

## “Prevalence and impact of malocclusion on parents and children aged 10-12 years – a prospective study”

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### **Abstract:**

#### **Aims and Objectives:**

1. To find prevalence of malocclusion in children aged 10-12 years, using Dental Aesthetic Index (DAI).
2. Assess impact of existing malocclusion, on quality of life of children using Child Perception Questionnaire (CPQ<sub>11-14</sub>)

**Method:** Study was conducted on a sample of 450 public school children, both males and females aged 10-12 years in Bangalore City, Karnataka State, India. Pearson's correlation test was used to determine the correlation between the total CPQ<sub>11-14</sub> and DAI scores.

**Results:** Prevalence of malocclusion was 65.1%. Very severe malocclusion (7.90%) among ten year old children and (10%) among eleven year old. 31.30% of twelve year olds had definite malocclusion. Among ten year old, anterior maxillary overjet  $\geq 2$ mm was most common malocclusion (49.3%). Class II molar relation was most common at 34.7% and 41.9% in 11 and 12 year old children respectively.

**Conclusion:** Malocclusion is prevalent in 65.1% of children aged 10 to 12 years. Very weak negative correlation between total DAI scores and CPQ<sub>11-14</sub> scores but not statistically significant. Statistically significant association between specific type of malocclusion and functional limitation and oral symptoms domain of Child Perception Questionnaire (CPQ<sub>11-14</sub>), showing malocclusion has negative impact on oral health and functional ability.

**Keyword:** Child Perception Questionnaire (CPQ<sub>11-14</sub>), Dental Aesthetic Index DAI, Malocclusion.

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## I. Introduction

Dentofacial region contributes significantly to overall facial appearance.<sup>1</sup> Adults with extreme overjet, deep bite, and crowding, whether or not they have previously received orthodontic treatment, have reported significantly lower self-concept ratings<sup>2</sup>Self- awareness and abstract thought develop at about six years of age, when comparisons begin to emerge regarding a child's physical characteristics and personality.<sup>3</sup> Hence the experiences in childhood mould the child and influence his / her life at a later stage.

Malocclusion has negative effects on oral function, appearance. In Brazil, a study showed significant association between “impact on quality of life” and global rating of oral health and overall well-being in a sample of two hundred and ten school children, in United Kingdom a strong correlation was found between impacts on quality of life and global oral health rating.<sup>5</sup>Hence this study aims to determine effects of malocclusion on social, functional and emotional state of children aged (10 to 12 years) in East Bangalore using self-reported child perception questionnaire (CPQ<sub>11-14</sub>).

## II. Materials& method

Ethical clearance was obtained from Institutional review Board and ethics & research committee. Ref: No. MRADC&H/ECIRB/1181A/2013-2014. Written informed consent was obtained from school authorities and parents for the same.

The study was conducted for 8 months between July 2013- Feb 2014, on a sample size of 450 public school children (222 males and 228 females) whose medium of instruction is English aged 10-12 years in East Bangalore City, Karnataka State, India, sample size was calculated using sample size calculator. None of these children had previously undergone interceptive orthodontics or were undergoing active treatment. Convenience sampling was followed and children were selected depending on inclusion and exclusion criteria.

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### **2.1 Inclusion criteria:**

- a) 10-12 year old public school children (males and females) of East Bangalore City.
- b) Participants who are able to read and are ready to answer the questions.
- c) Students who fulfil research criteria and are ready to give consent.

### **2.2 Exclusion criteria:**

- a) Students below 10 years of age and above 12 years.
- b) Participants who are not ready to give consent to participate in the study and who refuse to fill questionnaire.
- c) Subjects who are uncooperative for clinical examination during the study.
- d) Subjects with any type of severe systemic disease

A self-administered questionnaire was used to collect data regarding oral health related quality of life.

Oral examination was done by a single examiner (post graduate student), trained and calibrated with Intra-examiner reliability for the Dental Aesthetic index with kappa = 0.90. It recorded missing teeth, diastema, crowding of anterior teeth, greater upper anterior teeth irregularity, greater lower anterior teeth irregularity, upper anterior overbite, lower anterior overbite, anterior open bite and anterior-posterior molar relation.

Following the measurements an equation was applied for the calculation of values. The Dental Aesthetic Index furnishes four outcome possibilities: normality or mild malocclusion, no treatment ( $\leq 25$ ); definite malocclusion, treatment is elective ( $26 \leq \text{DAI} \leq 30$ ); severe malocclusion, treatment is highly desirable ( $31 \leq \text{DAI} \leq 35$ ); and very severe or debilitating malocclusion, treatment is fundamental ( $\geq 36$ ).<sup>4</sup>

Oral examinations were performed in a classroom, with natural lighting, using a sterile mouth mirror and CPITN probe. All examinations were carried out by single examiner.

The short form version of child perceptions questionnaire (CPQ<sub>11-14</sub>)<sup>5</sup> was used to determine impact of malocclusion on daily lives of children. It included 4 questions under 4 subscale summing up to total of 16 questions which is a pretested and validated questionnaire obtained by item impact method approved by the WHO for epidemiological surveys. It is robust, simple to understand and suitable for population based studies in children.<sup>6</sup> The items address frequency of events in past three months. This measure composed 4 subscales: Oral symptoms, functional limitations, emotional wellbeing and social wellbeing. A 5-point Likert scale was used: ‘Never’ = 0; ‘Once/twice’ = 1; ‘Sometimes’ = 2; ‘Often’ = 3; and ‘Every day/almost every day’ = 4.

Child perceptions questionnaire CPQ<sub>11-14</sub> scores was calculated as a simple sum of the response codes. There were 16 questions, final score varied from 0 to 64, for which a higher score denotes a greater degree of the impact of oral conditions on quality of life of child.

Two questions were asked to assess global rating of oral health and extent to which oral health affected their overall well-being, having four-point response format

1. ‘Would you say that the health of your teeth, lips, jaws and mouth is...?’
2. ‘How much the condition of your teeth, lips, does jaws or mouth affects your life overall?’

Children requiring orthodontic intervention were noted and their parents were informed.

## **III. Results**

Data was entered in Microsoft excel and analyzed using SPSS, Ver. (22) [IBM. Corp] for windows.

Pearson’s correlation test was used to determine correlation between total child perceptions questionnaire CPQ<sub>11-14</sub> and Dental Aesthetic Index DAI scores. Chi-square test, ANOVA and Student unpaired t test was used to compare the different variables.

Malocclusion was found in 65.1% of the children. Among the 10 year old children 40.7% (n=57) had minor malocclusion (grade 1), 25.70% had definite malocclusion (grade 2) requiring elective treatment and 7.90% had very severe malocclusion (grade 4), treatment being mandatory ( $\text{DAI} \geq 36$ ). Among the 11 year old, 36.7% (n=55) had minor malocclusion, 10% (n=26) had very severe malocclusion. Among the 12 year old children 31.30% (n=50) had definite malocclusion, 28.10% (n=45) had normal or minor malocclusion.

ANOVA test was carried out to compare differences in mean Dental Aesthetic Index (DAI) scores in three different age groups followed by Bonferroni’s Post hoc analysis, which showed that there was a statistically significant difference in the means between 10 year and 12 years age group with  $P = 0.04$ .

Correlation between total Child Perceptions Questionnaire CPQ<sub>11-14</sub> and Dental Aesthetic Index DAI scores was done using Pearson Correlation Test which showed a very weak negative correlation between the two entities, not statistically significant.

The Dental Aesthetic Index DAI scoring revealed that among 10 years old children anterior maxillary overjet >2mm was most common malocclusion (49.3%), followed by anterior maxillary irregularity >2 mm

(28.6%). Among 11 years old children class II molar relation was most common at 34.7%, followed by upper anterior irregularity at 27.3% and anterior maxillary overjet >2 mm (26.7%). Among 12 years old class II molar relation was predominant at 41.9% , followed by anterior maxillary overjet >2mm at 28.7% , followed by deep bite (18.1%).

In oral symptoms subscale, significant associations were found between bad breath and following variables:

- Missing tooth (P<0.001),
- crowding in the Incisal segment (P=0.004),
- lower anterior irregularity >2 mm (P=0.006),
- anterior over bite >2 mm (P= 0.03).

Significant association was found between mouth sores and following:

- Crowding in both arches (P=0.004),
- upper anterior irregularity > 2 mm (P=0.001),
- lower anterior irregularity < 2mm (P<0.001),
- presence of over bite with P<0.001

In functional limitation domain significant association was found between crowding and

- Difficulty eating, chewing firm food (P=0.02),
- Difficulty in eating / drinking (P<0.001) and
- Difficulty in speech P<0.001.

Significant association was found between diastema and upper anterior irregularity (P=0.002) with difficulty in eating/drinking (P=0.03),

Significant association was found between presence of open bite and difficulty in eating / drinking (P=0.04) and also between open bite and taking longer time to eat a meal (P=0.03).

In emotional wellbeing subscale, children with upper anterior irregularity > 2 mm were shy because of their teeth (P=.008). Those with spacing in anterior segment, 57.4% were upset because of their teeth (P=.04).

In social wellbeing subscale upper anterior irregularity >2 mm was associated to having frequent argument with others (39%) (P=0.04) and lower anterior irregularity was associated with children being questioned by other regarding their teeth (P=0.01).

34.8% children reported their oral health as being good and 18.4% rated their oral health as bad. In case of effect on oral health on life overall 16.8% reported that their oral health affects their lives very much.

#### **IV. Discussion**

This study shows that children with malocclusion experienced greater physical impact on daily life than those with no abnormalities in position of teeth. Results of present study are in accordance with previous studies showing association between malocclusion and quality of life.<sup>7, 8, 9</sup>

The primary outcome variables obtained from the results are that alignment of teeth had an influence on functional capability such as chewing firm food, speech as in pronouncing certain words which are formed by the contact between tongue and anterior teeth, also related to varied oral symptoms such as occurrence of mouth sores, foul odour due to accumulation or impaction of food between misaligned teeth sectors, which negatively impacted the quality of life of children.

However the total Dental Aesthetic Index DAI score and total child perceptions questionnaire CPQ score showed a very weak negative correlation which is not statistically significant, but a statistically significant association was found between specific type of malocclusion and oral symptoms and functional limitations domain of the child perceptions questionnaire CPQ<sub>11-14</sub> which is in accordance with a study conducted by Locker et al.<sup>10</sup>

The secondary outcome variables was that there was no significant association between Dental Aesthetic Index DAI and child perceptions questionnaire CPQ<sub>11-14</sub> score in the emotional wellbeing and social wellbeing domain, similar to the study conducted by Kolawole et al.<sup>11</sup>This could be attributed to demographic characteristic of study population and also to distribution of severity of malocclusion in study sample, as those with very severe malocclusion comprised only 10%, also the studies done previously in western countries show the importance given to esthetics which relies on a pleasing facial appearance by children in those countries and the decreased level of importance given to esthetics by the children surveyed in the present study.

Prevalence of malocclusion among 10 to 12 year old children was 65.1%, derived from Dental Aesthetic Index, similar to study by Das et al who found 71% prevalence of malocclusion in children aged 8-12 years in Bangalore city.<sup>12</sup> Study done by Kaur H et al showed 87.79% of malocclusion in south Indian population,<sup>13</sup> but another study in Himachal Pradesh on 12 year old children showed very low prevalence of 11.1% requiring orthodontic treatment.<sup>14</sup> A study on 12-15 year old children in Shimla city showed 41.9% with minor malocclusion and 17% with severe malocclusion requiring orthodontic treatment by Shailee F.<sup>15</sup>

Among 10 year old children, anterior maxillary overjet >2mm was most common malocclusion (49.3%), among 11 year old children, class II molar relation was most common (34.7%), and in 12 years age group class II molar relation was predominant at 41.9%, followed by anterior maxillary overjet >2mm at 28.7%.

DAI has 10 items that addresses aspects related to both aesthetics and function, enabling inclusion of a substantial number of variables and allow a broad scoped perspective regarding possible effects of malocclusion.

Short form version of child perceptions questionnaire CPQ<sub>11-14</sub> was employed, a reliable measure designed for use in children in chosen age group of 10 to 12 years. Aleksandra Jokovic<sup>16</sup> showed that short form of child perceptions questionnaire CPQ<sub>11-14</sub> demonstrated excellent criterion validity and good construct validity. Lyndie et al<sup>17</sup> showed that short form child perceptions questionnaire CPQ<sub>11-14</sub> was acceptable in younger age group between 5 years and 14 years as they are capable of providing their own perceptions of oral health impacts. At this age, children have a good capacity to remember, retrieve, and apply information related to specific events and experiences.<sup>18</sup> Their matured language skills and ease in independent reading allow for the comprehension of items and meet the demands of self reported questionnaires.<sup>19</sup> Further, children at this stage, reflective of Piaget's stage of formal operations<sup>20</sup> have matured intellectual functioning and are capable of making comparative judgments regarding their general and specific abilities which are, in fact, realistic.<sup>21</sup>

Al-Sarheed et al<sup>22</sup> showed that 11 years to 14 years old individuals with malocclusion reported significantly more impact and hence a worse quality of life compared with a group of individuals with no or minimal malocclusion.

The study also confirms that impact on quality of life of children were strongly related with global rating of oral health and effects of oral health on life overall. Children who have reported more impacts of oral health on quality of life have rated their global oral health as poor.

This finding was similar to previous studies conducted in Brazil, where a significant association between child perceptions questionnaire CPQ<sub>11-14</sub> scores (impact on quality of life) and global rating of oral health and overall well-being was found in school children. Impact on life overall was also significantly related to impacts on quality of life.<sup>23</sup>

There was an association between malocclusion and functional limitation and oral symptoms domain of the child perceptions questionnaire CPQ<sub>11-14</sub>, thereby further strengthening the hypothesis that malocclusion has negative physical effects on quality of life of children.

Occlusal problems may lead to difficulties in pronouncing certain consonants and sounds such as “s, z, sh, ch, g and dz” as the tongue may remain distant from the incisors, forcing the airflow to disperse.<sup>24</sup> Individuals with some type of malocclusion such as protruded upper anterior, anterior open bite may also experience speaking problems.<sup>25</sup>

Presence of open bite was associated with difficulty in eating / drinking, as it took longer time to eat a meal, in accordance with a study conducted by Martins et al showing that open bite >2 mm and upper anterior irregularity had effects on eating habits. A study done by Pandey M showed the children aged 12 – 14 years had changing opinion on the ill effect of malocclusion on esthetics and other oral function<sup>26</sup> around less than half of the participants were aware of an orthodontist and the procedures done by them.

This highlights the importance of an early diagnosis and treatment by dentists, Pediatric dentists and Orthodontists as it may affect the choice of food and balance of the child's diet, leading to nutritional problems,<sup>25,27</sup> moreover malocclusion may limit the ability to bite down on certain foods, thereby diminishing masticatory ability and efficiency.<sup>25</sup> The present study offers important evidence regarding influence of malocclusion on quality of life of children between 10- 12 years of age; it is a cross sectional study showing views at a specific point in time, longitudinal studies will be able to show the long term effects of malocclusion on the life of children.

## V. Tables

**Table 1-** Gender wise comparison of prevalence of malocclusion in different age groups using Chi Square test

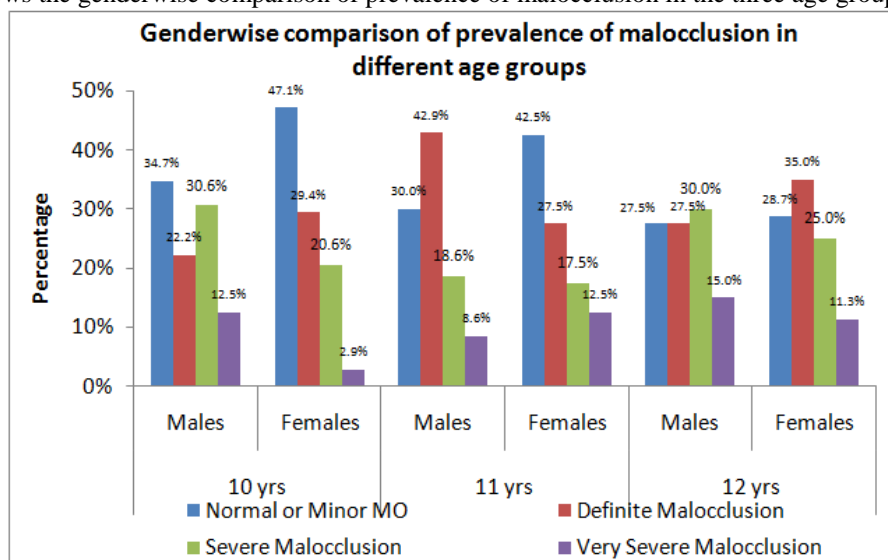
Gender wise comparison of prevalence of malocclusion in different age groups using Chi Square test							
Age	Gender	Normal or Minor MO	Definite Malocclusion	Severe Malocclusion	Very Severe Malocclusion	χ <sup>2</sup> Value	P-Value
10 yrs	Males	25	16	22	9	7.428	0.06
		34.70%	22.20%	30.60%	12.50%		
	Females	32	20	14	2		
		47.10%	29.40%	20.60%	2.90%		
Total	57	36	36	11			
	40.70%	25.70%	25.70%	7.90%			
11 yrs	Males	21	30	13	6	4.695	0.20
		30.00%	42.90%	18.60%	8.60%		
	Females	34	22	14	10		
		42.50%	27.50%	17.50%	12.50%		
Total	55	52	27	16			
	36.70%	34.70%	18.00%	10.70%			
12 yrs	Males	22	22	24	12	1.534	0.67
		27.50%	27.50%	30.00%	15.00%		
	Females	23	28	20	9		
		28.70%	35.00%	25.00%	11.30%		
Total	45	50	44	21			
	28.10%	31.30%	27.50%	13.10%			

**Table 2-Comparison of DAI Most positive findings in various age groups**

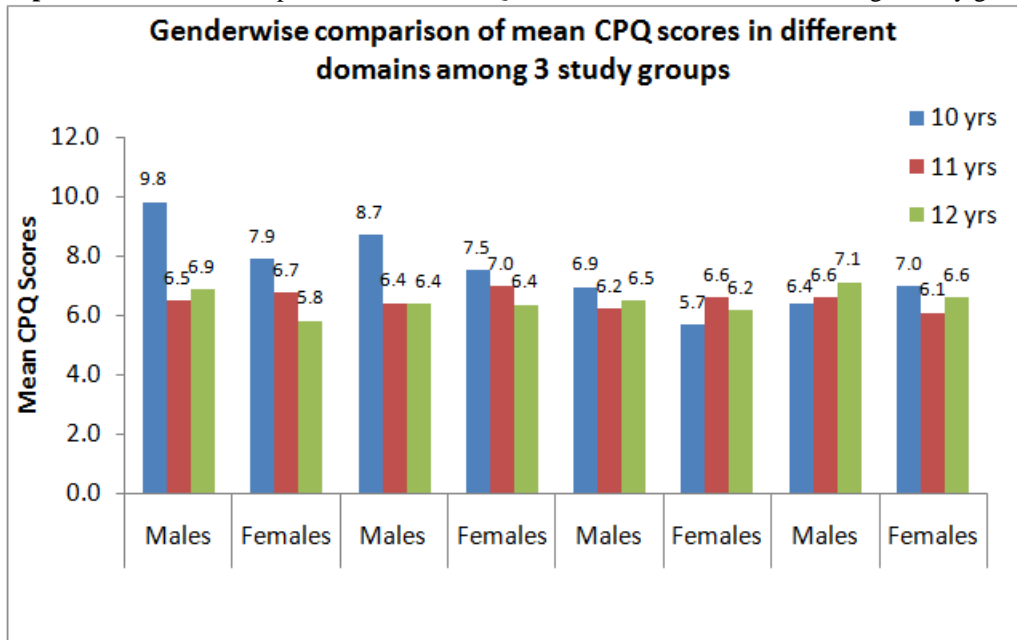
Comparison of DAI Most positive findings in various age groups							
DAI	Scales	Age Groups					
		10 yrs		11 yrs		12 yrs	
		n	%	n	%	n	%
Missing Tooth	Both arches	10	7.1%	16	10.7%	22	13.8%
Crowding	Both arches	32	22.9%	25	16.7%	24	15.0%
Spacing	Both arches	2	1.4%	16	10.7%	17	10.6%
Diastema	>=2 mm	11	7.9%	18	12.0%	22	13.8%
Upper Irregularity	>=2 mm	40	28.6%	41	27.3%	26	16.3%
Lower Irregularity	>=2 mm	27	19.3%	33	22.0%	22	13.8%
Overjet	>=4 mm	69	49.3%	40	26.7%	46	28.7%
Overbite	Yes	7	5.0%	10	6.7%	29	18.1%
Open Bite	>=2 mm	6	4.3%	1	0.7%	6	3.8%
Molar Relation	Class II	64	45.7%	52	34.7%	67	41.9%
	Class III	3	2.1%	21	14.0%	5	3.1%

## VI. Graphs/ Figures

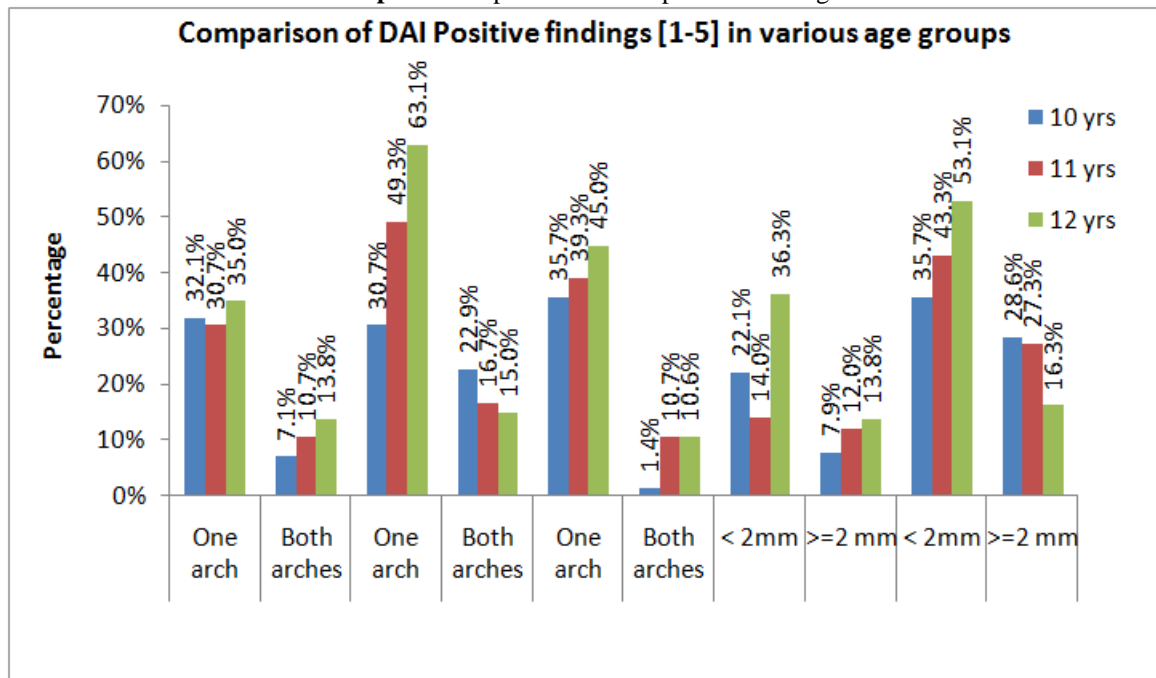
**Graph 1:** Shows the genderwise comparison of prevalence of malocclusion in the three age groups



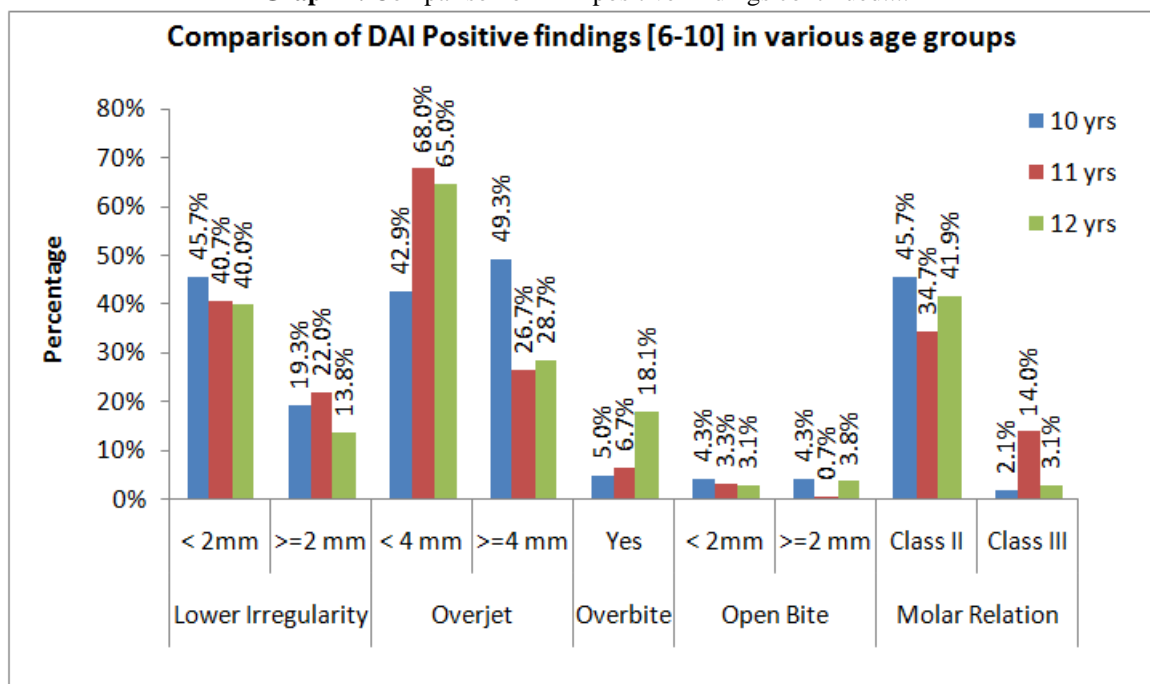
**Graph 2:** Genderwise comparison of mean CPQ scores in different domains among 3 study groups



**Graph 3:** Comparison of DAI positive findings



**Graph 4:** Comparison of DAI positive findings continued....



## VII. Conclusion

1. Prevalence of malocclusion in children between 10 years to 12 years requiring orthodontic treatment was 65.1%.
2. A very weak negative correlation was found between total DAI scores and total child perceptions questionnaire CPQ<sub>11-14</sub> scores (short version) but not statistically significant.
3. Statistically significant association was found between specific type of malocclusion and functional limitation as well as oral symptoms domain of child perceptions questionnaire CPQ<sub>11-14</sub> implying that individual tooth malocclusion does have a negative effect during mastication and speech thereby influencing quality of life of children.
4. Early recognition of malocclusion and increasing awareness among parents would help in providing early intervention, preventing establishment of severe malocclusion.

Difference found in this study with respect to lack of statistically significant association between psychological and social well-being domains with total Dental Aesthetic Index scores could be attributed to effect of demographic nature of study population and different age groups that was considered when compared to previous studies.

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