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International Journal of Current Research
Vol. 8, Issue, 11, pp.41126-41131, November, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

PREVALENCE OF MALOCCLUSION AND ORAL HYGIENE STATUS IN SCHOOL CHILDREN OF 8-12 YEARS OF AGE IN BHOPAL CITY

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ARTICLE INFO

Article History:
Received 20th August, 2016
Received in revised form
06th September, 2016
Accepted 23rd October, 2016
Published online 30th November, 2016

Key words:

Cooperative Movement,
Economy,
Five-Year Plan,
Development,
Agricultural Credit.

ABSTRACT

Aim: To access the Prevalence of malocclusion and oral hygiene status in school children of 8-12 years of age in Bhopal city.

Materials and Methods: This is a cross sectional longitudinal study. A sample of 1019 school going children was randomly selected out of 28 schools, divided in 14 zones* of Bhopal (Map Issued by Bhopal Municipal Corporation, 2012). It includes one Private and one Government school from each zone. The study included 8-12 years of student with prior consent and who are able to understand the instructions. Those students with developmental defects, syndromes or any special conditions were excluded from the study.

Results: Out of total population of 1019 individuals, crowding (23.4%), spacing (10.89%), diastema (17.0%), largest anterior mandibular irregularity (9.8%), Crossbite (5.09%), Overjet (51.7%), overbite (51.0%), vertical anterior open bite (1.0%) and poor oral hygiene(15%) was seen more in government school children which is statistically insignificant.($p>0.05$) Largest anterior maxillary irregularity (6.6%) was found more in private school children. ($p<0.05$) Crowding, spacing, diastema, largest anterior maxillary irregularity, largest anterior mandibular irregularity, crossbite, overjet, overbite, and poor oral hygiene was seen decresing with increase in age which is highly significant.($p<0.05$).Vertical anterior open bite has no significant relation with age. ($p>0.05$) The table demonstrates highly statistical significance relationship between crowding, spacing, cross bite and oral hygiene status of the students. ($p<0.05$)

Discussion: One of the major responsibilities of a pedodontist is the early recognition and management of irregularities of the developing primary dentition. The notable increase in child population in recent years warrants an increased need for pedodontic attention. Number of studies recognizing these irregularities and their significance are few to validate the necessity of rendering specialized preventive measures that are characteristic of pediatric dental care.

Conclusion: The study suggests that children with malaligned teeth had more chances of having poor oral hygiene and no difference was noted among private and government school children oral hygiene status and occlusal anomalies. There is a correlation between dental anomalies with respect to age groups, crowding spacing and cross bite had more tend to had poor oral hygiene as they show a significant difference.

Citation: Dr. Utkarsh Tiwari, Dr. Shilpy Singla, Dr. Ruchi Ahuja Thakur, Dr. Vidhatri Tiwari, Dr. Aishwarya Singh and Dr. Binu Santha, 2016. "Prevalence of malocclusion and oral hygiene status in school children of 8-12 years of age in bhopal city", *International Journal of Current Research*, 8, (11), 41126-41131.

INTRODUCTION

Malocclusion is one of the most wide spread oral health problems facing the society. Due to change in food habits, increase in caries and other associated factors, there is widespread increase in malocclusion (Murray *et al*., 2003). Malocclusion may adversely affect social interactions and psychological well-being. As children's feelings about their dental appearance begin early, at about 8 years of age, children have criteria similar to those of adults regarding the self perception of body image. Occlusal changes may occur in the mixed dentition and affect self-image. Therefore, it is important to evaluate the occlusion in the mixed dentition and early permanent dentition in order to avoid further functional and psychological harm. Thus, the assessment of the need for orthodontic treatment should also consider the child's age. Moreover, there is a lack of studies addressing the impact of malocclusion in the mixed dentition (Sardenberg *et al*., 2013). Malocclusion has a crowded or out of alignment teeth thus lack of proper spacing between teeth can make it incredibly

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difficult to completely clean the teeth and gums so further poor oral hygiene contributes to periodontal disease and dental caries (Greene and Vermillion, 1964). The primary etiological factor for gingivitis and periodontitis is bacterial plaque that forms on tooth surfaces adjacent to the gingival tissues. Gingival diseases are widespread, affecting 80% of schoolchildren in some countries. There is a high correlation between poor oral hygiene and the development of periodontal disease. (Al-Mutawa *et al*., 2011) There is a need to evaluate the relationship between malocclusion and oral hygiene index.

MATERIALS AND METHODS

This is a cross sectional longitudinal study. A sample of 1019 school going children was randomly selected out of 28 schools, divided in 14 zones* of Bhopal (Map Issued by Bhopal Municipal Corporation 2012). It includes one Private and one Government school from each zone. Prior to the survey official permission from concerned school authorities and written consent were taken from respective participants of the study and the ethical clearance was obtained from Institutional Review Board. The study included 8-12 years of student with prior consent and who are able to understand the instructions. Those students with developmental defects, syndromes or any special conditions were excluded from the study. Clinical oral examination was done on the sample subjects. Clinical examinations were carried out using relevant oral indices and were carried out by single investigator to avoid inter examiner variability.

Oral hygiene status and malocclusion were assessed using World Health Organization, Oral Health Assessment form 1997. A survey proforma was prepared with the help of WHO Oral Health Assessment Form (1997). The examination for Oral hygiene index – simplified and malocclusion was made according to the Dental Aesthetic Index (DAI) as described by WHO Oral Health Survey (1997) using Community Periodontal Index probe (API – Stainless Germany) and plane mouth mirror under adequate natural light in school premises. The children were allowed to sit on a chair or stool as per availability and a total number of 35-40 children were examined per day. A table to place instruments was placed within the easy reach of the examiner. The recording assistant was allowed to sit close enough to the examiner, so that instructions and codes could be easily heard and the examiner could see that, findings were being recorded correctly.

RESULTS

The data was transferred from pre-coded survey proforma to a computer. A master file was created for the purpose of data analysis. The data obtained was subjected to statistical analysis with the consult of a statistician. The data so obtained was compiled systematically. Chi square test was used to analyze categorical variables. The total data was subdivided and distributed meaningfully and presented as individual tables along with graphs.

Statistical procedures were carried out in 2 steps:

1) Data compilation and presentation
2) Statistical analysis

Table 1. Prevalence of malocclusion in private and government schools: (chi square test)

	PrivateN(%)		GovernmentN%	pvalue
	No crowding	287(28.1)	297(29.1)	
Crowding	1 segment crowding	97(9.5)	116(11.3)	0.172
	2 segment crowding	98(9.6)	124(12.1)	
	No spacing	374(36.7)	426(41.8)	
	1 segment spaced	94(9.2)	100(9.8)	
Spacing	2 segment spaced	14(1.3)	11(1.09)	0.501
	No diastema	350(34.3)	362(35.5)	
Diastema	1-2 mm	94(9.2)	121(11.8)	0.071
	3-4 mm	38(3.7)	54(5.2)	
	> than 4 mm	0	0	
	No irregularity	411(40.3)	469(46)	
Largest anterior	1-2 mm	26(2.5)	25(2.4)	
maxillary irregularity	3-4 mm	45(4.4)	43(4.2)	0.337
	> than 4 mm	0	0	
	No irregularity	388(38)	436(42.7)	
Largest anterior	1-2 mm	65(6.3)	61(5.9)	
mandibular irregularity	3-4 mm	29(2.8)	40(3.9)	0.779
	> than 4 mm	0	0	
	No crossbite	436(42.7)	484(47.4)	
	A c (single tooth)	37(3.6)	38(3.7)	
	P c (single tooth)	02(0.1)	1(0.09)	
Crossbite	P c (complete seg.)	07(0.6)	14(1.3)	0.861
	No overjet	06(0.5)	8(0.7)	
	1-2 mm	310(30.4)	347(34)	
	3-4 mm	159(15.6)	176(17.2)	
Overjet	>than 4mm	07(0.6)	06(0.5)	0.737
	No overbite	13(1.27)	15(14.1)	
	1-2 mm	309(30.3)	342(33.5)	
Overbite	3-4 mm	157(15.4)	178(17.4)	
	>than 4mm	03(0.2)	02(0.1)	0.925
	No overbite	480(47.1)	534(52.4)	
	1-2 mm	0	02(0.1)	
Vertical ant. open bite	3-4 mm	02(0.1)	01(0.09)	
	>than 4mm	0	0	0.743
X	Good	36	24	
OHI-S****	Fair	319	353	
	Poor	127	160	0.840
	Total	482	537	

Table 2. Correlation of different anomalies with different age group: (chi square test)

Anomalies		Age (year wise)					
		8	9	10	11	12	P value
	No crowding	79	106	121	141	137	
Crowding	1 segment crowding	55	51	36	45	26	<0.05
	2 segment crowding	84	35	42	29	32	
	No spacing	173	128	152	201	146	
Spacing	1 segment spaced	37	60	39	14	44	<0.05
	2 segment spaced	8	4	8	0	5	
	No diastema	161	112	145	158	136	
Diastema	1-2 mm	45	57	39	38	36	<0.05
	3-4 mm	12	23	15	19	23	
	> than 4 mm	0	0	0	0	0	
Largest anterior maxillary irregularity	No irregularity	188	160	179	191	162	
	1-2 mm	11	11	11	7	11	<0.05
	3-4 mm	19	21	9	17	22	
	> than 4 mm	0	0	0	0	0	
Largest anterior mandibular irregularity	No irregularity	183	155	167	168	151	
	1-2 mm	23	23	24	29	27	<0.05
	3-4 mm	12	14	8	18	17	
	> than 4 mm	0	0	0	0	0	
	No crossbite	176	166	190	197	191	
Crossbite	A c (single tooth)	28	20	7	16	4	<0.05
	P c (single tooth)	0	3	0	0	0	
	P c (complete seg.)	14	3	2	2	0	
	No overjet	4	3	2	3	2	
Overjet	1-2 mm	145	119	132	130	131	<0.05
	3-4 mm	66	67	64	79	59	
	>than 4mm	3	3	1	3	3	
	No overbite	7	7	4	6	4	
	1-2 mm	141	115	130	136	129	<0.05
Overbite	3-4 mm	70	70	63	70	62	
	>than 4mm	0	0	2	3	0	
Vertical ant. open bite	No overbite	217	190	198	214	195	
	1-2 mm	1	0	1	0	0	>0.05
	3-4 mm	0	2	0	1	0	
	>than 4mm	0	0	0	0	0	
Oral hygiene index	Good	17	11	17	7	8	<0.05
	Fair	111	133	127	169	132	
	poor	90	48	55	39	55	

Table 3. Correlation of oral hygiene with different anomalies (chi square test)

		OHIS*			P Value
		Good	Fair	Poor	
I. Crowding	No crowding	53	424	107	
	One segment crowded	7	148	58	<0.05*
	Two segment crowded	0	100	122	
II. Spacing	No spacing	46	523	231	
	One segment spaced	8	141	45	<0.05*
	Two segment spaced	6	8	11	
III. Diastema	No Diastema	40	469	203	
	1-2 mm	16	138	61	
	3-4 mm	4	65	23	>0.05
	More then 4 mm	0	0	0	
IV. Largest anterior maxillary irregularity	No maxillary irregularity	50	579	251	
	1-2 mm	3	34	14	>0.05
	3-4 mm	7	59	22	
	More then 4 mm	0	0	0	
V. Largest anterior mandibular irregularity	No mandibular irregularity	52	536	236	
	1-2 mm	5	89	32	
	3-4 mm	3	47	19	>0.05
	More then 4 mm	0	0	0	
VI. Crossbite	Non	60	595	265	
	Anterior cross bit with single tooth	0	54	21	
	Posterior cross bit with single tooth	0	3	0	<0.05*
	Posterior cross bit with Unilateral	0	20	1	
VII. Overjet	No overjet	0	10	4	
	1-2 mm	38	432	187	
	3-4 mm	21	223	91	<0.05
	More then 4 mm	1	7	5	
VIII. Overbite	no overbite	2	19	7	
	1-2 mm	43	422	186	
	3-4 mm	15	227	93	>0.05
	More then 4 mm	0	4	1	
IX. Vertical anterior openbite	No anterior openbite	60	668	286	
	1-2 mm	0	1	1	
	3-4 mm	0	3	0	>0.05
	More Then 4 mm	0	0	0	

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 17; Chicago Inc., USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Significance level was fixed at $p \leq 0.05$. Out of total population of 1019 individuals, crowding (23.4%), spacing (10.89%), diatema (17.0%), largest anterior mandibular irregularity (9.8%), crossbite (5.09%), overjet (51.7%), overbite (51.0%), vertical anterior open bite (1.0%) and poor oral hygiene(15%) was seen more in government school children which is statistically insignificant.($p>0.05$) Largest anterior maxillary irregularity (6.6%) was found more in private school children ($p<0.05$) (Table 1) crowding, spacing, diatema, largest anterior maxillary irregularity, largest anterior mandibularirregularity, crossbite,overjet, overbite and poor oral hygiene was seen decresing with increase in age which is highly significant ($p<0.05$).Vertical anterior open bite has no significant relation with age ($p>0.05$) (Table 2). The table demonstrates highly statistical significance relationship between crowding, spacing, cross bite and oral hygiene status of the students. ($p<0.05$) There was no statistical significant relation found between diastema, largest anterior maxillary irregularity, largest anterior mandibular irregularity, overjet, overbite and vertical anterior openbite with oral hygiene status of the students (Table 3).

DISCUSSION

One of the major responsibilities of a pedodontist is the early recognition and management of irregularities of the developing primary dentition. The notable increase in child population in recent years warrants an increased need for pedodontic attention. Number of studies recognizing these irregularities and their significance are few to validate the necessity of rendering specialized preventive measures that are characteristic of pediatric dental care. On the perusal of literature on pedodontics, orthodontics and preventive dentistry, much has been written on the effects of malocclusion relating to molar relation, canine relation, over-bite and over-jet. (Girish, 2005) Treatment of dental crowding and malocclusion is normally initiated after referral of a child at the age of 10 – 12 years, i.e. during the second period of the mixed dentition when a canine erupts or an increase in overjet becomes noticeable to the patient and parents. (Tausche *et al*., 2004) Unfortunately, very limited data is available on crowding, midline discrepancies and premature tooth loss in the primary dentition, which could have an effect on mixed and permanent dentition. This validates the need for study to provide information. Only with a thorough understanding of all the etiological factors responsible for malocclusion, can a more long standing preventive or therapeutic procedure be carried out. (Girish, 2005) A review of the dental effects of malocclusion (Shaw *et al*., 1980) indicated that the role of tooth malposition (crowding) and periodontal disease was not clearly established. This is perhaps not surprising since numerous variables are considered to predispose to and aggravate gingival and periodontal disease (Glickman 1972, Manson 1975). Logically, bacterial plaque which is considered the major aetiological factor in the development of chronic gingivitis (Loe *et al*., 1965), may be more difficult to remove from maipositioned teeth. The greater patient dexterity required may not be achieved undernormal circumstances. Some studies have demonstrated a relationship between malocclusion and malposition of teeth and periodonlal disease (Hellgren, 1956, Miller and Hobson, 1961; Ponkonand Aaronson, 1961; Alexander and Tipnis, 1970; Sandalii, 1973). Other studies, however, did not find such a causal link (Forsberg 1951, Massler and Savara, 1951, Beagrie and James, 1962, Geiger 1962, Gould andPicton, 1966, Sergl, 1970, Katz, 1977). (Addy *et al*., 1988) Thus, the present study was designed to appraise the prevalence of malocclusion and oral hygiene status of school children. A survey proforma was prepared with the help of WHO Oral Health Assessment Form. Who has recommended Dental Aesthetic Index (DAI) as a method of assessing dentofacialanomalies. (Shivakumar *et al*., 2009) Oral Hygiene Index Simplified (OHI-S) Simplified according to Green-Vermillion (1964) was used to examine oral hygiene according to the standards of WHO for the basic survey methods in dentistry. (Shivakumar *et al*., 2009) In this study, specific criteria of random subject selection were used and the sample was representative of Bhopal city with an ancestary from central part of country to provide ethnicity. A total of 1019 subjects were examined; including participant from government school and private school. The age assortment was between 8 years to 12 years. The study population incorporated 482 (47.3%) private and 537 (52.6%) government children. They were almost equally alienated. Exploration of the available literature revealed very scarce data related to the malocclusion and oral hygiene status of school children. Comprehensive data on oral hygiene status of the school children is hardly obtainable. Of the studies reported, majority of them had assessed crowding, spacing and cross bite with poor hygiene status.The result of the present study supports the concept that there is a association between the presence of irregular teeth and presence of plaque as documented by Ashley *et al*. (1998). The significantly poor oral hygiene status was recorded in crowded individual which was consistent with the Griffiths *et al*. (1981) but conflicting with those of Ingerval *et al*. (1977) who demonstrate that crowding of teeth do not favour plaque deposition on a proximal surfaces. As regards the different dental developmental stages, the crowding gradually increased from early mixed to the young permanent dentition as studied by Thilander *et al*. (2001).

It was concluded that space discrepancies was present in 50.6% of early mixed and increased to 55.7% to late mixed dentition. This result is in contrast to our study where it has shown crowding is decreased with increased age group and illustrated a significant difference. The reasons for crowding and spacing may be due to arch length and tooth material discrepancy, which is the most, accepted views for malocclusion. Other reasons could be premature loss of deciduous or permanent teeth leading to migration of adjacent teeth. Spacing was recorded to be present when there was no proximal contact between teeth in a range of 1mm or more within a segment as stated by Emmanuel *et al*. (2008). The prevalence of spacing is half as common as crowding which is in support of Thilander *et al*. (2001) study. In the present study 21.4 % had spacing, which is in agreement with the study conducted by Shivkumar *et al*. (2009), In the Indian population with 26% spacing on upper and lower arch. In contrast a higher prevalence was observed by Otuyemi *et al*. (1993) which is attributed due to para functional habit such as thumb sucking, mouth breathing and tongue thrusting. In the present study 30.1% of students are presenting with midline diastema, irrespective of poor oral hygiene. As 1-2 mm of midline diastema is decreasing with age and shows a significant difference. ($p< 0.05$) which is accordance to the study by Liu *et al*. (2012), where they state a similar result. In the developing dentition at the age of 8 to 12 years, the presence of diastema is regarded as normal

phenomenon (ugly duckling stage). In the absence of deep over bite it closes spontatneously. (Shivakumar *et al*., 2009) The result of our study is in accordance with the study conducted by Rodrigues de *et al*. (2011) where 31.8% diastema was present in study participants which is abnormal and esthetically undesirable in permanent dentition, but has a very little deleterious effect on mastication.

There was no pattern of correlation was observed between anterior maxillary and mandibular irregularity and showed its effect on oral hygiene status. This was in accordance with the study conducted by Ashley *et al*. (1998) where there was no evidence of relationship between incisor overlap and amount of plaque in subjects and therefore author concluded that the overlapping of incisor teeth is directly related to gingivitis and this relationship cannot be explained simply by an effect on oral hygiene. In the present study prevalence of largest irregularity was 13% in maxillary arch which is in accordance to the study conducted by Shivkumar *et al*. (2009) with a prevalence of 25.6%. But similar prevalence was seen in the mandibular arch with the irregularity of 19%.Crossbite was registered in only 9.7% which is close to the finding of Thilander *et al*. (2001) with 4.6% and Sidlauskas *et al*. (2009) with 8.8%. The high prevalence of crossbite was seen in Perinetti *et al*. (2008) study with 18.9% presented anterior or posterior crossbite. It is a matter of concern because it is not a self correcting with age and it is therefore an early sign of treatment. This can be attributed to deleterious habit like sucking habits and implementation of early treatment where needed. Crossbite is decreasing with age and showed a significant difference with oral hygiene status, which goes in accordance with study conducted by Sidlauskas *et al*. in (2009) where distribution of crossbite is decreasing with age. Maxillary overjet is the measurement of the horizontal relation of the incisor with the teeth in centric occlusion. The distance from the labioincisal edge of the most prominent upper incisor to the labial surface of the corresponding lower incisor was measured. (Shivakumar *et al*., 2009) The result of the current study indicated normal overjet was 30.4 % and 34% in private and government school respectively. Our study was in correlation with the study conducted by Garbin *et al*. (2010) i.e. 37.8 maxillary overjet, whereas 68.3% in Nigerian children and 65.7 % in Youroba race showed normal overjet, this can be attributed to possibility of bimaxilary protrusion in black race. With increased in maxillary overjet of 3-4 mm as seen in 15.6% and 17.2 % private and government school respectively. This was lower than the study conducted at Shirajuniversity by Oshagh *et al*. (2010) presenting 30% showing normal overjet. The current study do not show any significant relation of overjet with oral hygiene status which is consistent with the findings of Griffits *et al*. (1981) where there is a mean increase in plaque score of malpositioned tooth but did not show any significant difference with the normal positioned tooth. The reason was attributed by Shaw *et al* in 1980 that although overall cleanliness was affected by the tooth postioning, but relationship of tooth positioning of teeth to disease still not established.Excessive Over bite (15.4% in private and 17.4% in government school) was more than twice as common as anterior open bite (0.1 in private and 0.19 in government) in the present study, which is in accordance with study by Thilander *et al*. (2001). (18.9% overbite and 9.3% anterior open bite) and Emmanuel *et al*. (2008) (9.8% over bite and 4.1% open bite) who also noted the almost same difference between the prevalence of deep bite and open bite. The prevalence of deep bite is increased up to the late mixed dentition which is clearly seen in the present study which shows significant difference with increasing age. Full eruption of premolars and second molars aims to stabilize deep bite in permanent dentition. Knutson summarized that the temporary malocclusion are corrected with age because the child outgrows deforming habits and dental deforrmity returned to normal as documented by Poonacha *et al*. (2010) In fact, malocclusion is the third public health problem according to the World Health Organization as concluded by Almedia *et al*. (2011). Possible explanation of the current significant findings is illustrating the malocclusion as an etiological factor of poor oral hygiene and therefore there is a need of prophylactic oral health programme for this population and it would be interesting to find out that there is decrease in malocclusion or oral hygiene status or vice –versa.

Summary and Conclusion

1. There was no significant relation found between prevalence of malocclusion at government and private school level.
2. When age group was correlated with different anomalies there was a significant result detected when crowding, spacing, diastema, largest maxillary and mandibular irregularity, crossbite, overjet, overbite was recorded.
3. There is a correlation between crowding, spacing and crossbite when compared to oral hygiene status.
4. Most of the school children when alienated at government (66%) and private (65.7%) or gender (male 65% and female 66%) wise or age wise lies in fair oral hygiene status where as less than 10 % students have good oral hygiene at any segment.

Conclusion

1. The study suggests that children with malaligned teeth had more chances of having poor oral hygiene.
2. No difference was noted among private and government school children oral hygiene status and occlusal anomalies.
3. There is a correlation between dental anomalies with respect to age groups
4. Crowding, spacing and cross bite more tend to had poor oral hygiene as they show a significant difference.

Recommendations

1. To eradicate oral health problem there is a need to plan a preventive and oral health education programmes as to improve the oral health as whole and to prevent from early tooth loss.
2. The school governing bodies and major education organizing committees in association with dental hospitals and colleges should be encouraged to take a more active role in promoting programs for the prevention of oral disease and implementation of mandatory dental visits
3. Standardized dental screening protocols are needed to be established by school authorities or privately organized programs in the near future so that trends in the oral health can be tracked and treated with priority.

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