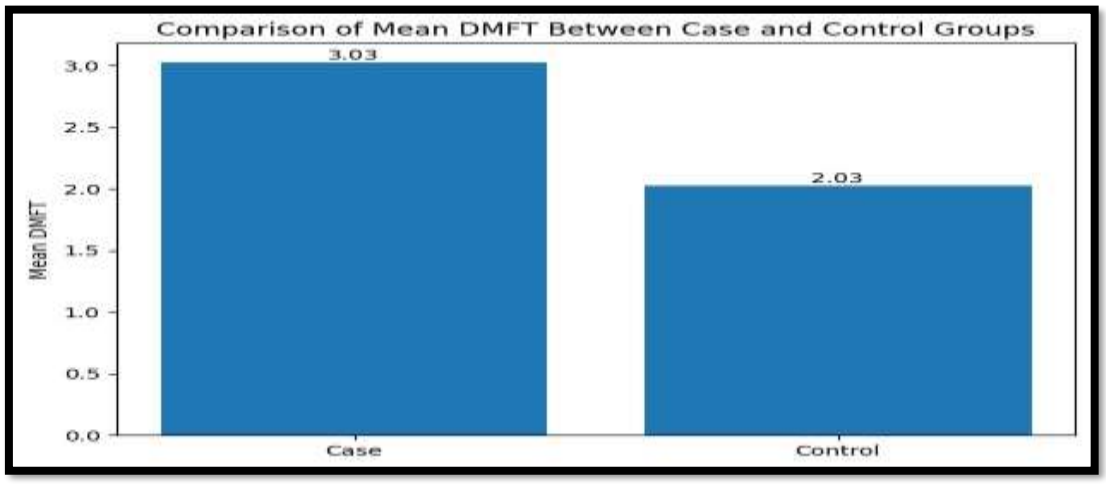
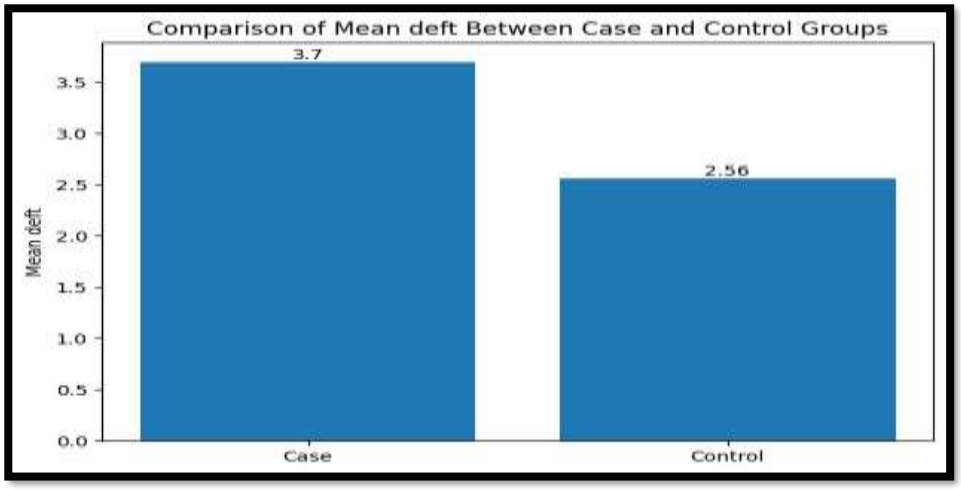


Table 9-Comparison of deft Between Case and Control Groups

Group	Mean ± SD	t value	df	p value
Case	3.70 ± 3.27	1.64	78	0.105
Control	2.56 ± 2.96			

The mean deft score in the case group was 3.70 ± 3.27, while in the control group it was 2.56 ± 2.96. The independent samples t-test showed no statistically significant difference between the groups (t = 1.64, df = 78, p = 0.105).



The present study compared oral hygiene status, gingival condition, occlusion, and dental caries experience between case and control groups (n = 40 each).

The comparison of oral hygiene parameters revealed no statistically significant variations between the two groups. Although fair debris scores were more common in the case group and good debris scores were more frequent in the control group, the difference was not statistically significant ($p > 0.05$). Similarly, calculus index and OHI-S scores showed comparable distributions between the groups without statistically significant differences.

With respect to gingival status, the majority of participants in both groups exhibited mild gingivitis, and no significant difference was observed ($p > 0.05$).

However, a statistically significant difference was observed in occlusal pattern. While all subjects in the control group exhibited Class I occlusion, 37.5% of the case group had Class II malocclusion, and this difference was highly significant ($p < 0.001$).

In terms of caries experience, the mean DMFT score was significantly higher in the case group in contrast to the control group ($p < 0.05$), indicating greater permanent dentition caries experience among cases. Conversely, the mean deft score was higher in the case group than in the control group, but the difference was not statistically significant ($p > 0.05$).

Discussion

Obstructive sleep apnoea (OSA) in children, affecting 1-5% globally, arises mainly from adenotonsillar hypertrophy, obesity, and craniofacial factors, causing repeated upper airway collapses during sleep. This leads to mouth breathing, reduced salivary flow, and chronic inflammation, heightening risks for caries, gingivitis, and enamel defects as evidenced in multiple studies. Systematic

reviews confirm steeper mandibular planes (FH-MP increased by 3.65°) and excess overjet (0.86 mm), linking OSA to dentofacial growth alterations that dentists can screen via Class II malocclusion or crowding signs [5]. Yet inconsistencies persist—some reports note lower caries in young OSA children—highlighting needs for polysomnography -confirmed, causal research in multidisciplinary care.

Kerala urgently needs a study on oral health in children with obstructive sleep apnea (OSA) because local epidemiology and sociocultural factors—high adenotonsillar hypertrophy from frequent respiratory infections, rising childhood overweight/obesity (NFHS-5: ~10–15% in 5–19-year-olds), and diets rich in fermentable carbohydrates—may amplify OSA-related risks such as increased caries, periodontal disease, xerostomia from mouth-breathing, and dentofacial anomalies; regionspecific data would guide targeted prevention and treatment.[6]

The age group of 7–10 was chosen because this mixed-dentition window combines high vulnerability to caries and periodontal changes with good cooperation for exams, overlaps the peak for adenotonsillar OSA and mouth-breathing (which affect salivary flow, plaque, and dentofacial growth). Kerala typically reflects school-aged children with established, carbohydrate-rich diets and rising obesity—factors that together capture the local interplay of lifestyle and respiratory morbidity.

In the present study, no statistically significant differences were observed between the OSA and control groups with respect to the Simplified Oral Hygiene Index (OHI-S) or gingival status. This finding may be attributed to increased parental supervision following an OSA diagnosis, including more frequent toothbrushing and professional oral prophylaxis, as well as hygiene counselling provided by healthcare professionals. These measures may have mitigated the potential oral effects of xerostomia. Furthermore, the increased movement of the lips and tongue associated with snoring may contribute to mechanical plaque disruption. The physiological responses of the gingival crevicular tissues during the mixed-dentition period may also provide some resistance to subclinical xerostomia-related changes in gingival health.

However, the existing literature presents inconsistent findings. Al-Hammad et al.[7] reported lower mean gingival and plaque index scores among 3–8-year-old children with OSA and snoring compared with controls . In contrast, Durhan et al.[8] observed higher gingival index scores and increased bleeding on probing among children with Down syndrome and OSA, despite comparable plaque scores, probing depths, and caries experience between the groups . These findings suggest that OSA may contribute to gingival inflammation through mechanisms involving intermittent hypoxia, inflammatory responses, and xerostomia. Similarly, Tamasas et al.[9] reported greater gingival inflammation and periodontal problems in children with OSA, which were associated with dry mouth and cytokine-mediated inflammatory effects that may adversely affect oral health-related quality of life . Differences in age, underlying systemic conditions, disease severity, oral hygiene practices, and parental involvement may account for the variation in findings across studies.

A highly significant difference was observed in the distribution of occlusal patterns between the two groups, with Class II malocclusion occurring significantly more frequently among the cases than the controls. This aligns with multiple studies showing a bidirectional link between craniofacial/occlusal anomalies and paediatric OSA/SDB, where Class II features (mandibular retrusion, increased overjet/overbite variations, maxillary constriction, posterior crossbite and increased lower facial height) narrow the upper airway and raise respiratory risk. Recent phenotyping and prevalence studies (Kim et al. 2026; Liu et al. 2026; Lyra et al. 2020) and reviews (Pandi et al. 2025) consistently identify Class II subtypes—often with transverse deficiencies and adenotonsillar hypertrophy—as key contributors, and report that early orthodontic interventions (RME, functional appliances, mandibular advancement) during growth can improve airway dimensions, supporting timely orthodontic screening and multidisciplinary management.[10, 11, 12, 13]

In the present study, children in the case group had significantly higher DMFT scores than those in the control group, indicating a greater caries experience in the permanent dentition. However, no statistically significant difference was observed between the groups with respect to deft scores, reflecting comparable caries experience in the primary dentition.

Numerous studies show a complex, sometimes contradictory link between pediatric OSA and dental caries, driven mainly by xerostomia, nocturnal mouth breathing, reduced salivary flow, and shifts toward cariogenic microbiomes. Several pediatric reports (Tamasas 2019; Byun 2018) find much higher caries and periodontal disease in OSA/SDB children—attributed to hypoxia-related inflammation, salivary hypofunction, and acidogenic bacterial overgrowth—while large longitudinal adult-cohort data (Lee

2025) suggest caries risk increases with cumulative OSA exposure into adulthood.[9, 14, 15] Contrarily, some pediatric samples (Al-Hammad 2015) show lower caries and plaque in diagnosed children, likely from heightened parental hygiene or selection bias, and salivary/microbiome studies (Li 2025; Tranfić Duplančić 2022) indicate early functional buffering that may delay decay until adolescence when chronic xerostomia and dysbiosis tip the balance.[7, 16,17]

Primary (deciduous) teeth are less susceptible to caries because their shorter functional lifespan (6– 12 years) limits cumulative exposure to cariogenic factors such as OSA-related xerostomia, and because their enamel–dentin proportions, frequent parental brushing with fluoridated toothpaste, and regionally available preventive measures (dietary counselling, high-fluoride applications) can promote rapid remineralization and disproportionately protect primary dentition before permanent teeth erupt. Despite moderate-to-good knowledge of pediatric OSA among Kerala dentists, practice-oriented screening and interdisciplinary management remain limited; a region-specific assessment would therefore (1) quantify caries, periodontal and dentofacial burdens in OSA-affected children, (2) identify local risk and protective factors, and (3) guide tailored prevention and collaborative care involving dentists, paediatricians, and ENT specialists.

Our cross-sectional, single-centre study—using nasal endoscopy and parental history rather than polysomnography—offers useful prevalence data but cannot establish causality or capture longitudinal changes; diagnostic limitations, hospital-based sampling, unmeasured confounders (BMI, brushing frequency), limited power for subgroup analyses, and omission of outcomes like OHRQoL constrain generalizability. Future research should use multi-centre, longitudinal designs with PSG-confirmed OSA, larger propensity-matched cohorts, thorough confounder adjustment, OHRQoL measures, and interventional trials (adenotonsillectomy, orthodontic therapies) to clarify causal pathways and inform targeted protocols.

CONCLUSION

Within the limitations of this cross-sectional, single-centre study without polysomnography, children with OSA showed distinct oral health differences versus controls: comparable OHI-S and gingival status, but a markedly higher prevalence of Class II malocclusion and significantly greater DMFT in permanent dentition (deft trends in primary teeth were non-significant). These results implicate OSA-related factors (adenotonsillar hypertrophy, altered craniofacial growth, xerostomia and reduced salivary buffering) in increased caries and occlusal risk and support early multidisciplinary vigilance—orthodontic screening, targeted caries prevention, and coordination with sleep specialists—to reduce long-term morbidity. Larger, longitudinal, multi-centre studies with PSG-confirmed OSA are needed to confirm causality and refine preventive and therapeutic protocols.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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