

Need For Orthodontic Treatment Among Indian Adolescents: Evaluation Based On Public Health

Dr.Sumeet Mishra^{*}, Dr.Shubhangi Ameet Mani^{***}, Dr. Olavo Neil[†], Dr. Ameet Mani^{***}, Dr. Vatsala Singh^{****} & Dr. Ravi Pratap Singh^{****}

Abstract

Introduction : *our objective was to identify the prevalence and the severity of malocclusions and to analyze factors associated with the need for orthodontic treatment of Indian adolescents.*

Methods: *This exploratory, cross-sectional study was carried out based on secondary data from the National Oral Health Survey in India (2004). Socio-demographic conditions, self-perception, and the existence and degree of malocclusion, using the Dental Aesthetic Index, were evaluated in 38,559 adolescent Indians. The need for orthodontic treatment was estimated from the severity of malocclusion by using self assessing questionnaires .*

Results: *The majority of the adolescents needed orthodontic treatment. In 12 to 15 year olds, the prevalence of the need for orthodontic treatment was larger among urban male population and in those that perceived a need for treatment, and also those that perceived their appearance as normal, bad, or very bad.*

Conclusions: *There was a high prevalence of orthodontic treatment need among adolescents in India and this need was associated with demographic and subjective issue. The high prevalence of orthodontic needs in adolescents is a challenge to the goals of India's universal public health system.*

Key Words: *Oral health; Malocclusion; Adolescent; Public health*

Introduction

India is a potpourri of various ethnic groups, tribes, castes, languages and regions. India being so diverse is home to different ethnic groups such as the Indo-Aryans and Dravidians. Such difference in racial and ethnic make up of India brought the need to assess the need of orthodontic treatment in adolescents amongst the various ethnic groups and regions across India. Previous studies have evaluated oral health status, indicating the need for implementation of health public policies for improvement of these conditions and universality of health, considering socio-

economic characteristics.^[4,5,6] Malocclusion, the third most prevalent oral pathology has been considered a priority in global public health and has many adverse consequences, such as psychosocial maladjustment, periodontal disease and unfavourable mastication.^[8,13]

Malocclusions are not classified as diseases and are difficult to define, unlike other issues of oral health,⁸ highlighting the importance of a clear definition, as well as an improvement in diagnostic criteria for obtaining epidemiological data regarding these issues in order to facilitate the planning of public health prevention and care.^[9] Therefore, there was a need to develop an epidemiological instrument to identify and classify malocclusions and recognize the dental and aesthetic need for orthodontic treatment of a given population to compare such needs among populations or longitudinally. In response to this need, Jenny & Cons developed the Dental

^{*}Post Graduate Student, ^{**}Professor,

^{***}Tutor, Rural Dental College, PIMS (DU), Loni

^{****}Post Graduate Student, Modern Dental College, Indore.

Address for correspondence:

Dr.Sumeet Mishra

Dept. Of Orthodontics, Rural Dental College,

Pravara Institute of Medical Sciences (Deemed to be University)

Loni, Maharashtra, India.

Aesthetic Index (DAI) in 1986.^[11] It quantifies aesthetic factors and clinical presentations, using both subjective and objective measures to produce a single numerical value that reflects all aspects of malocclusion. The DAI is composed of ten variables and results in a numerical value that classifies the individual on a scale of 13 to 80, which can be categorized into cut off points.^[11] DAI has been proposed by the World Health Organization (WHO) for the evaluation of malocclusions at the age of 12 and in 15-19-year-old adolescents.^[13,18] Urban population is more concerned about their dental condition than the rural population.^[7]

Malocclusion has been singled out as an important problem of oral health among adolescents in India, with prevalence rates above 40%. At national level, besides the high prevalence, greater severity of malocclusion among teenagers has been associated with the worst socio-economic conditions and subjective conditions of oral health, based on data from the epidemiological survey of the oral health conditions of the Indian population.

Method

This exploratory, cross-sectional study was carried out based on secondary data from the National Oral Health Survey in India (2004). 38,559 Indian adolescents from the age group of 12- 15 years , living across India were interviewed.

The participants were examined and interviewed via questionnaires. Data was collected regarding their socio-economic conditions, their use of dental services, and their self-perception of their oral health. Assessments of conditions and problems of oral health were based on criteria established by the World Health Organization (WHO) in 1997. A probabilistic cluster sample was used. In each region of the country survey was conducted. Cities, neighbourhoods and households were also randomly selected. The response rate for the age group of 12-15 year olds was 84.5%, resulting in the inclusion of 18,915 adolescents in the survey.^[15] Dentists, who were trained and calibrated ($k=0.61$) in accordance with the criteria established by the WHO , carried out at-home interviews and exams.^[14] The present study is based on data from this sample of adolescents between the ages of 12 - 15 years.

The dependent variable, the need for orthodontic treatment (NOT), was constructed based on the DAI (Table 1) and

has four possible outcomes: lack of normality or mild malocclusions/no need for orthodontic treatment (DAI<25), defined malocclusion/elective NOT (DAI=26-30), severe malocclusion/highly desirable NOT (DAI=31-35), and very severe or disabling malocclusion/essential NOT (DAI>36).^[10] In accordance with the possible outcomes of DAI, this numerical score was categorized into two categories for the dependent variable of this study: no NOT (DAI<25) and NOT (DAI>25).^[11]

Table 1. Descriptive analysis of Indians aged 12-15 years according to demographic variables.

	n	%
Sex		
Male	19,930	51.68
Female	18,629	48.32
Age		
12	19,644	50.94
15	18,915	49.16
Self Reported ethnic group		
Indo-Aryan	28533	74
Dravidian	10026	26
Place of residence		
Rural	25,845	67.02
Urban	12,714	32.98
Indian macro-region		
South	12,135	31.47
North	10,474	27.16
East	3,354	8.69
West	7,952	22.16
Northeast	1735	4.49
Central	2,909	8.1

The independent variables tested were socio-demographics (sex, age, self-reported ethnic group, place of residence, macro-region) and subjective conditions (self-perceived need for treatment, oral health, appearance, chewing perception, effect of oral health on relationships). The variable sex (male, female) was maintained in its original form from the original data bank. Location of residence (urban or rural) and macro-region of India (North, South, East, West, Central and Northeast) were maintained in their original form.

Factors associated with the dependent variable were identified. Analyses were conducted using the software

PASW (r) (Predictive Analytics Software) version 17.0 for Windows (Statistics for Windows, Version 17.0. SPSS Inc. Chicago, EUA).

Results

The majority of the 38,559 adolescents were males between 12 and 15 years of age (19,930), self-identified

as Indo-Aryan and living in urban zones (Table 1). Regarding the subjective conditions, most of the adolescents perceived the need for treatment and their oral health as good or excellent (Table 3). There was a greater prevalence of crowding and abnormal molar ratios in the evaluation of components of the DAI. The prevalence of need for orthodontic treatment was 53.2% (Table 4).

Table 2: Percentage of subjects with malocclusion by age, in India (rural, Urban, Males & Females), States & Union Territories

Malocclusion	R	U	M	F	Total	AP	ASM	GUJ	HR	HP	JK	KAR	KER	MP	MAH	ORI	PB	RAJ	TN	UP	CHA	DEL	GOA	PY
5 Yrs	12855	6284	10159	8980	19119	1896	617	2173	954	630	944	1256	842	1154	1549	1603	1001	805	1808	630	315	362	266	314
No malocclusion < 25)	100.0	98.2	100.0	98.8	98.4	99.8	99.5	100.0	100.0	99.8	100.0	99.7	99.0	100.0	99.7	99.8	100.0	99.9	99.8	99.7	100.0	99.7	100.0	99.4
Malocclusion present	0.0	1.8	0.0	1.2	1.6	0.2	0.5	0.0	0.0	0.2	0.0	0.3	1.0	0.0	0.3	0.2	0.0	0.1	0.2	0.3	0.0	0.3	0.0	0.6
Definite malocclusion(26-30)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe malocclusion(31-35)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
V severe malocclusion(36 or more)	0.0	1.8	0.0	1.2	1.6	0.2	0.3	0.0	0.0	0.2	0.0	0.3	0.8	0.0	0.3	0.2	0.0	0.1	0.2	0.0	0.0	0.3	0.0	0.6
12 Yrs	13209	6435	10136	9508	19644	1881	617	2178	956	629	941	1272	785	1124	1588	1686	1004	762	1840	630	316	350	267	318
No malocclusion < 25)	81.5	66.6	73.9	78.8	76.4	85.3	96.8	80.0	63.6	87.9	90.3	78.9	21.8	50.0	73.2	83.7	65.6	74.7	61.4	84.3	100.0	80.0	91.8	76.4
Malocclusion present	18.5	33.4	26.1	21.2	23.6	14.7	3.2	20.0	36.4	12.1	9.6	21.1	78.2	49.8	26.8	15.8	34.4	25.1	38.8	15.7	0.0	19.7	8.2	23.6
Definite malocclusion(26-30)	11.5	21.8	18.3	11.8	15.0	9.4	2.1	6.3	8.6	11.0	7.0	13.3	40.6	15.9	11.6	2.8	13.3	8.1	14.1	11.0	0.0	14.9	6.4	15.1
Severe malocclusion(31-35)	4.1	7.9	4.5	6.4	5.4	3.3	1.0	1.8	7.0	0.8	1.1	4.1	24.1	10.1	6.8	1.9	6.8	4.4	8.3	2.7	0.0	2.3	1.9	5.3
V severe malocclusion(36 or more)	2.9	3.5	3.2	3.0	3.1	2.0	0.2	11.8	20.8	0.5	1.5	3.7	13.5	23.8	8.3	11.2	14.2	12.7	14.5	2.1	0.0	2.6	0.0	3.1
15 Yrs	12636	6279	9794	9121	18915	1878	618	2178	959	629	940	1257	789	1155	1473	1668	1004	705	1801	631	314	334	268	314
No malocclusion < 25)	75.2	78.2	75.2	77.3	76.1	84.4	95.3	79.4	66.0	85.9	88.7	79.6	19.6	47.4	73.9	82.9	64.5	73.7	65.9	78.6	99.4	79.3	93.3	76.1
Malocclusion present	24.8	21.8	24.8	22.7	23.9	15.6	4.7	20.6	34.0	14.1	11.3	20.2	80.4	52.5	26.1	16.7	35.5	26.1	32.6	21.4	0.6	20.1	6.7	23.9
Definite malocclusion(26-30)	16.2	11.5	16.5	12.8	14.6	10.1	3.7	8.4	6.0	11.9	7.0	13.3	41.8	16.7	10.0	3.1	14.9	9.0	12.2	13.8	0.3	16.2	5.2	14.6
Severe malocclusion(31-35)	4.5	5.8	4.1	5.8	4.9	2.8	0.6	2.3	7.5	1.4	2.8	4.1	24.5	10.3	6.7	2.4	6.0	4.2	7.2	4.8	0.0	2.7	0.7	4.8
V severe malocclusion(36 or more)	4.1	4.4	4.3	4.1	4.4	2.7	0.3	10.0	20.4	0.8	1.5	2.9	14.1	25.6	9.3	11.2	14.5	12.9	13.3	2.9	0.3	1.2	0.7	4.5
35-44 Yrs	13812	6799	10619	9992	20611	1943	638	2363	981	628	957	1278	992	1252	1639	1885	1026	1162	1907	628	315	387	272	318
No malocclusion < 25)	52.9	63.0	59.8	52.8	56.3	76.6	83.4	49.1	57.5	62.3	79.5	68.8	20.0	47.4	66.2	79.8	58.8	69.3	54.3	54.1	91.4	70.5	70.2	55.0
Malocclusion present	44.9	36.1	39.6	44.3	42.0	23.0	6.6	47.8	41.7	36.8	20.2	26.1	79.7	52.1	31.4	19.4	41.1	30.3	42.0	44.6	8.6	27.4	28.7	43.1
Definite malocclusion(26-30)	20.7	13.8	16.5	20.3	18.4	10.1	3.9	12.0	8.5	19.4	0.2	11.0	29.0	10.9	10.5	3.8	15.5	9.7	12.4	14.0	5.4	14.5	9.6	18.9
Severe malocclusion(31-35)	10.7	7.3	9.2	9.9	9.5	4.3	1.1	8.1	8.0	7.5	2.2	5.2	24.2	8.8	7.1	2.5	6.9	4.7	8.3	7.6	1.3	5.7	8.8	9.7
V severe malocclusion(36 or more)	13.5	14.9	14.0	14.1	14.1	8.5	1.6	27.7	25.3	9.9	17.8	9.9	28.5	32.0	13.8	13.1	16.7	15.9	21.2	22.9	1.9	7.2	10.3	14.5

Table 3. Descriptive analysis of Indian adolescents aged 12-15 years according to subjective variables

	n	%		n	%
<i>Self-perceived need for treatment</i>			<i>Self-perception of chewing</i>		
No	8830	22.9	Great/good	29459	76.4
Yes	29728	77.1	Normal	6477	16.8
<i>Self-perceived oral health status</i>			Bad/very bad	2622	6.8
Great/good	20436	53.0	<i>Self-perception of speech</i>		
Normal	13804	35.8	Great/good	33045	85.7
Bad/very bad	4318	11.2	Normal	4202	10.9
<i>Self-perception of appearance</i>			Bad/very bad	1311	3.4
Great/good	22518	58.4	<i>Self-perception of relationships</i>		
Normal	11644	30.2	Not affected	30577	79.3
Bad/very bad	4395	11.4	Affected	7981	20.7

Table 4. Descriptive analysis of Indians aged 12-15 years according to DENTAL AESTHETIC INDEX variables.

	N	%
<i>Crowding in the anterior segment of the jaw</i>		
None	23019	59.7
One segment	9601	24.9
Two segments	5938	15.4
<i>Misalignment of the anterior upper jaw</i>		
<2 mm	35358	91.7
e"2 mm	3200	8.3
<i>Misalignment of the anterior lower jaw</i>		
<2 mm	37093	96.2
e"2 mm	1465	3.8
<i>Maxillary overjet</i>		
<4 mm	31811	82.5
e"4 mm	6747	17.5
<i>Mandibular overjet</i>		
<4 mm	38481	99.8
e"4 mm	77	0.2
<i>Anterior spacing</i>		
None	30307	78.6
One segment	5860	15.2
Two segments	2352	6.1
<i>Midline diastema (gaps)</i>		
0mm	33006	85.6
e"1 mm	5552	14.4
<i>Number of missing teeth in upper jaw</i>		
None	36669	95.1
One or more	1889	4.9
<i>Number of missing teeth in lower jaw</i>		
None	37440	97.1
One or more	1118	2.9
<i>Anterior over bite</i>		
<3 mm	36978	95.9
e"3 mm	1388	3.6
<i>Molar ratios</i>		
Normal	18122	47.0
Half cusp	13727	35.6
Full cusp	5783	15.0
<i>Normative need for orthodontic treatment</i>		
Absent	18045	46.8
Present	20513	53.2

Discussion

This study identified a high prevalence of malocclusion and consequently a high need for orthodontic treatment amongst Indian adolescents.^[19] It is widely accepted that adolescents are more vulnerable to socio-demographic and psychosocial factors, and that the lifestyle adopted by them may increase their susceptibility to diseases during adolescence and at future points in their life course². Adolescents may be particularly vulnerable because they no longer benefit from the care and attention given to children, and they also do not benefit from the maturity of adulthood.^[12,16]

The prevalence among Indian adolescents was somewhat consistent with the prevalence of 53.15% in Mexican schoolchildren (12-18 years) in the city of Puebla,¹⁷ however, it is greater than the high need for orthodontic treatment reported in other countries, such as Nigeria (40.7%).^[20,21]

The need for orthodontic treatment was associated with adolescents' sex, ethnic group, macro-region, self-perception of the need for treatment, oral health status, appearance, chewing, speech and relationships.

The organization and access to health services can be stratified in three distinct and interrelated levels: primary care, secondary care, and tertiary (hospital-based) care. In the area of oral health, primary care comprises a set of targeted actions to identify, prevent and solve major problems of the affected population.^[1] Secondary care covers more advanced treatments by oral health specialists in clinical and functional rehabilitation.^[22] Tertiary care in India's public oral health care programs includes some high-cost procedures, performed primarily by private providers and public university hospitals, and paid for with public funds at prices close to market value.^[23] Considering this organization of comprehensive care, orthodontic treatment is within the secondary service network.

Similarly, a variety of socio-cultural and psychological factors may influence self-perception of the need for orthodontic treatment. Adolescents who seek out orthodontic treatment may be concerned about improving their appearance and social acceptance, since people with malocclusion may feel shy, lose employment opportunities, and feel sorry for themselves, due to the compromised appearance of their teeth.^[3] Different types of malocclusions

may produce changes not only in the aesthetic acceptability of appearance but in functionality and quality of life in terms of chewing, swallowing, breathing, smiling, and speaking, as well as experiences of pain and temporomandibular joint disorders.^[24]

While the oral health strategies developed by SUS have led to positive outcomes for many Indians, inequalities based on socio-demographic factors persist.^[1] Therefore, the public system has yet to fully meet its goals of providing equitable, universal, and inclusive care to meet the oral health care needs of all Indian citizens. To better attend to core principles of the public health system, such as universality, comprehensive care, and equity with regards to oral, and consequently overall health, access to orthodontic treatment within the public health care sector needs to be continually expanded in India.

The estimates of the oral health conditions of the Indian population produced by this project have been discussed in the literature. The data used were generated over a decade ago; however, such associations had not been exploited yet by previous studies. Furthermore, given the methodological characteristics, cause-and-effect relationships between associations cannot be established. Despite these limitations, a high prevalence of need for orthodontic treatment among adolescents in India was identified, associated with demographic and subjective issues that define oral health. The high prevalence of orthodontic needs in adolescents is a challenge to the goals of India's universal public health system.

Conclusion

Thus this study showed that the higher percentage of malocclusion cases which were reported in 12-15 year old adolescents was amongst males. Based on ethnicity, the Indo-Aryans showed a higher degree of malocclusion cases. The study also concluded that many Adolescents themselves felt the need to seek orthodontic treatment. According to the region the southern macro region of India showed the highest percentage of malocclusion cases reported.

References

1. DR. R.K. BALI, DR. V.B. MATHUR, PROF. P.P. TALWAR, H.B. CHANNA, National Oral Health Survey & Fluoride Mapping, 2004

2. M.Choksi, B Patil, R. Khanna, Neogi S B, Sharma J. Health system India. 2016 Dec 7;36:S9-12
3. Travassos C. Equity in the Brazilian health care system: A contribution for debate. *Cad Saude Publica*. 1997;13:325-30.
4. Jacob Khulna, Sanitation in India: A Status Study.
5. Wamala S, Merlo J, Boström G. Inequity in access to dental care services explains current socioeconomic disparities in oral health: The Swedish National Surveys of Public Health 2004-2005. *J Epidemiol Community Health*. 2006;60:1027-33.
6. Peres MA, Peres KG, Barros AJ, Victora CG. The relation between family socioeconomic trajectories from childhood to adolescence and dental caries and associated oral behaviours. *J Epidemiol Community Health*. 2007;61:141-5.
7. Abelsen B. What a difference a place makes: Dental attendance and self-rated oral health among adults in three counties in Norway. *Health Place*. 2008;14:829-40.
8. Ngom PI, Diagne F, Benoist HM, Thiam F. Intra-arch and inter-arch relationships of the anterior teeth and periodontal conditions. *Angle Orthod*. 2006;76:236-42.
9. Nelson S. Epidemiology for the practicing orthodontist. *Semin Orthod*. 1999;5:77-84.
10. Normative and perceived orthodontic needs among 12 year old school children in Chennai, India – A comparative study, Sreedhar Reddy, Joseph John, S. Sarvanan, I. Meignana Arumugham ATI - Applied Technologies & Innovations Volume 3 | Issue 3 | November 2010 | pp. 40-47
11. Jenny J, Cons NC. Establishing malocclusion severity levels on the Dental Aesthetic Index (DAI) scale. *Aust Dent J*. 1996;41:43-6.
12. Col.Prasanna Kumar, Brig S. M. Londhe, Col Atul Kotwal SM, Col Rajat Mitra Prevalence of malocclusion and orthodontic treatment need in school children- An epidemiological study Volume 69, Issue 4, October 2013, Pages 369-374
13. Claudino D, Traebert J. Malocclusion, Dental aesthetic self-perception and quality of life in 18 to

- 21 year-old population: a cross section study. BMC Oral Health. 2013;13:3.
14. Agarwal SS, Jayan B, Chopra SS, An Overview of Malocclusion in India. Journal of Dental Health, Oral Disorders & Therapy Volume 3 Issue 3 – 2015
 15. Ajay Narayan, Suraj J Thomas, Augustin Daniel. An overview of oral health in India IJOCR, Oct-2016, 280-283
 16. Nanda Kishor KM. Public implication of oral health inequity in India, J Adv Dent rest. 2010(1)1:1-9
 17. World Health Organization. Nutrition in adolescence Issues and challenges for the health sector: Issues in adolescent health and development [Who Discussion Papers on Adolescence]. Geneva: WHO; 2005.
 18. Deepak Chauhan, Sachin Sachdev. A study of malocclusion and orthodontic treatment needs according to dental aesthetic index among school children of a hilly state of India. J Int Soc Prev Community Dent. 2013 Jan-Jun; 3(1): 32–37
 19. Dental Council of India. National oral health survey and fluoride mapping (India) 2002/2003. India: Dental Council of India; 2004.
 20. Shivakumar KM, Chandu GN, Subba Reddy VV, Shafiulla MD. Prevalence of malocclusion and orthodontic treatment needs among middle and high school children of Davangere city, India, by using Dental Aesthetic Index. J Indian Soc Pedod Prev Dent. 2009;27:211-8.
 21. Onyeaso CO, Aderinokun GA. The relationship between dental aesthetic index (DAI) and perceptions of aesthetics, function and speech amongst secondary school children in Ibadan, Nigeria. Int J Paediatr Dent. 2003;13:336-41.
 22. Subhita lakshminarayan, Role of government in public health: Current scenario in India and future scope J Family Community Med. 2011 Jan-Apr; 18(1): 26–30
 23. Paulo Capel Narvai, Collective oral health: Ways from sanitary dentistry to buccality Rev. Saúde Pública Vol.40 Special Issue, São Paulo Aug. 2006
 24. Martins AM, Jardim LA, Souza JG, Rodrigues CA, Ferreira RC, Pordeus IA. Is the negative evaluation of dental services among the Brazilian elderly population associated with the type of service? Rev Bras Epidemiol. 2014;17:71-90.

