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Original Research Article

Prevalence of malocclusion and its psycho-social impact among 14–18-year-old school going adolescents of Bhubaneswar

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Abstract

Introduction: Malocclusion has a substantial impact on both facial appearance and function. Objectives: To determine the prevalence of malocclusion among school-going adolescents in Bhubaneswar, together with its severity level, psychosocial impact and effects of gender and school type.

Materials and Methods: A cross-sectional study was conducted on 1800 14–18-year school going adolescents from various private and government schools/junior colleges from the city Municipal Corporation through multistage cluster random sampling. Data regarding prevalence of malocclusion and its severity was obtained using Dental Aesthetic Index and psychosocial impact was measured using Psychosocial Impact of Dental Aesthetic Questionnaire (PIDAQ) Analysis of data was performed through descriptive statistics, Chi-square test, independent t-test and analysis of variance (ANOVA) followed by post hoc tests and Pearson correlation.

Results: The overall prevalence of malocclusion was found to be 26.3% with mean DAI score 20.87±8.58. Students in private schools exhibited significantly higher prevalence of malocclusion (p=0.001). The overall mean PIDAQ score was determined to be 35.96±15.71. Mean Social Impact (SI), Psychological Impact (PI), Aesthetic Concern (AC) and PIDAQ scores increased significantly with increase in severity of malocclusion (p=0.001). Malocclusion was found to have a significantly greater psychosocial impact on males than on females (p=0.001), as well as on students in government schools (p=0.001). A weak and positive correlation was observed between mean DAI and PIDAQ scores (r=0.165, p=0.001).

Conclusion: The respondents' psychological wellbeing can be affected by presence and severity of malocclusion. The gender and school type can greatly influence the psychosocial aspects. Public health efforts focused on early prevention and awareness regarding treatment options would help tackle the psycho-social impact.

Keyword: Adolescents, DAI, Malocclusion, Psychosocial impact, PIDAQ

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1. Introduction

Worldwide, millions of people suffer from a variety of oral health problems, with malocclusion being one of the most common. It refers to improper alignment of teeth or jaws when the jaws are closed.[1] Malocclusion was listed by the World Health Organization (1987) under the category of Handicapping Dento-facial Anomaly, that was defined as an anomaly which causes disfigurement or which impedes function, and requiring treatment "if the disfigurement or functional defect was likely to be an obstacle to the patient's physical or emotional well-being".[1-2] It currently ranks third in importance among all oral health related issues globally. Next to dental caries, it is the second most prevalent dental condition in children and young adults.[2-3] Presence of malocclusion will not only have a negative impact on speech, mastication, swallowing and other oral processes, it may also affect the aesthetics and facial appearance.[4-5]

Concern about physical appearance especially regarding face starts from adolescence. Additionally during this phase, a person begins communicating with his or her surroundings and the society which may exert a complex influence or be subject to peer pressure.[5] Presence of mal-aligned teeth can negativ ely affect the Quality of Life due to awkwardness and reluctance, social stigma, work place challenges and low self-esteem.[6] The primary objective of traditional orthodontic therapy was to improve function and

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dental health as determined by the clinician, with relatively little attention paid to the patient's self-perception and psychosocial needs.[5] The prevalence of malocclusion varies significantly around the world and this wide heterogeneity may be caused by the varying ages and ethnicities of the individuals included in studies conducted.[5,7-9] As per the global data, it was found to be prevalent among developed countries and more in those people living in urban localities.[10]

Various indices have been implemented to assess the degree of malocclusions and the requirement for orthodontic interventions; among them, the Dental Aesthetic Index was adopted by the WHO and is also incorporated into the WHO oral health evaluation form 1997.[11] Because of its ease of application and quick measurement it is widely used in different epidemiological surveys and also acts as a guide in determining the need for orthodontic treatment.

Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) is a psychometric instrument developed in order to evaluate effect of dental aesthetics on the psychosocial status of young adults.[12] It was intended to evaluate how orthodontic factors impact quality of life. Translation of this questionnaire into different languages has also been done. Though some research.[4,13-16] has been undertaken in various parts of India for determining the prevalence of malocclusion but till, yet no studies have been conducted in Odisha for determining the same. There is lack of scientific data and clarity regarding prevalence of malocclusion of Odisha notably the adolescent group, who have, as well as how it influences their psychosocial well-being. Obtaining this epidemiological data will aid in planning and later execution of dental public health initiatives to raise public awareness. Early diagnosis and treatment may help avoid the need for more extensive, expensive, and complicated orthodontic treatment. Hence this study intends determine the prevalence of malocclusion and its psychosocial impact among the adolescents of Bhubaneswar.

2. Materials and Methods

This cross-sectional study was undertaken on 14 to 18-year-old adolescents from schools and junior colleges of Bhubaneswar Municipal Corporation. It was carried out between October 2021to December 2022. Based on the prevalence (P) of malocclusion from previous study (30%)[17] and 95% Confidence Interval (CI) sample size was estimated using the formula $Z^2_{\alpha/2}$ P×Q×D/E^2. Minimum sample size was estimated to be 1792 by putting Z value 1.96 for 95% CI, design effect (D) 2 and allowable error (E) 10% of P and total sample size was rounded off to 1800. The participants were recruited using a multistage cluster random sampling technique. (*Figure 1*) Participants of 14-18 years age group belonging to Bhubaneswar Municipal Corporation were included in the study. Informed consent was obtained from the parents. The study protocol was thoroughly analysed and ethical clearance was granted by the Institutional Ethical

Committee of (Reg no./ ECR/627/Inst/OR/2014/RR-20, Dated 5th September, 2022). Medically compromised individuals, those suffering from severe dental caries and undergoing orthodontic treatment were excluded from the study.

A single examiner carried out the entire data collection and contacted the relevant school authorities before visiting all of the chosen junior colleges and public and private schools. The objective of the study was explained to the school administration, who were then asked to share it with the parents. In the chosen schools and junior colleges, a number of oral health camps were held in order to collect data. Prior to this, a timetable of the camps that will be held was created. A minimum of one camp was held each week to cover the 17 government schools with junior colleges and 25 private schools. Participants were reminded of the study's objective on the day of the examination and a brief explanation of the items or questions that would be answered were provided so they will not find difficulty when filling out the questionnaire. Those participants who gave their assent were included in the study.

2.1. Data collection

A survey proforma was created to gather information on sociodemographic characteristics and oral clinical findings. This proforma comprised of three domains: the first included demographic information, the second had 23 questions about the psychosocial effects of malocclusion, and the third was for clinical assessment to document the malocclusion. The Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) developed by Klages et al in the year 2006[12] was used to assess the psychosocial impact of malocclusion. In schools where English is the primary medium of education, the original English version of PIDAQ was distributed, whereas in those where Odia is the primary medium of education, the translated Odia version of PIDAQ was used to gather data. This questionnaire was created primarily to assess the psychosocial effects of dental aesthetic on young individuals. It is a validated self-rating instrument that assesses key elements of oral health-related quality of life (OHRQoL), including four domains Dental Self-Confidence (DSC), Social Impact (SI), Psychological Impact (PI), and Aesthetic Concern (AC). The DSC domain consists of six items, SI consists of eight items, PI consists of six items and AC consists of three items. DSC is a useful tool for assessing people's self-esteem and contentment with their dentition. SI assesses the potential issues that a person may encounter in social settings as a result of an undesirable dental look, whereas PI measures the sensation of grief or inadequacy in contrast to others. AC refers to information about the worry or disapproval that one's oral appearance causes when they look in the mirror, see themselves in pictures, or watch themselves on camera.[18]

Responses of this questionnaire are recorded based on five-point Likert scale score where score 0 denotes 'not at all', 1'a little', 2 'somewhat', 3 'strongly' and 4 'very strongly'.

The questionnaire was translated into the local language (Odia version PIDAQ) through forward and back translation method. The bilingual expert committee panel made up of public health specialists who are proficient in both English and Odia as well as individuals with experience translating the health-related questionnaire evaluated the original and back-translated versions. In order to make the back-translated items as similar to those in the original questionnaire as feasible, this committee gave comments and offered suggestions. Additionally, the content validity of the translated questionnaire was also evaluated by the expert panel. The panel's consensus served as the foundation for later adjustments and the resolution of conflicts in the translated questionnaire. On a small sample of school-going adolescents comprising around 20 participants meeting the prespecified age criteria, the translated questionnaire was pretested. They were recruited from the same sampling frame and were not regarded as being a part of the study. Following the distribution of the questionnaire to each participant for completion, an oral examination was performed.

2.2. Dental aesthetic index

Recording of malocclusion was performed using Dental Aesthetic Index (DAI) developed by Naham C. Cons, Joanna Jenny, and Frank J. Kohout in 1986. It examines ten occlusal features and was adopted by the World Health Organization.[11] Interpretation of DAI scores: DAI scores ≤ 25- normal/minor malocclusion- no or slight treatment need, DAI scores 26 to 30- definite malocclusions- elective treatment, DAI scores 31 to 35- severe malocclusion- highly desirable treatment, DAI scores ≥36- very severe or handicapping malocclusion. Investigator was trained by an experienced senior faculty member of Department of Orthodontics and dentofacial orthopaedics having 10 years of expertise regarding recording of malocclusion using DAI prior to the study's execution. Calibration was done by examination of 20 patients attending the OPD, conforming to the age criteria. Using Kappa statistics, it was determined that the intra examiner reliability for the Dental Aesthetic Index (DAI) was 90%.

2.3. Clinical examination

To evaluate the malocclusion status of individuals, an ADA Type III dental examination was executed using a mouth mirror and CPI probe in a setting with ample natural light and strict sterilising procedures.
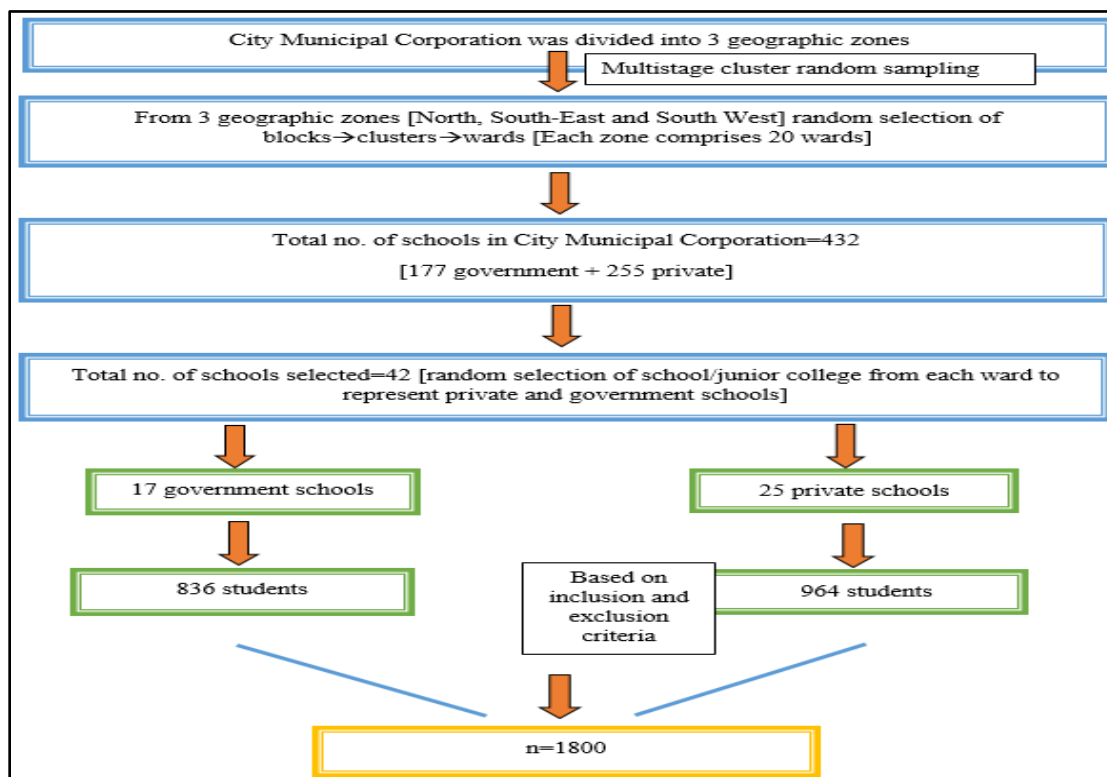

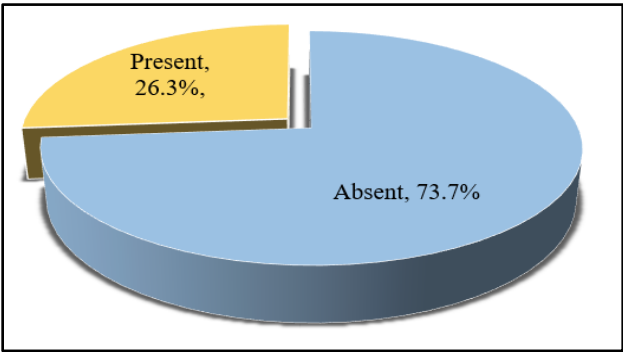**Figure 1:** Flow chart of sampling technique
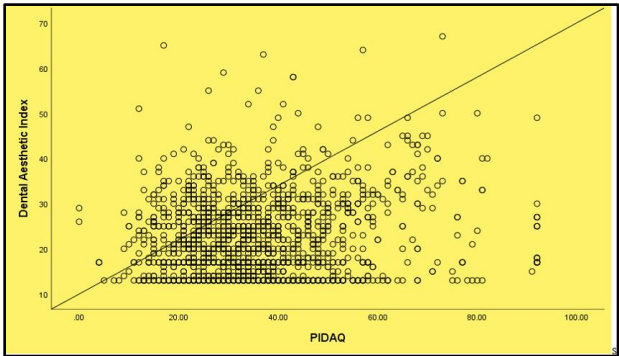
Figure 2: Prevalence of malocclusion

Figure 3: Correlation between PIDAQ and DAI scores

Table 1: Socio-demographic profile

Socio-demographic profile		n (%)
Age	14	584 (32.4)
	15	258 (14.3)
	16	309 (17.2)
	17	402 (22.3)
	18	247 (13.7)
	Total	1800 (100.0)
Gender	M	986 (54.8)
	F	814 (45.2)
	Total	1800 (100.0)
Type of school	Govt.	836 (46.4)
	Pvt.	964 (53.6)
	Total	1800 (100.0)

Table 2: Comparison of mean DAI according to age, gender and type of school FFDF

Age in years	n	Mean DAI±SD	P value	Post hoc
14	584	20.02±9.67		
15	258	21.12±8.91		
16	309	20.57±7.05	0.011*	18>14,15,16,17
17	402	21.38±7.67		
18	247	22.13±8.44		
Total	1800	20.87±8.61		
Gender				
M	986	20.65±8.50	0.233	
F	814	21.13±8.67		
Type of school				
Govt.	836	19.43±8.04	<0.001*	
Pvt.	964	22.12±8.83		

P value ≤ 0.05, Statistically significant using One way ANOVA. Post hoc Bonferroni test:18 Versus 14(*P- value ≤ 0.05).*
*ANOVA- Analysis of Variance, SD- Standard Deviation. *P- value ≤ 0.05, Statistically significant using independent t-test, SD-*
Standard Deviation.

Table 3: Prevalence of malocclusion category according to age groups, gender and schools

			DAI Category				Total
			Normal/ minor malocclusion	Definite malocclusion	Severe malocclusion	Very severe or handicapping malocclusion	
	14	n (%)	426 (72.9)	61 (10.4)	45 (7.7)	52 (8.9)	584 (100.0)

Age in years	15	n (%)	180 (69.8)	34 (13.2)	25 (9.7)	19 (7.4)	258 (100.0)
	16	n (%)	244 (79.0)	32 (10.4)	19 (6.1)	14 (4.5)	309 (100.0)
	17	n (%)	300 (74.6)	53 (13.2)	30 (7.5)	19 (4.7)	402 (100.0)
	18	n (%)	177 (71.7%)	40 (16.2)	18 (7.3%)	12 (4.9)	247 (100.0)
Total		n (%)	1327 (73.7)	220 (12.2)	137 (7.6)	116 (6.4)	1800(100.0)
P value							0.054
Gender	M	n (%)	740 (75.0)	115 (11.6)	74 (7.5)	57 (5.7)	986 (100.0)
	F	n (%)	587 (72.1)	105 (12.8)	63 (7.7)	59 (7.2)	814 (100.0)
Total		n (%)	1327 (73.7)	220 (12.2)	137 (7.6)	116 (6.4)	800 (100.0)
P value							0.457
Type of school	Gov.	n (%)	660 (78.9)	91 (10.8)	47 (5.6)	38 (4.5)	836 (100.0)
	Pvt.	n (%)	667 (69.1)	129 (13.3)	90 (9.3)	78 (8.0)	964 (100.0)
Total		n (%)	1327 (73.7)	220 (12.2)	137 (7.6)	116 (6.4)	1800(100.0)
P value							<0.001*

P- value ≤ 0.05, Statistically significant using Chi-square test

Table 4: School wise distribution of malocclusion category among male and female students

Gender			DAI Category				Total n (%)
			Normal/minor malocclusion n (%)	Definite malocclusion n (%)	Severe malocclusion n (%)	Very severe Or handicapping malocclusion n (%)	
Male	Type of school	Govt.	411 (80.7%)	59 (11.6%)	19 (3.7%)	20 (3.9%)	509 (100.0%)
		Pvt.	329 (69.0%)	56 (11.7%)	55 (11.5%)	37 (7.8%)	477 (100.0%)
	Total		740 (75.1%)	115 (11.7%)	74 (7.5%)	57 (5.8%)	986 (100.0%)
	P value						0.001*
			DAI Category				Total n (%)
			Normal/minor malocclusion n (%)	Definite malocclusion n (%)	Severe malocclusion n (%)	Very severe or handicapping malocclusion n (%)	
Female	Type of school	Govt.	249 (76.1%)	32 (9.8%)	28 (8.6%)	18 (5.5%)	327 (100.0%)
		Pvt.	338 (69.4%)	73 (15.0%)	35 (7.2%)	41 (8.4%)	487 (100.0%)
	Total		587 (72.1%)	105 (12.9%)	63 (7.7%)	59 (7.2%)	814 (100.0%)
	P value						0.044*

Table 5: Comparison of mean DSC, SI, PI, AC and PIDAQ among subjects according to the age, gender and type of schools

Age in years	n	Mean DSC±SD	Mean SI±SD	Mean PI±SD	Mean AC±SD	Mean PIDAQ±SD
14	584	12.22±6.07	11.51±7.19	9.55±5.01	4.64±3.45	37.92±15.25
15	258	12.70±5.65	10.75±7.32	9.27±4.45	4.14±3.23	36.87±13.05
16	309	12.78±6.21	8.95±6.83	8.41±5.37	3.67±3.30	33.83±14.33
17	402	12.29±5.92	8.81±6.52	8.36±5.30	3.76±3.30	33.20±13.44
18	247	13.49±6.44	10.03±7.35	8.93±5.61	4.69±3.35	37.55±16.64
Total	1800	12.63±6.07	10.15±7.09	8.96±5.17	4.21±3.36	35.96±14.73
P value		0.004*	0.001*	0.001*	0.001*	0.001*
Post-hoc		18 >17 >14, 15,16	14 >16 >17,15,18	14 >16 > 17, 15,18	18 >17 >16, 14,15	18 >16 >17,14,15
Gender	n	Mean DSC±SD	Mean SI±SD	Mean PI±SD	Mean AC±SD	Mean PIDAQ±SD

M	986	12.83±6.11	10.65±7.02	9.14±5.14	4.25±3.34	36.85±15.42
F	814	12.45±6.02	9.55±7.14	8.79±5.25	4.28±3.59	34.89±13.85
P value		0.240	0.001[*]	0.103	0.588	0.005[*]
Type of school	n	Mean DSC±SD	Mean SI±SD	Mean PI±SD	Mean AC±SD	Mean PIDAQ±SD
Govt.	836	12.88±6.11	11.60±6.96	9.47±4.98	4.80±3.13	38.75±15.43
Pvt.	964	12.43±6.03	8.90±6.97	8.53±5.28	3.70±3.47	33.55±13.65
P value		0.118	<0.001[*]	<0.001[*]	<0.001[*]	<0.001[*]

[*]*P- value ≤ 0.05, Statistically significant using One way ANOVA. Post hoc Bonferroni test; Mean DSC: 18 Versus 17[*], 18 Versus 14[*] ([*]P Value ≤ 0.05), Mean SI: 14 Versus 16[*], 14 Versus 17[*]([*]P Value ≤ 0.05), Mean PI: 14 Versus 16[*], 14 Versus 17[*]([*]P Value ≤ 0.05), Mean AC: 18 Versus 17[*], 18 Versus 16[*]([*]P Value ≤ 0.05), Mean PIDAQ: 18 Versus 16[*], 18 Versus 17[*]([*]P Value ≤ 0.05). ANOVA- Analysis of Variance, SD- Standard Deviation. [*]P- value ≤ 0.05, Statistically significant using independent t-test, SD- Standard Deviation.*

Table 6: Comparison of mean DSC, SI, PI, AC, PIDAQ scores among different DAI categories

	n	Mean DSC±SD	Mean SI±SD	Mean PI±SD	Mean AC±SD	Mean PIDAQ±SD
Normal/minor malocclusion	1327	12.68±6.03	9.55±6.61	8.54±4.73	3.94±3.21	34.70±13.60
Definite malocclusion	220	12.49±6.24	10.39±7.81	9.26±6.00	4.85±3.57	36.93±16.20
Severe malocclusion	137	12. 39 ±5.61	12.51±7.42	9.97±5.66	4.86±3.70	39.66±16.33
Very severe handicapping malocclusion	116	12.80±6.84	13.77±8.81	12.20±6.26	5.38 ± 3.74	44.22±18.41
Total	1800	12.63±6.07	10.15±7.09	8.96±5.17	4.21±3.36	35.96 ±14.73
P value		0.868	0.001[*]	0.001[*]	0.001[*]	0.001[*]
Post hoc		NS	4>3>2>1	4>3>2>1	4>1,2,3	4>3>2>1

[*]*P- value ≤ 0.05, Statistically significant using One way ANOVA. Post hoc Bonferroni test; Mean SI: 4 Versus 3[*], 4 Versus 2[*], 4 Versus 1[*]([*]P Value≤0.05), Mean PI: 4 Versus 3[*], 4 Versus 2[*], 4 Versus 1[*]([*]P Value≤0.05), Mean AC: 4 Versus 1[*]([*]P Value≤0.05), Mean PIDAQ: 4 Versus 3[*], 4 Versus 2[*], 4 Versus 1[*]([*]P Value≤0.05). ANOVA- Analysis of Variance, SD- Standard Deviation. 1- Normal/minor malocclusion, 2- Definite malocclusion, 3- Severe malocclusion, 4- Very severe or handicapping malocclusion, NS- Not Significant*

Table 7: Gender wise comparison of mean PIDAQ and its subscale scores in government and private schools

Type of school		Gender	n	Mean±SD	P Value
Govt.	DSC	M	509	12.98±6.07	0.548
		F	327	12.72±6.18	
	SI	M	509	11.92±7.03	0.097
		F	327	11.10±6.83	
	PI	M	509	9.83±5.11	0.009[*]
		F	327	8.90±4.74	
	AC	M	509	4.71±3.14	0.287
		F	327	4.95±3.13	
	PIDAQ	M	509	39.43±16.20	0.110
		F	327	37.68±14.09	
Pvt.		Gender	n	Mean±SD	P Value
	DSC	M	477	12.58±6.16	0.419
		F	487	12.27±5.91	
	SI	M	477	9.30±6.76	0.078
		F	487	8.51±7.16	
	PI	M	477	8.41±5.08	0.503
		F	487	8.64±5.48	
	AC	M	477	3.76±3.34	0.576
		F	487	3.64±3.60	
	PIDAQ	M	477	34.09±13.92	0.221
		F	487	33.02±13.37	

[*]*P- value ≤ 0.05, Statistically significant using independent t-test, SD- standard deviation.*

Table 8: School wise comparison of mean PIDAQ and its subscale scores among male and female students

Gender		Type of school	n	Mean±SD	P value
Male	DSC	Govt.	509	12.98±6.07	0.315
		Pvt.	477	12.58±6.16	
	SI	Govt.	509	11.92±7.03	0.001[*]
		Pvt.	477	9.30±6.76	
	PI	Govt.	509	9.83±5.11	0.001[*]
		Pvt.	477	8.41±5.08	
	AC	Govt.	509	4.71±3.14	0.001[*]
		Pvt.	477	3.76±3.34	
	PIDAQ	Govt.	509	39.43±16.20	0.001[*]
		Pvt.	477	34.09±13.92	
Female		Type of school	n	Mean±SD	P value
	DSC	Govt.	327	12.72 ± 6.18	0.300
		Pvt.	487	12.27 ± 5.91	
	SI	Govt.	327	11.10 ± 6.83	0.001[*]
		Pvt.	487	8.51 ± 7.16	
	PI	Govt.	327	8.90 ± 4.74	0.485
		Pvt.	487	8.64 ± 5.48	
	AC	Govt.	327	4.95 ± 3.13	0.001[*]
		Pvt.	487	3.64 ± 3.60	
	PIDAQ	Govt.	327	37.68 ± 14.09	0.001[*]
		Pvt.	487	33.02 ± 13.37	

[*]*P- value ≤ 0.05, Statistically significant using independent t-test, SD- standard deviation*

2.4. Statistical analysis

A Microsoft Excel data sheet was used to enter the acquired data and the Statistical Package for Social Sciences programme was used to analyse it (SPSS, IBM Version 25.0). Calculations of percentages, means and standard deviations (SD) consisted of descriptive statistics. Normality testing was done with the help of Kolmogorov-Smirnov test and the data was found to be normally distributed. Chi-square test was employed for comparing the prevalence of malocclusion categories according to age groups, gender and type of school. Independent t-test was employed to compare mean DAI score according to gender and type of school. It was also applied to compare mean PIDAQ and its subscale scores according to gender and type of school. One way ANOVA followed by post hoc tests were applied to compare mean DAI, PIDAQ and its subscale scores according to age groups. Comparison of severity of malocclusion with mean PIDAQ and its subscales were also done with the help of ANOVA followed by post hoc tests. Pearson's correlation was used to analyse the association between PIDAQ and its subscales with DAI scores. The CI and P value for all tests were set at 95% and 0.05, respectively.

3. Results

3.1. Socio-demographic profile of study participants

The mean age of the population was found to be 15.71±1.45 years. The information on the study respondents' demographics were presented in table1. As per the data

ajority of the study subjects belong to 14 years age group (32.4%) category and proportion of males participating in the study was higher (54.8%). (**Table 1**)

The current study findings revealed that majority of the study participants (73.7%) had normal/minor malocclusion followed by definite malocclusion (12.2%) and severe malocclusion was only in 7.6%. Overall prevalence was 26.3% (
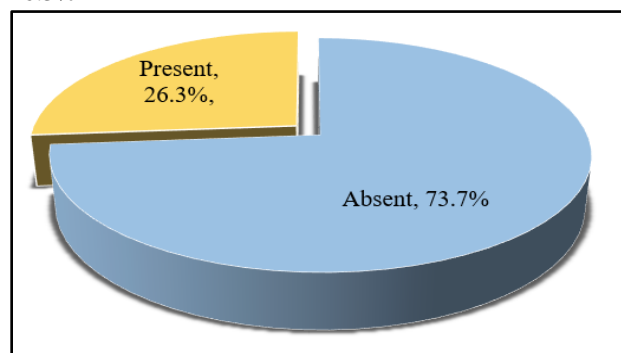
Figure 2: DAI score was estimated to be 20.87±8.58.

3.2. Association of malocclusion with other variables

Distribution of malocclusion category and mean DAI scores by age, gender and type of school:
When the mean DAI scores of the five age groups were examined, it was observed that the 18-year-old group had a significantly higher mean DAI score (22.13±8.44, p=0.011) than that of the 14-year-old group (20.02±9.67) however it was found to be non-significant with the other age groups.

(**Table 2**) Private school students had significantly higher mean DAI scores (22.12±8.83, p<0.001). (**Table 2**)

The degree of malocclusion was divided into four categories based on the DAI scores, as shown in **Table 3**. The most frequently encountered malocclusion category in terms of age was definite malocclusion and the majority of those affected (16.2%) were in the 18-year-old age group. Government and private schoolers' malocclusion severity was significantly different (p<0.001), with a larger percentage of private school students (13.3%) exhibiting definite malocclusion necessitating elective treatment. (**Table 3**) Comparing scores between schools revealed that the mean DAI score of male and female students in private schools was significantly higher (p=0.001). Both mean and categories of DAI depicted that among both genders private school adolescents were affected more however while boys from private school had the highest mean score (22.2), girls had higher severity of malocclusion (8.4%). (**Table 4**)

3.2. Association of PIDAQ and its subscales with other variables

The overall mean PIDAQ score was determined to be 35.96±15.71. Students in the 18-year age group had the highest mean DSC (13.49±6.44) and AC scores (4.69±3.35) out of all the categories and they scored significantly higher than students in the 17 years age group. (p≤ 0.05) (**Table 5**) Furthermore, the mean SI (11.51±7.19) and PI (9.55±5.01) scores were both significantly greater in the 14-year-old age group compared to the 16-year-old and 17-year-old age groups. (p=0.001) Similarly, the mean PIDAQ scores for students in the 14-year age group were the highest of all the age groups (37.92±15.25) and significant difference was also noted across the other age groups. (p=0.001) *(Table 5)* The mean SI (10.65±7.02) and PIDAQ scores (36.85±15.42) of males were significantly higher than those of females (SI: 9.55±7.14, PIDAQ: 34.89±13.85). (p≤ 0.05) (Table 5) Compared to boys (4.25±3.34), girls (4.28±3.59) were more concerned with aesthetics. (p>0.05) It was discovered that except for mean DSC scores all the other components were significantly higher among government school children then private ones. (p <0.001) (**Table 5**)

Mean PIDAQ and its subscale scores of different categories of malocclusion were presented in table no.6. According to the findings except for mean DSC scores, other subscales scores of PIDAQ and total mean PIDAQ scores significantly increased with increase in the severity of malocclusion. (p=0.001). (**Table 6**)

The mean scores of each component of PIDAQ were compared among both the sexes of government and private schools separately and it was found that mean PI scores of government school males (9.83±5.11) was significantly higher than that of females (8.90±4.74). (p=0.009) (**Table 7**)

Mean PIDAQ scores and its component scores were compared among males of both the schools and females of both schools as shown in table no.8. It was observed that for

every component of PIDAQ, males of government schools scored significantly higher (SI: 11.92±7.03, PI: 9.83±5.11, AC: 4.71±3.14, PIDAQ: 39.43±16.20, p=0.001) than that of males of private schools (SI: 9.30±6.76, PI: 8.41±5.08, AC: 3.76±3.34, PIDAQ: 34.09±13.92) except for DSC. (p=0.001) (Table 8) Except for DSC and PI component (p>0.05) females of government schools scored significantly higher (SI: 11.10±6.83, AC: 4.95±3.13, PIDAQ: 37.68±14.09, p=0.001) than that of private school females (SI: 8.51±7.16, AC: 3.64±3.60, PIDAQ: 33.02±13.37). (**Table 8**)

A weak but significant correlation was observed between mean DAI and PIDAQ scores (Pearson Correlation r=0.165, p=0.001). (Figure 3) While the DSC showed negative insignificant correlation with malocclusion severity (Pearson Correlation; r=-0.013, p=0.584) other PIDAQ components exhibited positive and weak correlation with malocclusion grades and it was found to be statistically significant. (p=0.001)

4. Discussion

Concern regarding appearance and aesthetics in the present times is found initiate during childhood and intensify while approaching adulthood. The dental characteristics of an individual, in particular the alignment of their teeth, significantly affects their facial features, appearance and attractiveness which in turn influences their social interaction and communication. As a result, the study's target population of schoolchildren aged 14 to 18 was chosen with mean age of 15.71±1.45 years.

The prevalence of malocclusion in the present study was determined to be 26.3%, while the study population's overall mean DAI score was 20.87±8.58. According to Jha et al[17] and Tak et al[14] , who conducted study upon school-age children in Lucknow and Udaipur, respectively, between the ages of 12 and 15, the overall prevalence was 30.41% and 33.3%, respectively, which is in line with the current study's outcomes.[14,17] Studies by Nagalakshmi et al[19] and Shivakumar et al[20] in Southern India (Tamilnadu, Karnataka) reported the overall prevalence to be 17.3% and 19.9%, respectively, which is slightly lower than the findings of the current study. Balachandran et al[21] has conducted a systematic review and meta-analysis on malocclusion prevalence in India and found the prevalence to be 26.69% which is congruent with the results of the current study. With a nation as diverse and populous as India, there is a significant regional variance in the occurrence of malocclusion. This may be brought on by differences in dietary preferences, nutritional status, ethnicity, genetic and environmental factors.

Malocclusion prevalence varies throughout nations, as well as among various age groups and sexes. While it varies between 20% to 43% in India,[22] it was found to be 63.3% to 77 % in Brazil,[23] 63.4% in Australia,[24] 63.8% in Chile,[7] 65% in Norway[25], 29% in Kenya[26], 22% in Japan,[27] 9% in

Tehran.[28] This variance in malocclusion prevalence from nation to nation may be brought on by ethnicity, age groups as well as variation in diagnostic standards and measuring criteria of malocclusion indices.

Most of the participants in the current study (73.7%) fall into the category of normal/mild malocclusion and do not need any intervention. Similar outcomes were observed in studies by Jha et al[17], Gupta et al,[29] Shivakumar et al[20] and Nagalakshmi et al[19] who reported that the proportion of individuals needing no/minimal treatment is 69.6%, 78.5%, 80.1%, and 82.74%, respectively.

The findings of the current study concur with the earlier literature's conclusions [4,7,14,17,29] suggesting malocclusion prevalence decreases as severity increases. The frequency of severe and very severe malocclusion is relatively less common in this population than that of the normal/mild group since a few occlusal factors (deep bite, posterior cross bite and open bite, any midline discrepancy) are not investigated by DAI.[14]

The majority of students in the 18-year age range were diagnosed with definite malocclusion (16.2%) in the current study, whereas Figueroa et al's study[7] revealed that the majority of students in the 17-year age group fall into this category. According to the data given by National oral health survey & fluoride mapping, India 2002-2003,[30], proportion of people suffering from very severe malocclusion category is 11.2% for 15 year age group which is comparable to the findings of the current study (7.4%). In line with the findings of the other research,[29,31] the present investigation found that younger children had a higher prevalence of extremely severe malocclusion. It could take some time for the permanent teeth to erupt into the mouth cavity and form the right occlusion. The greater incidence in younger children may be explained by the incomplete alignment that follows their eruption at this time, which gets better over time. According to the current study, there is a significant difference between students who attend government and private schools in terms of the prevalence of malocclusion. (p≤0.05)

Mean PIDAQ of current study was found to be 35.96 which is comparable to the findings of the study conducted by Figueroa et al[7] (38.3), Bahirrah et al[32] (31.83), Yi et al[33] (27.22) however study conducted by Motloba et al[8] found it to be 45.26 that is higher to the findings of the current study.

The current study findings revealed that with increase in age the mean DSC score was increasing and younger ones (14-year age group) were less confident about their dental aesthetics as compared to the elder ones. Therefore, the 14-year-old age group was shown to be the most socially and psychologically impacted group compared to the other age groups. Even the study performed by Jha et al[17] also reported that elder ones had highest mean DSC score in contrast to the younger age groups. Older children begin to socialise with the outside world which may help them overcome their self-consciousness.

According to a study by Bellot-Arcís et al[34] mean SI scores of males were higher than females (males: 6.18, females: 6.02) which is comparable to the findings of the current study (males: 10.65, females: 9.55). Females were more concerned about their face attractiveness, smile, dental aesthetics, and how it would be perceived in society. Men are equally concerned with their appearance in the twenty-first century, as social media and other associated technologies have become an integral part of daily life. Among these, there has been an increase in the worry of being accepted for one's appearance and self-image in society, on social media and during a job interview.

The current study discovered that government school students were more affected socially and psychologically due to presence of malocclusion and concerned more about their dental aesthetics than private school students (p<0.001). Similar findings were reported by AlSagob et al[35] and Johnson et al[36]. A synergistic relationship exists between malocclusion, bullying, and psychological stress. According to the research, children attending government schools had a higher likelihood than those attending private schools of being subjected to verbal bullying and teasing.[19,33]

The results of present study suggested that with increase in severity of malocclusion, mean PIDAQ and its subscale scores increased significantly (p=0.001) except for DSC domain. Similar findings were also observed by the study conducted by Velangi et al,[5] Motloba et al,[8] Chakradhar et al,[9] Bellot-Arcís et al[34], Yi et al[33] It supports the idea that malocclusion affects adolescents' psychological wellbeing, which can have a significant impact on their social interactions and self-perception.

In the current study, a positive and weak correlation was identified between malocclusion severity and its psychosocial impact. These results concur with those of the studies conducted by Figueroa et al[7] and Velangi et al.[5] The relatively weak correlation between the malocclusion severity and its psychosocial impact in our sample can be attributed to a number of factors. First of all, proportion of people affected with severe and very severe malocclusion necessitating orthodontic treatment was relatively very less which has significant psychosocial impact among adolescents. Secondly perception of self-image is changing. Malocclusions may not invariably have a negative impact on how one perceives himself because beauty is solely a subjective issue. Thirdly, students from private schools are expected to have basic understanding about malocclusion as oral health education has already been incorporated into their curriculum. As a result, they may feel less self-conscious and apprehensive about their appearance in public and the possibility of rejection by others as a result of their teeth's misalignment because they are more informed about the disease and how to manage it.

The current study is first of its kind in Bhubaneswar which has evaluated the prevalence of malocclusion and its psychosocial impact among the school going adolescents. Epidemiologists now have a more useful tool in the form of the DAI, an orthodontic index that assigns a single score combining public views of dental aesthetics with objective measurements related to malocclusion.

The true nature of the causality between malocclusion and its psychosocial impact could not be assessed due to the cross-sectional nature of the study. The study would be strengthened by using a longitudinal study design, which could help expand our understanding of the impact of these factors on an individual's life. Due to its simplicity and convenience of use, DAI was employed in the current study to record malocclusions; nevertheless, it does not capture some abnormalities, including anterior and posterior crossbite, deep bite, posterior open bite, and the existence of any mid line deviations. This may underestimate the condition.

In the current study, factors that may affect the results, such as parental financial situation and cultural background, have not been considered. Thus, more research including individuals from diverse socioeconomic and cultural backgrounds is advised to fully comprehend the relationship between malocclusion and its psychosocial effects.

5. Conclusion

The prevalence of malocclusion was estimated to be 26.3%. Distribution of malocclusion severity showed no significant difference betsween the five age groups and both the gender are equally affected with different grades of malocclusion. The prevalence among the private schools is noticeably higher. The present study findings provide support to the notion that the psychosocial effects of malocclusion vary with severity, with the impact on an individual increasing with increasing severity. 14-year age group was the most socially and psychologically impacted group in contrast to others. It was discovered that boys experience the psychological effects of malocclusion more than girls. Students from government schools were more psychologically impacted by the condition than that of private ones.

Based on the findings of the study we recommend:

1. Management of malocclusion on a clinical and psychological level
2. Thorough screening of malocclusion to determine the need for orthodontic treatment.
3. Incorporating oral health education into the general school curriculum with a focus on government school students
4. Steps to be taken by the Department of Public Health Dentistry and Orthodontics with the support from dental institutions for management of malocclusion in a comprehensible manner.

5. More extensive research, such as longitudinal and case control studies, ought to be carried out in the future

6. Source of Funding

7. Conflict of Interest

None.

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9. Conflict of Interest

The authors acknowledge no conflict of interest.

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