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RESEARCH ARTICLE

IS PREVALENCE OF MALOCCLUSION IN PRIMARY DENTITION AN INDICATION TO FUTURE MALOCCLUSION???

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ABSTRACT

Context: With the increasing awareness of aesthetics among the general population more children seek orthodontic correction of their malocclusion. If malocclusion is identified early, simple preventive & interceptive measure alone can alleviate a developing malocclusion.
Aims: To assess the prevalence of malocclusion in primary dentition as an indicator to future malocclusion
Settings and Design: Complete clinical examination was performed under day light in the school & relevant statistical analysis was employed to test the proportions in different groups
Statistical analysis used: Chi square test was employed to test the proportions in different groups
Results: Oral hygiene status in the sample group was found to be 36.5% good, 18% fair and 45.5% had poor. Amongst the class I malocclusion (Flush terminal Plane) 35% had crowding in lower arch & 14.3% had crowding in upper arch, 7.5% had proclination in upper arch & 2.7% in lower arch. Spacing occurred in 78% in upper arch & 59.5% in lower arch. Crowding in upper & lower arches is 14.3 & 35%. Over jet percentage in our total sample is 5.1%. Prevalence of posterior cross bite is 4.2%.
Conclusions: Prevalence of malocclusion in primary dentition in urban population in Nagpur within the age group of 3-6years is 81.2% Future Class I, 15.7 % Future Class II and 3.1 % Future Class III.

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INTRODUCTION

The prevalence of malocclusion has been the subject of several epidemiological studies conducted with children and adolescents. Most of these studies are cross-sectional surveys intended to estimate the need for orthodontic treatment. The prevalence's of malocclusion reported ranges from 39%to 93%, indicating generally that most children do not have straight teeth and perfect occlusions. (Thilander *et al*., 2001) This large divergence in prevalence figures can be attributed to differences in registration methods, ethnic origin, social class, or age of the examined subjects, making comparisons questionable. Some studies were conducted to determine the prevalence of malocclusion traits in randomly selected samples representing whole adult populations, (Proffit *et al*., 1998; Stenvik *et al*., 1996) whereas others had narrower perspectives, focusing on staff and students, (Tod and Taverne, 1997) untreated dentalstudents, (Tang, 1994) untreated 15 to 20-year-olds with full dentitions, (Lavelle, 1976) untreated middle-class subjects, (El-Mangoury and Mostafa, 1990) and men in amilitary unit. (Ingervall *et al*., 1978) Data from the World Health Organization (WHO) (Foster and Menezes, 1976) show that malocclusion is third most important condition in the ranking of oral health problems, outranked only by caries and periodontal disease. With the increasing awareness of aesthetics among the general population more children seek orthodontic correction of their malocclusion. Early correction of skeletal problem has been recommended for a variety of reasons. Primary occlusion may improve or worsen as an individual moves from primary to mixed and permanent dentition. (Bijoor and Kohli, 2005) Longitudinal studies indicate that, a diagnosis of malocclusion and fairly consistent prediction of development of mixed and permanent dentitions can be based on several occlusal features of the primary dentition. (Slaj *et al*., 2003) The key question is whether these changes persist into mixed dentition and to what degree. The available literature suggests that some occlusal characteristics persist into the mixeddentition. (Legovic and Mady, 1999) conversely, some can be Self-correcting. (Legovic and Mady,

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1999) Earlier Studies have focused on malocclusion characteristic in mixed & permanent dentition. Literature however has remained silent to discuss about deciduous dentition which is of paramount importance. The lack of such vital information has propelled the study of this subject.

Aim of the study

To assess the prevalence of malocclusion in primary dentition as an indicator to future malocclusion

MATERIALS AND METHODS

This study was based on examination of 2000 children with primary dentition with age of 3- 6 years. This age group was again subdivided into 3 groups, each differing from its precursor by 1 year, so that exact prevalence of malocclusion can be checked & verified statistically. The children were selected at random from a school of urban population of Nagpur city .The age, address & socio economic status were obtained from their school records.

Following armamentarium was used in study: Mouth mirror, Probe, Divider, Millimetre scale. The examination was performed under day light.

Following criteria was assessed:
Oral hygiene status: Good / Fair/ Poor
DMF index: D M F

Tooth present

EDCBA	ABCDE
EDCBA	ABCDE

If any permanent teeth had erupted, such children were excluded from the study.

Malocclusion: Individual / Both Arches

	Upper Arch	Lower Arch
Spacing		
Proclination		
Crowding		
Rotation		
Supernumerary		
Midline shift		

Molar relation →Future Class I (Flush terminal plane)
Future Class II (Distal step)
Future Class III(Mesial step)

Table 1. Age distribution & molar relation

Group	No	Flush terminal plane (%) Future Class I ???	Distal step (%) Future Class II ???	Mesial step (%) Future Class III ???
3-3.5 yr	432	21.9 %	18.7 %	27.2 %
3.5-4.5 yr	790	39.9 %	36.8 %	30.3 %
4.5-5.5 yr	778	38.17 %	44.5 %	42.4 %
Total	2000	1624 (81.2 %)	310 (15.7 %)	66 (3.1 %)

Table 2. Arch relationship

Variable	Response	Male	Female	Total (n=2000)	
		No	No	No	%
Oral hygiene status	Good	420	310	730	36.5
	Fair	200	160	360	18
	Poor	600	310	910	45.5
DMF INDEX	No caries	680	440	1320	66
	Caries present	560	120	680	34
Spacing –Upper Anteriors	Spacing	1000	560	1560	78
	No spacing	234	206	440	22
Spacing- Lower Anteriors	Spacing	710	480	1190	59.5
	No spacing	520	290	810	40.5
Proclination-Upper Anteriors	Proclination	88	62	150	7.5
	No proclination	1140	710	1850	92.5
Proclination-Lower Anteriors	Proclination	34	20	54	2.7
	No proclination	1206	740	1946	97.3
Crowding-Upper Anteriors	Crowding	160	126	286	14.3
	No crowding	1100	614	1714	85.7
Crowding-Lower Anteriors	Crowding	460	240	700	35
	No crowding	800	500	1300	65
Rotation-Upper & Lower Anteriors	Rotation	8	0	8	0.4
	No rotation	1250	742	1992	99.6
Midline –Upper Anteriors	Midline shift	60	40	100	5
	No midline shift	1200	700	1900	95
Midline-Lower Anteriors	Midline shift	220	140	360	18
	No midline shift	1040	600	1640	82
Molar relation	Future Class I: Flush terminal plane	1080	544	1624	81.2
	Future Class II: Distal step	144	168	312	15.7
	Future Class III: Mesial step	46	18	64	3.1
Canine relation	Class I	1000	562	1562	78.1
	Class II	200	160	360	18
	Class III	60	18	78	3.9
Vertical relation	Deep bite	580	1268	1848	92.4
	Open bite	80	18	98	4.9
	Incomplete open bite	40	14	54	2.7
Transverse relation	Over jet increased	60	100	160	8

If any child had one type of molar relation on one side & another type of molar relation on the other side, such children were excluded from the study.

Canine relation →Class I
Class II
Class III
Vertical relation → Deep bite
Open bite
Incomplete open bite
Transverse relation → Anterior cross bite
Posterior cross bite / scissor bite

Defining the criteria's

CRITERIA	Included if
Spacing	>2 mm between each adjacent tooth
Proclination	>2 mm
Crowding	>3 mm
Rotation	>2 mm

- Deep bite: > 3mm was considered
- Open bite: > 2 mm was considered
- cross bite: > 2 mm was considered

Statistical analysis

Chi square test was employed to test the proportions in different groups.

RESULTS

Oral hygiene status in the sample group was found to be 36.5% good, 18% fair and 45.5% had poor. Amongst the class I malocclusion (Flush terminal Plane) 35% had crowding in lower arch & 14.3% had crowding in upper arch, 7.5% had proclination in upper arch & 2.7% in lower arch. Spacing occurred in 78% in upper arch & 59.5% in lower arch. Crowding in upper & lower arches is 14.3 & 35%. Over jet percentage in our total sample is 5.1%. Prevalence of posterior cross bite is 4.2%.

Table 3. Cross bite

Variable	Response	Male	Female	Total (n=2000)	
		NO	NO	NO	%
	Anterior	50	20	70	3.5
Cross bite	Posterior	60	25	85	4.25

Table 4. Comparison of Arch relation with Molar Relation

Variable	Response	Future Class I (1624) Flush terminal plane	Future Class II (312) Distal step	Future Class III (64) Mesial step	X^2 value	df	P value
		No	No	No			
Spacing –Upper	Abnormal	314	96	16	10.12	2	.006
Anteriors	normal	1310	216	108	-	-	
Spacing- Lower	Abnormal	624	112	22	.11	2	.95
Anteriors	normal	1000	200	42	-	-	
Proclination- Upper	Abnormal	84	12	4	.83	2	.66
Anteriors	normal	1540	300	60	-	-	
Proclination- Lower	Abnormal	24	12	4	.27	2	.88
Anteriors	normal	1600	300	60	-	-	
Crowding- Upper	Abnormal	224	52	10	.56	2	.76
Anteriors	normal	1400	260	54	-	-	
Crowding- Lower	Abnormal	584	106	14	2.53	2	.28
Anteriors	normal	1040	206	50	-	-	
Midline – Upper	Abnormal	56	22	18	42.5	2	.0001
Anteriors	normal	1568	290	46	-	-	
Midline- Lower	Abnormal	264	72	18	5.35	2	.06
Anteriors	normal	1360	240	46	-	-	
Cross bite anterior	Abnormal	24	12	32	228.2	2	.0001
	normal	1600	300	32	-	-	
Cross bite posterior	Abnormal	24	46	0	46.74	2	.0001
	normal	1600	266	64	-	-	
Excess over jet	Abnormal	244	180	0	140.1	2	.0001
	normal	1380	132	66	-	-	

Table 5. Comparison of Vertical and Transverse arch relation with molar relation

Variable	Response	Future class i (1624) Flush terminal plane	Future class ii (310) Distal step	Future class iii (66) Mesial step	X^2 value	DF	P value
		No	No	No			
Deep bite	Abnormal	124	32	2	1.33	2	.51
	Normal	1500	280	62	-	-	
Open bite	Abnormal	64	8	4	4.25	2	.12
	Normal	1560	304	60	-	-	
Incomplete open bite	Abnormal	18	16	0	3.43	2	.18
	Normal	1606	296	64	-	-	
Edge to edge	Abnormal	258	24	2	11.98	2	.01
	Normal	1366	288	62	-	-	
Posterior cross bite unilateral	Abnormal	4	22	4	19.65	2	.0001
	Normal	1620	290	60	-	-	
Posterior cross bite bilateral	Abnormal	4	20	2	19.72	2	.0001
	Normal	1620	292	64	-	-	

DISCUSSION

The increasing awareness of aesthetics among the general population has been reflected in increased statistics of patients seeking orthodontic advice for correction of malocclusion. Many individuals approach an orthodontist seeking a pleasant smile. The misconception that orthodontics is best performs only during adolescence or in permanent dentition has led children to report for correction only after the age of 12 years. Once past the maximum growth potential at adolescence, complicated mechanotherapy with compromises or even orthodontic camouflage is the only answer. To intercept the development of cross bite and excessive over jet in mixed dentition, the developing occlusion should be observed in primary dentition. (Heimer *et al*., 2008; Cozza *et al*., 2007) Vertical, sagittal, and transverseocclusal relationships should be evaluated at 2 or 3 years of age, in children. (Heimer *et al*., 2008; Cozza *et al*., 2007) If interfering contacts of primary canines are noted, or if anegative overbite or an excessive over jet is present, parents should be instructed to seek appropriate treatment, if required. Because adverse dental effects of non-nutritive sucking habits occur after age of 2 years. (Heimer *et al*., 2008; Cozza *et al*., 2007) In order to avert this situation the current trend in Orthodontics focuses on early management with prevention and interception. Psychological conditions related to aesthetic problems and prevention of upper incision fractures after trauma can influence the decision in favour of an earlier intervention (Heimer *et al*., 2008). Deciduous dentition can be considered as an acceptable predictor for occlusal relationship in permanent dentition. Growth pattern, habits and cooperation of a child are factors, which influence the outcome of treatment at this age. A feature of malocclusion present early in life is crowding, even in deciduous dentition. In 20% of children it lead to crowding in permanent dentition. Hence early diagnosis of malocclusion bestows one with an opportunity to identify and check the etiological factors responsible, which in essence, is the need for early management. Major facets of interest in early management of malocclusions in primary dentition should be focussed on:

Lack of space in primary dentition, Lateral deviations like cross bites, Sagittal discrepancies like increased over jet or Future class II molar relation (Distal Step). In the present study, Oral hygiene status in the sample group was found to be 36.5% good, 18% fair and 45.5% had poor. Prevalence of caries was 34%. This reveals the need to improve oral hygiene status as a priority in early management to restore the mesio distal dimension of primary teeth &to avert an impending malocclusion (Table 2). This study revealed that the Prevalence of Futureclass I (Flush terminal Plane) malocclusion at 81.2% was the highest as against Futureclass II (Distal Step) with 15.7 % & Futureclass III (Mesial Step) of 3.1 % (Table 2) Amongst the class I malocclusion (Flush terminal Plane) 35% had crowding in lower arch &14.3% had crowding in upper arch, 7.5% had proclination in upper arch & 2.7% in lower arch. Spacing occurred in 78% in upper arch & 59.5% in lower arch (Table 4) These features were similar to studies conducted by earlier workers revealing high Prevalence of Futureclass I (Flush terminal Plane) in apache Indians with 89.3%, blacks with 88.7%, white had low rate with 62%. In African American children 75% had Futureclass I malocclusion (Flush terminal Plane). Chinese children had the least Prevalence with 40.3%. (Tang, 1994) The Prevalence of Futureclass I malocclusion (Flush terminal Plane) was then computed at 1 year age intervals to study the molar relationship with advancing age. This showed that Futureclass I molar relationship (Flush terminal Plane) in 3-.3.5 is 21.9%, 3.5-4.5 is 39.9%, & 4.5-5.5 is 38.17% (Table 1). This increase in percentage with age is attributed to more no. of subjects included in this age group or may be that the major percentage of the population had Futureclass I malocclusion (Flush terminal Plane). Crowding in upper & lower arches is 14.3 & 35% (Table 2) (Cozza *et al*., 2007) in our study & most prevalent amongst males, as compared against studies of French children of 78% (Lavelle, 1976), American blacks & whites had 16.2% & 15.2% (Thilander *et al*., 2001); British children 33% (Bishara *et al*., 2006); revealing the variability of occurrence with different population groups. The Prevalence of Futureclass II (Distal Step) in other population is higher than ours (Foster and Menezes, 1976; Heimer *et al*., 2008; Bishara *et al*., 2006) The Futureclass II (Distal Step) have been defined as potential cases for transforming into Futureskeletal class II with age & hence require early intervention. (Heimer *et al*., 2008)

Over jet percentage in our total sample is5.1% (Table 4) which is more when compared with studies of 3% in blacks, 4% (Thilander *et al*., 2001) in whites, 6.8% in Danish, but French children showed 16.7% (Cozza *et al*., 2007) which was higher than our study. Prevalence of Futureclass II malocclusion (Distal Step) when computed by 1 year age interval shows that Futureclass II molar relation (Distal Step) increased with age from 18.7% between 3-3.5 to 36.8% between 3.5-4.5, 44.5% between 4.5-5.5 (Table 1) which means that Futureclass II (Distal Step) could continue in mixed dentition aspotential malocclusion demanding early attention. In contrast to our study Prevalence of Futureclass II malocclusion (Distal Step) decreased with age in United States population. (Nobile *et al*., 2007) Prevalence of open bite & edge to edge (Table 5) in present sample is less compared to French children with (34.2%) (Cozza *et al*., 2007), in Chinese with 6.8%, Europeans at 14.3%. Most cases of open bite in deciduous dentition are of dentoalveolar origin & will improve with age & early orthodontic treatment is not advised (Cozza *et al*., 2007) Prevalence of posterior cross bite (Table 3&4) is 4.2% & is significantly higher in males & in Futureclass II group (Distal Step). In apache Indian i.e 5.3% &whites with 7.1% & blacks had 2.1%. (Foster and Menezes, 1976) This reveals that posterior cross bite is a silent feature of malocclusion associated with Futureclass II (Distal Step) & requires an early check on aberrant muscle activity with preventive measures. Prevalence of anterior cross bite is 3.5% (Table 3 & 4) & it was associated with Futureclass III malocclusion (Mesial Step). In whites i.e 4.1%. Blacks & apache Indians had 32% & 7.8%, in African Americans is 5% (Thilander *et al*., 2001). Prevalence of Futureclass III (Mesial Step) in our study is 3.1% whereas Chinese have 45.7%, 16.1% in Europeans, 7.1% (Slaj *et al*., 2003) in blacks, whites with 1.7% [1]FutureClass III molar relationship (Mesial Step) computed to one year interval show that with 3-3.5 is 27.2%, 3.5-4.5 is 30.3%, 4.5-5.5 is 42.4% (Table 1) This progressively increasing percentage attributed to increasing sample size & increasing ages which remains a potential problem that require early monitoring & guidance into mixed dentition.

Midline shift was present more in lower arch (Table 4). It is more prevalent in Futureclass III (Mesial Step) & in deep bite cases. Spacing present in upper arch is 78% & in lower arch it is 59.5% (Table 2) which is in accordance with other studies (Cozza *et al*., 2007). Spacing is considered a positive finding that naturally averts crowing later. Premature loss of deciduous

teeth or losses of permanent teeth with no immediate replacement are potential causes of malocclusion. (Nobile *et al*., 2007) Given that the literature establishes anunequivocal link between malocclusion and improper function of oral muscles, (Proffit *et al*., 1998; Heimer *et al*., 2008) providing guidance to the Children and/or their guardians is an essential preventive procedure to decrease the probability of future occlusal changes related to these problems.

Summary and Conclusion

Even though the transition of occlusion from primary to permanent dentition is complex & heavily dependent on the individual growth potential, a tentative diagnosis can be obtained which is as follows: Prevalence of Futureclass I (Flush terminal Plane) 81.2%, Futureclass II (Distal Step)15.7%, Futureclass III (Mesial Step) 3.1%. Prevalence of crowding is 14.3% in upper & 35% in lower, poor oral hygiene (45.5%), 34% caries, lower midline shift of 18%, 7.5% proclination in upper arch & 2.7% in lower arch, Prevalence of posterior cross bite 4.25% is significantly higher than anteriors 3.5%. This tentative provisional diagnosis helps to warn the parents & guardians of the children about the future occurrence of malocclusion. Hence they can be educated to proceed to preventive & interceptive orthodontics procedures to prevent their children from the trauma of malocclusion.

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