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Prevalence of malocclusion in four zones of Karnataka state school children using Ackermann–Proffit system – An epidemiological survey



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Keywords:
Prevalence
Malocclusion
School children
Ackermann–Proffit classification
Karnataka state

ABSTRACT

Background: Epidemiological studies of malocclusion not only help in orthodontic treatment planning and evaluation of dental health services but also offer a valid research tool for ascertaining the operation of distinct environmental and genetic factors in the etiology of malocclusion.

Aims: To assess the prevalence of malocclusion in 10–16 year old school children in four zones of Karnataka state.

Settings and design: School settings and Descriptive cross-sectional survey.

Methods and material: A cross-sectional epidemiological survey was conducted in all the four zones of Karnataka. School children in the age group of 10–16 years were the target population. Population proportionate technique was employed for the sample size estimation. A total sample of 9505 was randomly selected from 102 schools all over Karnataka.

Statistical analysis used: Simple descriptive statistics were used to describe the study variables.

Results and conclusion: The prevalence of malocclusion seems to be equally distributed in all the four zones of Karnataka.

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1. Introduction

In a vast and diverse country like India, a large variation in prevalence of malocclusion exists in varying regions of our country. This can be due to variations in ethnicity, nutritional status, religious beliefs, and dietary habits. Various studies have been conducted among diverse Indian regional populations.[1–3] Malocclusion describes a deviation from the normal or ideal occlusion. Malocclusion is not a single entity but rather a collection of situations each in itself constituting a problem; many of the situations are complicated by a multiplicity of causes and are reversible through growth and development or through tooth loss and treatment.[4]

The demand for orthodontic treatment is increasing in most countries, therefore rational planning of orthodontic measures on a population basis is essential in assessing the

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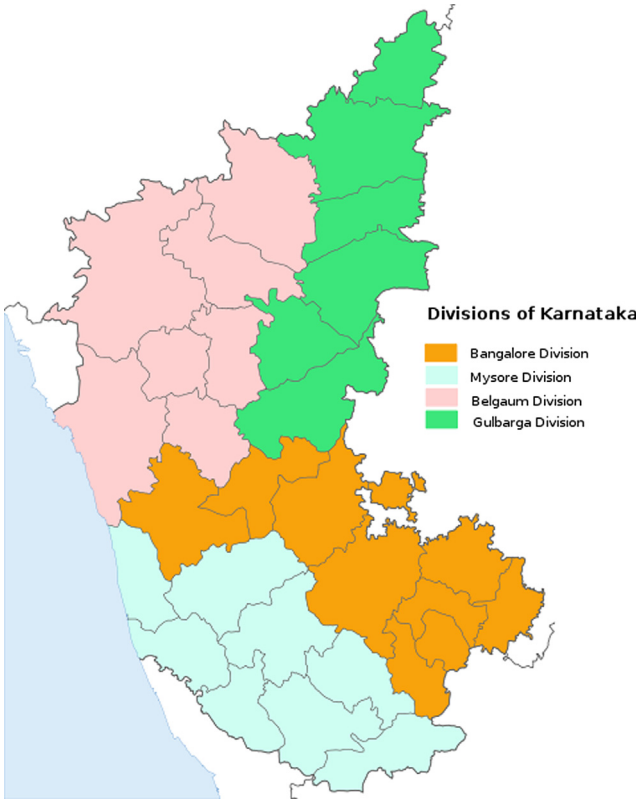
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http://dx.doi.org/10.1016/j.jpfa.2014.01.001

resources required for such a service. This stresses the importance of epidemiological studies in order to obtain knowledge about different types of malocclusion and the need for orthodontic treatment. Hence a survey was undertaken to assess the prevalence of malocclusion in school children in four zones of Karnataka.

2. Methodology

Karnataka is a vast state in India constituting 30 districts. The state covers an area of 191,976 square kilometers (74,122 sq mi), or 5.83% of the total geographical area of India. Karnataka is divided into 30 districts and 4 administrative divisions.

Bangalore division	Belgaum division	Gulbarga division	Mysore division
Bangalore urban	Bagalkot	Bellary	Chamarajanagar
Bangalore Rural	Belgaum	Bidar	Chikamagalur
Chikkaballapur	Bijapur	Gulbarga	Dakshina Kannada
Chitradurga	Dharwad	Koppal	Hassan
Davanagere	Gadag	Raichur	Kodagu
Kolar	Haveri	Yadgir	Mandya
Ramanagara	Uttara Kannada		Mysore
Shimoga			Udupi
Tumkur			



A cross-sectional epidemiological survey was conducted in the State of Karnataka, by obtaining prior permission from the Ministry of Higher Primary and Secondary Education Board of Karnataka. The survey was carried out in selected schools in all the district head quarters. Children in the age group of 10–16 years were included in the study and constituted the study population. Population proportionate technique was employed for sample size estimation. According to the population census 2011, the total population in Karnataka was 61,130,704 out of which 10–16 years old children constitute 29% (According to National Family Health Survey-2, India [1998–99], child population in the age group of 10–16 years was taken as a reference). With 95% confidence level, the estimated sample size was 9505. In the first stage of sampling, three categories of schools, namely, Government schools, Aided schools, and Private schools in each district were selected from a list of schools provided by the Karnataka Higher, Primary and Secondary Education Board by simple random sampling. In the second stage, 102 schools all over Karnataka were surveyed during the year 2012. A total sample of 9505 children in the age group of 10–16 years was selected from the randomized schools in each district all over Karnataka. Children who obtained written informed consent from parents to participate in the study were included. Exclusion criteria used were- history of previous orthodontic treatment, rampant caries, multiple missing teeth, mutilated malocclusion and other craniofacial anomalies like cleft lip and palate, facial hemiatrophy, cleido-cranial dysplasia etc.

Ethical clearance to conduct the survey was obtained from the Vokkaligara Sangha Dental College and Hospital Review and Ethical Committee. Prior permission to conduct the survey was taken from the concerned school authorities.

The oral examination was done in day light using mouth mirror and dental probe. The observations were recorded in the assessment form and later transferred to the PC. Few modifications were done to Ackermann–Proffit[5] classification of malocclusion which was used to record the malocclusion. The Dental Health check-up was done for the remaining children and an oral health education lecture was given to all the children in the school to create awareness about Dental health and Orthodontic treatment.

3. Statistical analysis

Data were coded and entered into excel sheet. To maintain the data quality (validity) rechecking and crosschecking were done during data entry phase. Later, data were transformed into SPSS windows version 16, where coding, recording, crosschecking, processing and analysis of data were done. Simple descriptive statistics were used to describe the study variables.

4. Results

Descriptive statistics for the distribution of occlusal traits of the total sample are presented using frequencies and percentages.

Table 1 – Frequency of crowding.

Division		Crowding					Total
		Absent	Mild	Moderate	Severe	Posterior crowding	
Bangalore	Count	1419	706	605	296	240	3266
	% of DIVN	43.4%	21.6%	18.5%	9.1%	7.3%	100.0%
Belgaum	Count	1187	348	355	173	127	2190
	% of DIVN	54.2%	15.9%	16.2%	7.9%	5.8%	100.0%
Gulbarga	Count	1127	353	348	118	125	2071
	% of DIVN	54.4%	17.0%	16.8%	5.7%	6.0%	100.0%
Mysore	Count	935	476	300	115	152	1978
	% of DIVN	47.3%	24.1%	15.2%	5.8%	7.7%	100.0%
Total	Count	4668	1883	1608	702	644	9505
	% of DIVN	49.1%	19.8%	16.9%	7.4%	6.8%	100.0%

Table 2 – Frequency of Angle's molar relation.

Division		Angle's molar relation					Total
		Class I	Class II division1	Class II division 2	Class II subdivision	Class III	
Bangalore	Count	2398	486	223	156	3	3266
	% of DIVN	73.4%	14.9%	6.8%	4.8%	.1%	100.0%
Belgaum	Count	1863	233	39	55	0	2190
	% of DIVN	85.1%	10.6%	1.8%	2.5%	.0%	100.0%
Gulbarga	Count	1704	271	50	46	0	2071
	% of DIVN	82.3%	13.1%	2.4%	2.2%	.0%	100.0%
Mysore	Count	1565	274	63	74	2	1978
	% of DIVN	79.1%	13.9%	3.2%	3.7%	.1%	100.0%
Total	Count	7530	1264	375	331	5	9505
	% of DIVN	79.2%	13.3%	3.9%	3.5%	.1%	100.0%

4.1. *Section 1: alignment discrepancies*

Mild to moderate crowding was observed in 40.1% of children in Bangalore division, 32.1% in Belgaum division, 33.8% in Gulbarga division and 39.3% in Mysore division. Severe crowding was reported in 9.1% of children in Bangalore division, 7.9% in Belgaum division, 5.7% in Gulbarga division and 5.8% in Mysore division in as shown in Table 1.

4.2. *Section 2: antero-posterior deviations*

The prevalence of Angle Class I, Class II and Class III molar relations were 73.4%, 26.5% and .1% in children of Bangalore division. In Belgaum division, 85.1% had Angle Class I, 14.9% of Class II and 0% of Class III molar relation. Gulbarga division children reported 82.3% of Angle Class I, 17.7% of Class II and 0% of Class III molar relation and 39.3% of children in Mysore division had Angle Class I, 20.8% of Class II and .1% of Class III molar relation as shown in Table 2. Increased over-jet was observed in 6% of children in Bangalore division, 7% in Belgaum division, 5.8% in Gulbarga division and 6.4% in Mysore division as shown in Table 3.

4.3. *Section 3: transverse discrepancy*

Cross-bite was reported in 23.1% of children in Bangalore division, 13.6% in Belgaum division, 13.7% in Gulbarga division and 18.5% in Mysore division as shown in Table 4.

Table 3 – Distribution of over-jet.

Division		Over-jet					Total
		Normal	Moderate	Increased	Reduced	Reverse	
Bangalore	Count	1812	698	197	520	39	3266
	% of DIVN	55.5%	21.4%	6.0%	15.9%	1.2%	100.0%
Belgaum	Count	1442	405	153	173	17	2190
	% of DIVN	65.8%	18.5%	7.0%	7.9%	.8%	100.0%
Gulbarga	Count	1340	433	121	164	13	2071
	% of DIVN	64.7%	20.9%	5.8%	7.9%	.6%	100.0%
Mysore	Count	1162	425	127	225	39	1978
	% of DIVN	58.7%	21.5%	6.4%	11.4%	2.0%	100.0%
Total	Count	5756	1961	598	1082	108	9505
	% of DIVN	60.6%	20.6%	6.3%	11.4%	1.1%	100.0%

Table 4 – Frequency of cross-bite.

Division		Cross-bite						Total
		Absent	Single tooth	Two or more teeth	Anterior teeth	Posterior unilateral	Posterior bilateral	
Bangalore	Count	2510	471	168	52	47	18	3266
	% of DIVN	76.9%	14.4%	5.1%	1.6%	1.4%	.6%	100.0%
Belgaum	Count	1893	225	48	19	3	2	2190
	% of DIVN	86.4%	10.3%	2.2%	.9%	.1%	.1%	100.0%
Gulbarga	Count	1786	222	43	17	2	1	2071
	% of DIVN	86.2%	10.7%	2.1%	.8%	.1%	.0%	100.0%
Mysore	Count	1608	255	62	29	19	5	1978
	% of DIVN	81.3%	12.9%	3.1%	1.5%	1.0%	.3%	100.0%
Total	Count	7797	1173	321	117	71	26	9505
	% of DIVN	82.0%	12.3%	3.4%	1.2%	.7%	.3%	100.0%

Table 5 – Distribution of overbite.

Division		Overbite				Total
		1/3 of Lower incisors	2/3 of Lower incisors	Completely locked	Edge to edge	
Bangalore	Count	1142	1292	636	196	3266
	% of DIVN	35.0%	39.6%	19.5%	6.0%	100.0%
Belgaum	Count	835	931	236	188	2190
	% of DIVN	38.1%	42.5%	10.8%	8.6%	100.0%
Gulbarga	Count	729	989	249	104	2071
	% of DIVN	35.2%	47.8%	12.0%	5.0%	100.0%
Mysore	Count	796	728	301	153	1978
	% of DIVN	40.2%	36.8%	15.2%	7.7%	100.0%
Total	Count	3502	3940	1422	641	9505
	% of DIVN	36.8%	41.5%	15.0%	6.7%	100.0%

4.4. *Section 4: vertical discrepancy*

Increased overbite was reported in 19.5% of children in Bangalore division, 10.8% in Belgaum division, 12% in Gulbarga division and 15.2% in Mysore division as shown in Table 5.

4.5. *Section 5: skeletal deviations*

Straight profile was reported in 27.9% of children in Bangalore division, 33.7% in Belgaum division, 38.3% in Gulbarga division and 32.6% in Mysore division. 71.2% of convex profile was reported in children of Bangalore division, 65.8% in Belgaum division, 61.3% in Gulbarga division and 66.9% in Mysore division. .8% of concave profile was observed in children of Bangalore division, .5% in Belgaum division, .4% in Gulbarga division and .5% in Mysore division which is represented in Table 6.

5. Discussion

Indices like IOTN, DAI and HMAR were used in the reported studies to record the severity of malocclusion. Ackermann–Proffit classification of malocclusion can also be used which is not reported in any of the studies. This classification overcomes the major limitations of the Angle system by considering all the three planes of space i.e, sagittal, transverse and vertical planes to record malocclusion. The logical approach used in constructing the classification is similar to

Table 6 – Distribution of profile.

Division		Profile					Total
		Straight	Anterior divergent	Posterior divergent	Convex	Concave	
Bangalore	Count	912	3	2	2324	25	3266
	% of DIVN	27.9%	.1%	.1%	71.2%	.8%	100.0%
Belgaum	Count	738	1	0	1441	10	2190
	% of DIVN	33.7%	.0%	.0%	65.8%	.5%	100.0%
Gulbarga	Count	794	0	0	1269	8	2071
	% of DIVN	38.3%	.0%	.0%	61.3%	.4%	100.0%
Mysore	Count	645	0	0	1324	9	1978
	% of DIVN	32.6%	.0%	.0%	66.9%	.5%	100.0%
Total	Count	3089	4	2	6358	52	9505
	% of DIVN	32.5%	.0%	.0%	66.9%	.5%	100.0%

that employed for preparing computer programs which is an additional advantage. Hence this system lends itself well to surveys, where data processing by computers is desired. Hence we have used the Ackermann–Proffit[5] classification in our survey to record the malocclusion. The results of our study could not be directly compared to any studies as division wise results are not reported.

There were very few studies[6–10] conducted to assess the severity of malocclusion in India. These studies were carried out in different parts of India, at different times with varied objectives. A survey[11] conducted in Haryana interpreted that Class I malocclusion was more prevalent than class II and least seen was class III. Crowding and over-jet was observed to be higher in our study which is in correspondence with the studies by Gardener and Valiathan.[12,13] The most important single factor that has influenced extreme of variation in prevalence of malocclusion is differences in methodology in recording the traits of malocclusion found many difficulties to compare these findings because of the great variability of methods and indices used by one examiner and another to record occlusal relationships. Distribution of different type of malocclusion may show great variability even in a population of same origin.

6. Conclusion

The epidemiological data on the prevalence of malocclusion is an important determinant in planning appropriate levels of orthodontic services. This baseline data can be used for proper treatment planning and further research.

Conflicts of interest

All authors have none to declare.

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