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## Research Article

# Dental Caries Experience among 12 Year Old School Children from Macedonia and India

### Abstract

The aim of the present study was to compare the dental caries status of the 12 year old children of the eastern region of Macedonia and Budgam district of Jammu and Kashmir state of India.

**Material and Method:** In this comparative study (N=396) 12-year old children from Macedonia and 592 from India were included. Dental status of participants was evaluated using the 2013 World Health Organization caries diagnostic criteria for Decayed, Missing or Filled Teeth (DMFT) by 2 calibrated examiners in Macedonia and by the single examiner in India.

**Results:** The mean value of the DMFT index for the whole sample of India was  $1.91 \pm 1.76$  whereas for Macedonia it was  $3.46 \pm 2.90$ , and the difference was statistically significant ( $p < 0.001$ ). In the Indian sample, 152 (25.68%) and in Macedonia sample 81 (21.46%) of the individuals were caries free (DMFT=0). In both countries, the female children have higher mean DMFT values. The filled component of DMFT was more among the Macedonian children which shows the higher utilization rates of dental care in that region in comparison to Indian counterparts.

**Conclusion:** The mean DMFT of children from Macedonia was higher in comparison with children from India. The most possible reason for this can be the fact that sugar consumption in India was less in comparison with Macedonia.

## Introduction

Dental caries is the most prevalent dental affliction of childhood. Despite credible scientific advances and the fact that caries is preventable, the disease continues to be a major public health problem. In the developing countries changing life-styles and dietary patterns are markedly increasing the caries incidence [1]. Growing children need proper guidance for healthy growth, upkeep and hygiene of their teeth [2,3].

The oral health of children 12 years old is the object of several epidemiological studies conducted around the world [4]. According to the World Health Organization (WHO, 2013) [5], the importance given to this age group is due to the fact that it is the age that children leave primary school. Thus, in many countries, is the last age at which data can be easily obtained through a reliable sample of the school system. Moreover, it is possible that at this age all the permanent teeth except third molars, have already erupted. Thus, the age of 12 was determined as the age of global monitoring of caries for international comparisons and monitoring of disease trends.

To assess the difference in rate of dental caries among children in the developing nations, we have considered children 12 years old from India and Macedonia, although both are in different continents and have differences in respect to demographic parameters. India being the second largest populated country in world, Macedonia takes the central part of the Balkan Peninsula in Europe. The whole territory

of the Republic of Macedonia consists of just 8 non-administrative units-statistical regions and 84 municipalities as administrative units [6], whereas India has 29 states and 7 union territories. But the currency rate of two countries are almost similar with Macedonian Denar is marginally higher than Indian Rupee.

For the current study, Eastern region of Macedonia is taken and Budgam district from Jammu & Kashmir district of India. The reason of for taking these two sites is that in Macedonia, there are couple of programs concerning oral health of children - National Caries Preventive Program and National Strategy of Prevention of Oral Diseases in children at age 0-14years [7]. In India there is no nationwide government funded preventive program regarding oral health but state of Jammu & Kashmir state runs a school health program which comprises dental health and is envisaged as an important tool to provide preventive, primitive and curative health services to the children.

The East Region is mainly a mountainous region and comprises the extreme East of the Republic of Macedonia. It spreads along the Bregalnica River, over the basins of Shtip, Maleshevo and Pijanec and the field of Kochani. The region comprises 14.2% of the total area of the Republic of Macedonia, with 8.7% of the total population in 2011, and it is one of the least densely populated regions with 50.7 citizens per km<sup>2</sup>. On the other hand Budgam is one of the newly formed districts of the Jammu and Kashmir state, situated at an average height of 5,281 feet above sea-level. The topography of the district is mixed with both mountainous and plain areas. The total population of the district is 7.35 Lacks with a literacy rate of 57.98%. The density of population in the district is 537 citizens per km [8].

The AIM of the present study was to compare the dental caries status of the 12 years old children of the Eastern region of Macedonia and Budgam district of Jammu and Kashmir state of India.

### Materials and Methods

The samples of the study were taken from two countries- India and Macedonia. Ethical clearance was taken separately at both countries from the concerned authorities, for Macedonia it was Ministry of Health and for India it was Chief Medical Officer, Budgam district, Jammu & Kashmir state. At both sites, it was decided to use cluster sampling because it was more economical and achievable within the constraints of resources and finance.

For Indian sample, the study was carried out in Budgam District of Kashmir Division of Jammu and Kashmir State.

A two-stage sampling technique was used to achieve representative sample of 592. In first stage, the schools were randomly selected. Four government schools were selected based on probability proportional to enrolment size (PPE). According to PPE, the schools with high number of regularly attending students were more likely to be selected than schools with low number of students regularly attending. In second stage, the students from these schools were randomly selected to be included in the study through simple random sampling procedure.

For a national pathfinder survey, between 10 and 15 sampling sites are usually sufficient. A two-stage sampling technique was used to achieve representative sample of 396. The sampling in eastern region of the Republic of Macedonia is based on the administrative divisions. In our survey we included main urban centres and small towns and rural areas. Random sampling of subjects within each school was applied.

The Macedonian sample involved 396 school children from sixth and seventh grades, attending 9 central and 13 regional schools in the cities and villages from the Eastern region of Macedonia. Based on the information from the Macedonian State Statistical Office [9] there are approximately 3844 children attending sixth grade and 1945 attending seventh grade of the primary school in this region. Permission for the study was obtained from the school authorities, who sought and obtained consent from the parents of the children concerned. Children from all classes (sixth and seventh grades) in these schools were included in the study. Two calibrated dental examiners conducted the dental examination and the clinical part of the form was filled out by two other trained dentists (kappa values for inter-examiner reliability was 0.85).

Clinical data for both samples was collected by means of Type III clinical examination in daylight using plain dental mirrors and probe, which took place in a separate room with the subject seated on the chair. At both sites, World Health Organization 2013 [5] caries diagnostic criteria were followed. The Decayed, Missed, or Filled Teeth (DMFT) was used to evaluate children’s dental caries experience.

### Statistical analysis

Simple descriptive statistical tests were used in the form of

percentage and frequency distribution. T-Test was used for the comparison of means. The SPSS software version 20.0 was used for performing the statistical analysis. The level of significance was set at  $P < 0.05$ .

### Results

Total 396 and 592 subjects were included in the study for Macedonian and Indian sample respectively. The distribution of subjects in terms of gender and according to area of residence is shown in Table 1.

The mean value of the DMFT index for the whole sample of India was  $1.91 \pm 1.76$  whereas for Macedonia it was  $3.46 \pm 2.90$ , and the difference was statistically significant ( $p < 0.001$ ). In the Indian sample, 152 (25.68%) and in Macedonian sample 81 (21.46%) of the individuals were caries free (DMFT=0) (Table 2).

In Figure 1, the box plot of DMFT score for both Indian and Macedonian is given, showing the range, quartiles and outliers.

The mean DMFT index with SD was calculated for each sample (according to gender and area of residence) and these results are reported in Table 2. Unpaired T - test was performed to see if there are differences in mean DMFT index between sex orientation groups among the two samples ( $p < 0.001$ ) and within the sample ( $p = 0.03$ ), corresponding p-values indicated that there was statistically significant differences between gender groups. In both countries, the female children have higher mean DMFT values.

The DMFT components, DT, MT and FT, were also analyzed. Their mean values with SD’s for both samples are provided for in Table 3. The FT component is markedly higher in Macedonian sample ( $1.43 \pm 1.90$ ) than Indian sample ( $0.09 \pm 0.35$ ).

### Discussion

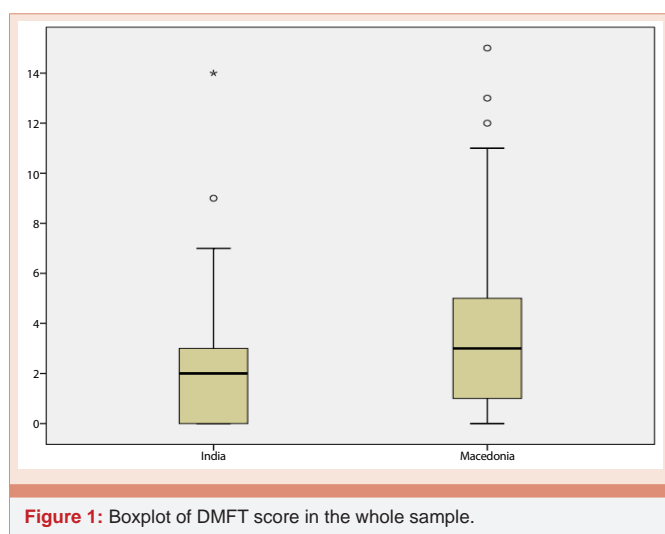
Dental caries and periodontal diseases are most common oral diseases showing striking geographic variations, socio-economic

**Table 1:** Distribution of individuals studied in sample.

		Male	Female	Total
India	Urban	282	175	457
	Rural	81	54	135
	Total	363	229	592
Macedonia	Urban	122	121	243
	Rural	79	74	153
	Total	201	195	396

**Table 2:** Caries free individuals, DMFT scores and equality tests for mean DMFT index.

	Caries free N (%)		DMFT Mean $\pm$ SD		p value
	India	Macedonia	India	Macedonia	
Whole population	152 (25.68)	85 (21.46)	1.91 $\pm$ 1.76	3.46 $\pm$ 2.90	$P < 0.001$
Male	114 (24.95)	53 (26.37)	1.84 $\pm$ 1.63	3.37 $\pm$ 3.04	$P < 0.001$
Female	38 (28.15)	32 (16.41)	2.15 $\pm$ 2.14	3.56 $\pm$ 2.76	$P < 0.001$
			$P = 0.03$	$P = 0.03$	
Urban	95 (26.17)	53 (21.81)	1.9 $\pm$ 1.78	3.31 $\pm$ 2.86	$P < 0.001$
Rural	57 (24.89)	32 (20.92)	1.93 $\pm$ 1.71	3.7 $\pm$ 2.97	$P < 0.001$
			$P = 0.65$	$P = 0.82$	



**Figure 1:** Boxplot of DMFT score in the whole sample.

**Table 3:** DT, MT, FT Mean (SD) scores for the whole sample.

	India	Macedonia
DT	1.56(1.48)	1.85(2.22)
MT	0.26(0.81)	0.19(0.61)
FT	0.09(0.35)	1.43(1.90)

patterns and severity of distribution all over the world [10]. The extent of epidemiological data varies widely between countries. For many countries there is very little information, and few countries have undertaken repeated cross-sectional data on representative samples of their population.

In India, many epidemiological studies on caries and periodontal status in 12 year old children have been carried out [11]. Furthermore, systemic national and local data on oral health of 12 year old children is also available [12]. While in the studies for Macedonia, the data on oral health condition of the same age group of children are very few [13,14].

In the present study, the samples were taken from two countries - India and Macedonia taking into consideration the index age group of 12 years old as the available data shows and this gives the data on caries in the early adolescence in children in both countries making the comparison meaningful. Also 12 years is the age at which children leave primary school and is the last age at which a reliable sample can be obtained easily through the school system. Moreover, at this age all permanent teeth, except third molars would have been erupted.

The mean DMFT of children from India was  $1.91 \pm 1.76$  whereas for Macedonia it was  $3.46 \pm 2.90$  which clearly indicated the increased caries in the latter country. Although both countries are developing nations still a major difference is evident. The most possible reason for this could be the difference in the oral hygiene practices and the intake of the sugars in both countries. Many previous studies done in India are suggestive of the fact that sugar consumption in India was less than in many other developing countries as Nigeria [15], Burkina Faso, Africa [16] and Kuwait [17]. The relation between the regular consumption of sweets and higher dental caries amongst school children has been well established in many previous studies [18].

While according the data presented by WHO, despite the marked decline in dental caries in developed countries over the past 30 years, dental caries remain high in many developed countries and is a major public health problem. Countries with scores above 3 DMFT, have failed to meet the WHO global goal for the year 2000. In Europe, the Baltic States and Eastern Europe have high levels of caries [19].

Macedonia as a developing country in similar region has a higher consumption of sugars as compared to India which can be accounted for the increased level of caries in this country as compared to the India. Previous studies have reported a higher mean DMFT of about 3.56 in 12 year old children from Skopje city [13] and 4.98 in 15 Years old children from the Vardar region of the Republic of Macedonia [20].

Nutritional status affects the teeth during the pre-eruptive stage, however, this nutritional influence is much less important than the post-eruptive local effect of dietary practices on caries formation. Post eruptive contact with readily fermentable carbohydrates for a longer duration leads to cavity formation or caries.

Previously researchers have also showed concern over the absence of comprehensive programme of applying fissure sealants, and fluoride applications in children of Macedonia which can also be accounted for high DMFT among 15 years old children [20,21]. Though such preventive programs are also absent in most parts of India, the use of fluoride in form of fluoridated paste on large scale can be thought to be the differentiating factor in two populations.

Other findings of the present study show that the filled component of mean DMFT was more existent among the Macedonian children, showing the higher utilization rates of dental care in that country in comparison to India. Previously researchers have also reported higher F component in the DMFT in children of Macedonia. It has been reported that FT (F=34.97%), were the major part of DMFT in adolescents [20].

Furthermore the Higher DMFT in children of Macedonia can be a result of the fact that, dental hard tissues are not self-healing, established caries leaves a scar, the tooth either remains decayed, or if treated it is extracted or filled [15].

Although epidemiological data on caries of children in developing countries is scarce, knowledge of the life history and patterns of caries can be utilized to give a more detailed epidemiological picture [22]. The current study has provided a global depiction of caries prevalence difference among two developing nations from Asia and Europe.

Clearly, the requirements to reduce the dental caries in these populations are such that a single individual has least control and mostly or entirely can be improved at the population or group level. Decisions on packages of interventions take into account the "common risk factor approach" and makes the integrated management of the major childhood diseases more cost effective, because clusters of diseases can often be treated together sharing the same treatment protocols, the same drugs and the same services.

## Conclusion

The mean DMFT of children from Macedonia was higher in



comparison with children from India. The most possible reason for this can be the fact that sugar consumption in India was less in comparison with Macedonia. One obvious aspect of a positive strategy would be a move from the current way in which oral health services are directed to children in Macedonia, towards preventive and promotional activities under the umbrella of Minimal Intervention Dentistry. The present study concludes that in 12 year olds even after having better treatment rates in Macedonia when compared to India, the rate of tooth decay is higher which suggest that there is a need of more extensive preventive measures and change in diet pattern is needed for Macedonian children.

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