

Prevalence of Malocclusion and Its Impact on Oral Health Related Quality of Life (OHRQoL) among 12–15-year-old School-going Children of Modinagar, Ghaziabad

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ABSTRACT

Background: Malocclusion is known to be the second most common oral disorder in children and young adults, just next to dental caries. It has a profound impact on the physical, social, and psychological well-being of individuals. The various public health advances have led to better treatment and cures for the existing diseases and also delayed mortality. Thus, it was insightful for those who measure health outcomes to go about assessing the population's health not only based on saving lives but also in terms of quality of life.

Aim: The present study aimed to assess the prevalence of malocclusion and its impact on oral health-related quality of life (OHRQoL) among 12–15-year-old school-going children in Modinagar, Ghaziabad.

Methodology: A descriptive, cross-sectional survey was carried out and included a total of 900 children, aged 12–15 years from 60 schools in Modinagar, Ghaziabad. The data was analyzed using the statistical package for the social sciences (SPSS) version 20.0 software package. Chi-square test was used to measure the prevalence of malocclusion and the association between the mean of oral health impact profile (OHIP-14) dimensions. Independent Sample *t*-test was used to compare the difference in means for the OHIP-14 dimensions. The *p*-value less than 0.05 was considered statistically significant.

Results: In the present study, the prevalence of malocclusion was calculated to be 28.89% in the population of 12 to 15-year-old school-going children of Modinagar. The mean dental aesthetic index (DAI) score was determined to be 24.23 ± 6.07 and no significant difference was found between the children of the Government and the Private schools. The study demonstrated that the children with malocclusion experienced a significant impact on their OHRQoL. The overall OHRQoL was shown to have a positive correlation with the increase in the severity of malocclusion in the children.

Conclusion: The results of the current study indicated a high prevalence of malocclusion in the 12–15-year-old school-going children of Modinagar. The study concluded that malocclusion has a significant impact on the OHRQoL of school children. The findings of the study highlighted the need for oral health education and good oral health maintenance among school children. Thus, interceptive programs need to be planned and the present baseline data can be employed for future follow-up and evaluative research.

Keywords: Malocclusion, Oral health, Orthodontic treatment need, Quality of Life, School children.

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INTRODUCTION

Oral health is as crucial as the general health and well-being of the body at every stage of life. It has been found to have a deep effect on the physical, social, and mental health of individuals.¹ In recent times, the paradigm of the concept of health is continuously shifting from the absence of disease to a multi-dimensional construct. The various preventive and public health measures have led to better treatment and cures for the recurring diseases and also impedes mortality. Thus, it is deemed reasonable for those who quantify health outcomes should also assess the health of the general population, not only based on redeeming human lives but also in terms of the patients' quality of life (QoL).²

A healthy and operative dentition is essential throughout the life of an individual since it gives the face of the individual a particular shape, and form and supports necessary oral functions, such as speech, eating, smiling, and being social.³ Particularly during adolescence, fragile changes in the mental and physical growth to new surroundings and intellectual structure have been noted. Some of these elements of facial appearance such as dental aesthetics have been of great significance for the self-perception and self-esteem of adolescents.³ Malocclusion is one of the oral

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problems that not only affects the facial appearance but also has a large impact in terms of unease in the individual, QoL, and societal and operative limitations.

Malocclusion is “any deviation from normal occlusion of teeth”. It is defined as an irregularity of the teeth or a mal-relationship of

the dental arches beyond the range of what is accepted as normal. It is the second most common oral disease in children and young adults, just followed by dental caries.⁴ It also remarkably influences the look of the smile, which is a profound aspect of the facial appeal of an individual and a powerful way of communicating his emotions. The aesthetic effect of malocclusion may have a serious impact on the adolescents' quality of life, and can impair societal relationships, friendships, and mental health; leading to a sense of inferiority.⁵

The basis of the dental aesthetic index (DAI) in the assessment of malocclusion for oral public health is that it connects the numerical, objective, physiological, and subjective aesthetic factors to give a summative score that demonstrates both the aspects of the malocclusion.⁶ Some people with severe malocclusion are content with or may not be concerned about their dental aesthetics, however, some others may be mindful of even the minor irregularities.⁷ These issues become particularly significant when dealing with adolescents, as they expect dental treatment to boost their self-esteem and confidence. Thus, it becomes consequential to assess the prevalence of malocclusion and its adverse effects on society, especially in the adolescent age group.⁸

The oral health impact profile (OHIP) was produced with the purpose of demonstrating a comprehensive measure of self-reported debilitation, unease, and disablement as a result of malocclusion.⁹ The DAI is an assessment given by the dental professional, while the OHRQoL is a self-evaluation of malocclusion by the patients themselves. The self-assessment based on patient's perception of their facial aesthetics is of the utmost importance as it may significantly deviate from the judgment of the dental professional, thus making it consequential to signify if there is a correlation between the two instruments.¹⁰

Thus, considering all these factors, the present study was conducted to assess the prevalence of malocclusion and its impact on the OHRQoL using both the normative indices DAI and subjective perception (OHRQoL) among 12–15-year-old school-going children of Modinagar, India.

MATERIALS AND METHODS

A descriptive, cross-sectional study was conducted to assess the prevalence of malocclusion and its impact on OHRQoL among 12–15-year-old school-going children. The study was carried out for 24 of the private schools and 36 of the government schools in Modinagar, Ghaziabad.

The official permission and ethical clearance for the study (DJD/IEC/2019/A-38) was taken from the Institutional Review Board of the dental college, where the study was carried out. Principals of the schools included were thoroughly explained about the purpose and methodology of the study and official permission was obtained to examine the children. The parents of the children were asked to provide written informed consent for their children through the school authorities, along with the verbal consent of the children to participate in the study.

Inclusion Criteria

- Subjects who were attending government and private schools in Modinagar city.
- Subjects who were 12–15 years of age.
- Subjects whose parents gave written informed consent were included.
- Subjects who were in attendance on the day of examination.

Exclusion Criteria

- Subjects whose parents did not give consents were excluded.
- Subjects with oral disorders or conditions that limit them from oral examination.
- Subjects with mixed dentition, craniofacial anomalies (clefts and syndromes).
- Subjects with systemic disorders like congenital heart disease, a history of epilepsy, asthma, psychiatric conditions, existing hypertension diabetes, and chronic renal disease were excluded.
- Subjects who were undergoing or had completed orthodontic treatment were excluded.

STUDY SUBJECTS

A pilot study was conducted for 100 randomly selected children, 50 children in a government school and the rest 50 children in a private school, to determine the prevalence of malocclusion and establish their oral health status for the feasibility of the survey. These subjects were however excluded from the main study. According to the pilot study, for the prevalence obtained for malocclusion (35% for government schools and 37% for private schools), the confidence level of 95%, and allowable error of 5%, the sample size for the Government schools' children were determined to be 364.0, and for the private school children, it was calculated to be 372.96.

With an expected attrition rate of 15%, the sample size was rounded off to 400 children for the government school and 500 children for the private secondary school. Thus, a total of 900 school children, in the age group of 12–15 years were included in the present study. The data sample for the present study was collected through the stratified random sampling method.

SCHEDULING OF THE SURVEY

The study was systematically conducted for 4 months from November 2021 to February 2022 among 12–15-year-old school-going children of Modinagar, Ghaziabad. An elaborate weekly timetable for the study examination of the children was made and sent to the principals of the schools included in the study.

Based on the pilot study, the average time for the survey and examination of each subject was determined to be 10–15 minutes. The daily and weekly timetables were prepared accordingly and a reminder was given to the school a day before the scheduled date of their examination. The consent forms were collected from the study subjects, followed by the examination as per the defined criteria. In a single day, an average of 25–30 subjects were examined at every school. The examinations were usually conducted in 2–3 schools per week.

DATA COLLECTION

A self-structured, pretested study questionnaire was distributed among the children for data collection. The three components of the form that were used were:

1. Demographic data, dental history, and oral hygiene practices to determine the socio-demographic information and oral health status of the subjects as indicated by the clinical examination as per the WHO Basic Oral Health Survey 2013 proforma.¹¹
2. Dental aesthetic index (DAI) to assess malocclusion and its prevalence among school-going children.
3. Oral health impact profile–14 (OHIP-14) to assess the OHRQoL among the school-going children.

According to the need of the study, the government and private school children of each zone schools were separately examined. The clinical examination was done accordingly as per the WHO survey proforma, by a single trained and calibrated examiner with the help of sterilized instruments. This was followed by a recording of the interviewer-administered questionnaire, which was answered verbally by each student.

Statistical Analysis

The collected data was analyzed with the help of the Statistical Package for the Social Sciences – SPSS version 22.0 software package. Descriptive statistics such as arithmetic mean, standard deviation, and frequency distributions were used. Chi-square test was used to measure the prevalence of malocclusion and the association between the mean for the dimensions of OHIP-14. Independent t-test was used to compare the difference in means for the OHIP-14 dimensions. The correlation between malocclusion and the Mean OHIP scores was analyzed using Pearson’s correlation. The value $p \leq 0.05$ was considered statistically significant.

RESULTS

In the current study, 900 school children (400 from the government and 500 from private) were included. Most of the study subjects (30.8% from government and 31.2% from private) were 12 years of age. The mean age of the children was reported to be 13.35 ± 1.14 in the government children and 13.33 ± 1.12 in the private children. There were 40.3% male and 59.7% female government school children whereas the private children included 44.6% males and 54% females. For the present study, 18.5% of the government school children and 21.8% of the private school children were found to have any medical history.

Among the 900 school-going children, 47.2% of government children, and 43.2% of private children had never visited a dentist. The most common type of deleterious oral habit was lip or nail or pencil biting, which was found in 17.8% of the government children and 17.0% of the private children. Toothbrush and toothpaste were used as oral hygiene methods by most of the government children (86.5%) and private children (88.4%) in the present study. Concerning the frequency of tooth brushing, most of the government (70.3%) and private (63.8%) school children brushed their teeth only once a day. Table 1 describes the demographic details of the study participants.

Table 1: Demographic data of the study participants

Demographic data	Government		Private	
	N	%	N	%
Age				
Number of children	400	44.4%	500	55.6%
12 years	154	30.8%	125	31.2%
13 years	127	25.4%	98	24.5%
14 years	118	23.6%	89	22.3%
15 years	101	20.2%	88	22.0%
Gender				
Male	161	40.3%	223	44.6%
Female	239	59.7%	277	55.4%
Medical history				
Present	74	18.5%	109	21.8%
Absent	326	81.5%	391	78.2%

(Contd...)

Table 1: (Contd...)

Demographic data	Government		Private	
	N	%	N	%
Frequency of dental visits				
Never	189	47.2%	173	43.2%
In 6 months	211	52.8%	227	56.8%
Yearly	67	16.7%	95	19.0%
Dietary habits				
Vegetarian	215	53.7%	262	52.4%
Mixed	185	46.3%	238	47.6%
Sugar score				
≥Score 5	157	39.3%	187	37.4%
Score 10	166	41.5%	207	41.4%
≤Score 15	77	19.2%	106	21.2%
Deleterious oral habits				
Mouth breathing	36	9.0%	40	8.0%
Thumb sucking	10	2.5%	11	2.2%
Tongue thrusting	30	7.5%	35	7.0%
Bruxism	11	2.7%	12	2.4%
Lip/Nail/Pencil biting	71	17.8%	85	17.0%
No habits	242	60.5%	317	63.4%
Oral hygiene methods				
Toothbrush and toothpaste	346	86.5%	442	88.4%
Finger and toothpowder	52	13.0%	58	11.6%
Finger and charcoal	2	0.5%	0	0%
Only finger	0	0%	0	0%
Methods of cleaning the teeth				
Horizontal	220	55.0%	305	61.0%
Vertical	154	38.5%	157	31.4%
Circular	26	6.5%	38	7.6%
Frequency of tooth cleaning				
Once	281	70.3%	319	63.8%
Twice	117	29.2%	178	35.6%
More than twice	2	0.5%	3	0.6%
Time of cleaning the tooth				
Before food	236	59.0%	269	53.8%
After food	164	41.0%	231	46.2%
Duration of changing brush				
0–3 months	148	37%	104	26.0%
4–6 months	94	23.5%	246	61.5%
7 months–1 year	86	21.5%	41	10.2%
More than 1 year	11	2.8%	0	0%
When the bristles flare	61	15.2%	9	2.2%
Use of interdental cleaning aids				
Yes	103	25.7%	129	25.8%
No	297	74.3%	371	74.2%
Use of interdental cleaning aids				
Toothpicks	53	13.2%	67	13.4%
Dental floss	12	3.0%	16	3.2%
Mouthwash	31	7.8%	40	8.0%
Interdental brush	4	1.0%	6	1.2%
Other methods	3	0.7%	0	0%
No use of Interdental aids	297	74.3%	371	74.2%

Table 2: Number and percentage of school children based on the severity of malocclusion (Dental Aesthetic Index scores)

Severity of malocclusion	DAI scores	Number	Percentage	Treatment indication
No abnormality or minor malocclusion	≤25	640	71.11%	No or slight need
Definite malocclusion	26–30	139	15.44%	Elective
Severe malocclusion	31–35	68	7.56%	Highly desirable
Very severe or handicapping malocclusion	≥36	25	5.89%	Mandatory
Prevalence of malocclusion	≥26	232	28.89%	–

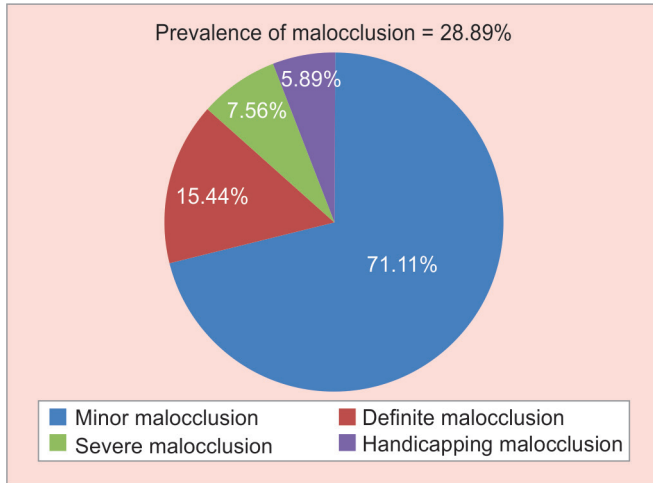


Fig. 1: Percentage of school children based on severity of malocclusion (DAI scores)

According to the DAI, 640 (71.11%) children had either no abnormality or minor malocclusion, thus no or slight need for treatment was indicated. While 139 (15.44%) children suffered from definite malocclusion which indicated an elective need for treatment. About 68 children (7.56%) children suffered from severe malocclusion which indicated a highly desired need for treatment. The rest of the 25 (5.89%) children suffered from very severe or handicapped malocclusion and thus required compulsory orthodontic treatment as described in Table 2. The prevalence of malocclusion among the children according to the DAI was determined to be 28.89%. Figure 1 describes the prevalence of School children based on the severity of malocclusion as per the DAI scores.

According to the present study, for the 12-year-old children, 205 (22.8%) had no or minor malocclusion, 39 (4.3%) had definite malocclusion, 18 (2.0%) had severe malocclusion and 17 (1.9%) experienced handicapping malocclusion. Among the 13-year-old children, 159 (17.7%) had no or minor malocclusion, 32 (3.6%) had definite malocclusion, 19 (2.1%) had severe malocclusion and 15 (1.7%) experienced handicapping malocclusion. In the 14-year-old children, 146 (16.2%) were reported to have no or minor malocclusion, 28 (3.1%) had definite malocclusion, 17 (1.9%) had severe malocclusion and 16 (1.7%) experienced handicapping malocclusion.

For the remaining 15-year-old children, 130 (14.4%) had no or minor malocclusion, 40 (4.4%) had definite malocclusion, 14 (1.6%) had Severe malocclusion and 5 (1.7%) had handicapping malocclusion. No statistically significant difference was found between the various age groups of the children with respect to DAI scores and the type of malocclusion the children suffered ($p = 0.268$) (Table 3).

The seven dimensions of the OHIP-14 index include: Physical pain, functional limitation, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The mean value for all the seven dimensions for OHIP-14 has been denoted in Figure 2. In the current study, the total mean score for OHIP was calculated to be 7.80 ± 0.18 and the standard error of mean was found to be 5.36. The mean values for each dimension of OHIP-14 have been described in Table 4.

In the current study, a positive correlation was established between the DAI scores and the mean scores for the dimensions of OHIP-14. With the increase in the DAI scores, there was an increase in the severity of the problems associated with the dimensions of OHIP-14. The correlation was found to be statistically significant for all the dimensions of OHIP-14 ($p \leq 0.05$) (Table 5).

DISCUSSION

In the modern world, the outward appearance of an individual is considered to be one of the most important characteristics that can have the greatest influence on the self-esteem, behavioral aspects, and relationships of the individual. The prevalence of malocclusion changes from nation to nation and among different age groups and genders. Great variations have been observed in the prevalence of orthodontic treatment needs in various countries, ranging from 11% in Sweden to 75.5% in Saudi Arabia.^{12–14} Schoolchildren form an integral part of Indian society and have an essential role in laying down a strong foundation for the development of the country. Therefore, their good oral health knowledge as well as OHRQoL is consequential for their better oral health as well as overall growth as an individual.^{3,15}

The present study comprised 900 school-going children, in the age group of 12–15 years, who were included from 60 schools across Modinagar, Ghaziabad. Out of the total sample included, 400 children were from the government and 500 children were from private schools. A slightly higher proportion of female (57.3%) in comparison to male (42.7%) children was observed in both the government and private schools. This finding for the present study can be attributed to the various grassroots-level interventions and strategic initiatives such as the Sarva Shiksha Abhiyan (SSA) which was initiated in 2001, with the nationwide goal of providing education to children, especially targeting the rural populations.¹⁶

The prevalence of malocclusion was reported to be 28.89% for the present study. This was by the National Oral Health Survey (2002–2003) which stated that the prevalence of malocclusion ranged from 23.6% among 12-year-olds to 23.9% in children aged 15 years respectively.¹⁷ These findings were also in agreement with the studies conducted by Tak M et al.¹⁸ and Sharma A et al.¹⁹ which concluded the prevalence of malocclusion to be 33.3 and 33.1% respectively.

The mean DAI score was determined to be 24.23 ± 6.07 in the present study. These results were similar to the results of the studies conducted by Danaei et al.²⁰ and Sharma A et al.¹⁹ which have

Table 3: Number and percentage of DAI scores in the subjects according to the age of the school children

Age	No or minor malocclusion	Definite malocclusion	Severe malocclusion	Handicapping malocclusion	Chi-square value	p-value
12 years	205 (22.8%)	39 (4.3%)	18 (2.0%)	17 (1.9%)	11.11	0.268**
13 years	159 (17.7%)	32 (3.6%)	19 (2.1%)	15 (1.7%)		
14 years	146 (16.2%)	28 (3.1%)	17 (1.9%)	16 (1.7%)		
15 years	130 (14.4%)	40 (4.4%)	14 (1.6%)	5 (0.6%)		
Total	640 (71.1%)	139 (15.4%)	68 (7.6%)	53 (5.9%)		

p-value > 0.005; **Non-significant

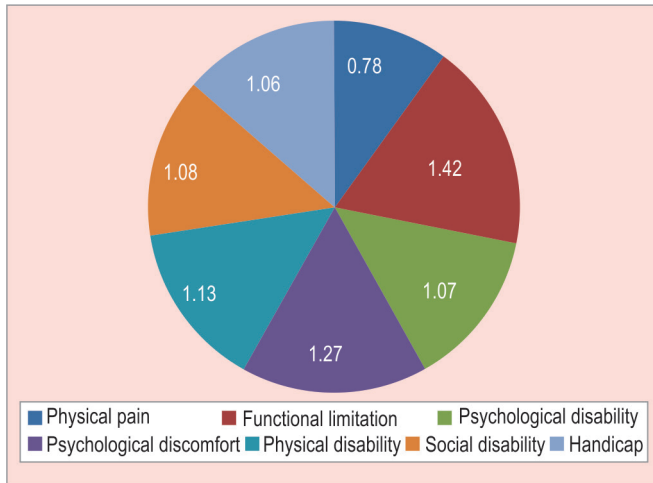


Fig. 2: Mean values for each dimension of OHIP-14

Table 4: Mean values for each dimension of OHIP-14 recorded for the school children

OHIP-14 dimensions	Mean value	Standard deviation	Standard error of mean
Physical pain	0.78	1.15	0.04
Functional limitation	1.42	1.03	0.03
Psychological discomfort	1.07	1.05	0.03
Physical disability	1.27	1.11	0.04
Psychological disability	1.13	1.01	0.03
Social disability	1.08	1.20	0.04
Handicap	1.06	1.04	0.03
Total OHIP	7.80	5.36	0.18

Table 5: Correlation between DAI scores and OHIP-14 scores among the school children

OHIP-14 dimensions	Correlation coefficient (r)	p-value	Significance
Physical pain	0.421	0.000*	Significant
Functional limitation	0.425	0.000*	Significant
Psychological discomfort	0.498	0.000*	Significant
Physical disability	0.392	0.000*	Significant
Psychological disability	0.484	0.000*	Significant
Social disability	0.453	0.000*	Significant
Handicap	0.363	0.000*	Significant
Total OHIP score	0.623	0.000*	Significant

*Significant (p ≤ 0.05)

demonstrated the mean DAI scores to be 24.1–23.5 respectively. However, it was found to be higher in comparison to the study done by Naveen KB et al.²¹ which showed a mean DAI score of 18.2. This difference could be caused due to dissimilar genetic predispositions, cross-cultural differences in the living standard, variation in growth, facial skeletal development, and occlusion.

In the current study, no statistically significant difference in the mean DAI score was found between the male (24.14 ± 5.78), and female (24.31 ± 6.29) children. This was in agreement with the study results shown by Ansai T et al.²² and Naveen KB et al.,²¹ which reported that the mean DAI scores between the male and female children had no statistically significant difference. For the present study, no statistically significant difference in the mean DAI score was found between the Government school (24.48 ± 6.46) and private school (24.05 ± 5.74) children which are in compliance with the study conducted by Shailee F et al.²³

The current study demonstrated that those affected by malocclusion experienced a consequential effect on their OHRQoL, especially among adolescents which were by the studies conducted by Liu Z et al.⁵ and Siluvai S et al.²⁴ In the current study, physical disability (Dimension 3) was found to have the highest oral impact among the seven dimensions of OHIP-14, followed by psychological disability (Dimension 4) and the least affected dimension was found to handicap (Dimension 7). This was found to be in comply with the study conducted by Ashari A and Mohamed AM.²⁵

However, one of the major limitations of the current study was its cross-sectional nature, which may cause an issue in the process of hypothesis testing as the data on both, the risk factors and the outcome of the study variables were assessed at the same time. Thus, it is required to evaluate the performances of OHRQoL in longitudinal and interventional studies. Oral health impact profile should be recorded before and after the Orthodontic treatment to study the improvement in the OHRQoL in the individuals. Along with the DAI, other indices should also be recorded to confirm that the impact is due to malocclusion only and not any other oral problems such as fluorosis and any fractured anterior teeth.

Generally, the studies using OHIP-14 require a larger sample size. A study with a greater sample size, ranging from 12 to 19 years of age, should be conducted to generalize the results of the study. Thus, a well-planned, longitudinal study with a greater sample size should be conducted to further assess and demonstrate the impact of OHRQoL among the adolescent population.

CONCLUSION

The present study highlighted that an increase in the severity of the malocclusion is associated with a higher adverse effect on the OHRQoL of the individuals. If a better OHRQoL is to become a reality in the future for the children, it is of utmost importance that the caregivers of the children should also become aware of malocclusion to improve the OHRQoL for the children. Thus, in the

current study, the overall OHRQoL was found to have a positive correlation with the increase in the severity of malocclusion.

With an increasing number of children being diagnosed with malocclusion, dental professionals should be deeply connected to other parts of the community to bring about an improvement in the OHRQoL and benefit children with sustained lifetime oral health. More detailed studies are needed to be carried out to further assess the impact of malocclusion on the OHRQoL for the school-going children.

RECOMMENDATIONS

In light of the observations from the following study and to improve the OHRQoL of school children in Modinagar, the following recommendations were given:

- Regular yearly oral health screening is a public health service that be provided to all schools, not only limited to private and NGO-supported public schools, by making orthodontic screening compulsory in the annual health evaluation, which needs to be undertaken by an orthodontist or trained dentist or dental hygienist.
- The governmental health and educational agencies should mandate all schools to establish a yearly orthodontic/dental screening starting at age 7 years for early detection of malocclusion, or at least by the age of 8–8.5 years, the expected time for the early mixed dentition to set in.
- Documentation by the pediatrician, during the child's regular medical screening, of mouth breathing and sucking habits, followed by referral for treatment of these habits.
- Focus on the prevention of malocclusion may prove to be more successful in the initial phases. Interceptive orthodontic treatment in US Medicaid patients was found to be effective in reducing the severity of malocclusion. Thus, similar healthcare policies for the improvement of oral healthcare need to be implemented in our healthcare systems in India as well.
- Public Health Services need to take malocclusion into special consideration for planning new oral health initiatives and policies, as malocclusion is also a public health problem that has shown considerable impact on the OHRQoL as well the QoL of an individual in general.

Thus, good oral health in terms of balanced occlusion can be achieved by educating and imparting knowledge to the parents about oral health through the school oral health programs. The purpose of a school oral health program is to improve the knowledge and motivate parents and children regarding their oral health and treatment needs. Thus, more school oral health programs need to be conducted regularly to reach the goals of the WHO and for the benefit of the community at length.

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