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Influence of Paternal Socioeconomic Variables on Dental Caries in Lucknow City (India): A Case- Control Study

Rachana Bahuguna[1*], Suleman Abbas Khan[1], Saima Yunus Khan[2] and Syed Naved Zahid[3]

[1]Department of Pedodontics with Preventive Dentistry, Saraswati Dental College and Hospital, Lucknow, India.
[2]Department of Pediatric and Preventive Dentistry, Aligarh Muslim University, Aligarh, India.
[3]Department of Orthodontics and Dentofacial Orthopedics and Dental Anatomy, Aligarh Muslim University, Aligarh, India.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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Case- Control Study

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ABSTRACT

Introduction: Dental caries, an important public health problem of children and adolescent has multi factorial causation. Different studies have brought out varying prevalence and attributed its increase to dietary factors, poor oral hygiene, lack of knowledge and paternal sociodemographic factors. The present Case – Control study was conducted to investigate the association between paternal variables and dental caries among 1 -18 year old children and adolescent of Lucknow city, India.
Methods: Study was carried out in the Outpatient Department of Pedodontics and Preventive Dentistry, Saraswati Dental College and Hospital, Lucknow (U.P) India. Study included 400 cases with dental caries and equal number of controls without dental caries. Cases were matched with controls on three variables (age, sex and religion). Clinical examination (DMFT/deft) was done in

**Corresponding author: Email: jaindratul@yahoo.co.in;*

accordance with W.H.O. criteria for epidemiological studies. Participants with fluorosis, discernible enamel hypoplasia were excluded. Patients and their fathers were interviewed using a self-prepared questionnaire.
Results: In Clinical examination; mean (DMFT/deft score) was 2.77±2.25, major contribution by "D" component. Mandible was most affected arch with posteriors as most affected teeth. Educational status of father's in control group was significantly better than the study group ($p<0.001$). A Statistically significant difference was observed between both the study groups as regards father's occupation
($p<0.001$). The monthly income of father's in control group was significantly higher than the study group ($p<0.001$). The association and strength of association was judged by Chi square test and Odds ratio at 95% confidence interval between father's socioeconomic variables and dental caries.
Conclusion: Paternal socioeconomic variables are significantly associated with dental caries among their children. Preventive measures are needed towards healthy oral practices keeping in view the paternal socioeconomic variable inequalities.

Keywords: Dental caries; educational status; occupations; income.

1. INTRODUCTION

Dental caries is an infectious and multi-factorial disease. It remains the single most common disease of childhood. More than 80% of the pediatric population is affected with dental caries by the age of 17 years [1]. Childhood caries is an acute, rapidly developing dental disease. Early onset and rampant clinical progression makes childhood caries a serious public health problem [2]. In a developing nation like India, dental caries have shown an increasing trend over a relative period of time. Earlier studies revealed the prevalence as 55.5%in 1940 which rose to 68%in 1960 [3]. The epidemiological studies now conducted are more detailed and scientifically sound. These studies have shown a variation of 19.2 – 77% in different parts of India [4,5,6,7,8]. This is largely attributed to increased frequency of sugar consumption, poor oral hygiene and dietary habits, lack of knowledge, attitude, inadequate exposure to fluoride and sociodemographic factors.

The DMFT index is commonly accepted by the dental community for measuring caries prevalence in the population and has been used repeatedly in the National Health and Nutrition Examination Survey (NHANES) [9]. Based on DMFT index, the World Health Organization (WHO) has announced the global oral health goal of DMFT < 3 in 12 year old by the year 2015 [10].

Although the etiological mechanisms of dental caries are well known, the early life events which may contribute to dental caries continue to be poorly understood [11]. Reviewing the literature related to research on risk factors for dental caries revealed that mother-related variables have been receiving a biased attention, compared with father-related variables. Salwa and Sadhan [12] also found a significant association between maternal education and dental caries. However, a study conducted in Brazil [13] studied the relationship between early childhood dental caries and behavior, attitude and socioeconomic background of parents. They reported that prevalence of early childhood caries was 28.2%; with a significant association between paternal educational level and severe early childhood dental caries. They concluded that fathers should be viewed not merely as providers but have an important influence on the child's development as a whole.

So, the researcher identified the need to focus on exploring the impact of socioeconomic variables related to father and dental caries among their children with a Case - Control approach. Case – Control study, an important aspect of Analytical epidemiology, estimates the association and strength of association between the disease under study and the risk factors and helps to modify the preventive programmes accordingly. Literature available on a study design with Case-Control approach on dental caries is quite scarce in Lucknow city, the state capital of Uttar Pradesh (U.P) India.

Hence the present study was aimed to investigate the association between variables related to fathers' characteristics (education, occupation and monthly income) and dental caries among their children and adolescent.

2. METHODS

This study was conducted at the Outpatient Department of Pedodontics and Preventive

Dentistry Department, Saraswati Dental College and Hospital, Lucknow (U.P) India.

The sample size was determined according to the WHO manual for the sample size determination in health studies [14] with an anticipated population proportion of 44% and with an absolute precision of 5% at 95% confidence interval, indicating that the minimal sample size required for the study was calculated to be 399 cases. So, 400 children with dental caries (i.e., DMFT/deft>0) were included in the study with an equal matching number of controls (n=400) by age, sex and religion were taken. All newly diagnosed cases and even those treated earlier within one year of time, covering all the six OPD days at the Outpatient Department of Paediatric and Preventive Dentistry, Saraswati Dental College and Hospital, Lucknow were included and the participants were divided into the following groups - Group A (1-6 year), Group B (6-12 year), Group C (12-18 year).There was no randomization. The controls were free from the disease under study (i.e., DMFT/deft = 0). They were drawn from the nearby schools of Saraswati Dental College and Hospital, Lucknow. The names of the schools and the participants were kept confidential. Exclusion criteria were set - participants with fluorosis, discernible enamel hypoplasia and those who refused to participate in the study were excluded.

Clearance of Ethical committee of Saraswati Dental College and Hospital, Lucknow was obtained. An informed consent was taken from parents of both the cases and the controls and they were informed about the strict confidentiality of the procedure.

Participants and their fathers were interviewed and the data were recorded on a self-prepared questionnaire. Pilot study was conducted on 10 children and their father's before the start of the main study. These 10 children were not included in the main study sample. The study was conducted by a single examiner .Standardization and validity of the questionnaire was done before the conduct of the study. The Kappa value was found to be 0.98.

The first part of the questionnaire dealt with the personal characteristics of the participant child (age, religion, sex) and his/her father's characteristics (level of occupation, monthly income, education) [15]. The second part of the questionnaire dealt with the clinical examination of the participants. DMFT/deft index was recorded in accordance with WHO criteria for epidemiological studies [16] using a sterilized mouth mirror and a community periodontal index (CPI) probe. The oral examination was performed for both the cases and the controls under artificial light at the OPD and mobile dental vans with portable dental chairs. Data analysis was done by employing SPSS (Statistical Package for Social Sciences) version 15 software. Descriptive statistics (frequency and percentages), Chi square test, odds ratio at 95% Confidence interval were applied. A significant difference was considered at $p<0.05$.

3. RESULTS

Clinical examination (mean DMFT/deft) score for the present study was observed to be 2.77±2.25, with major contribution by the "D" component (Table 1). The mandible was the most affected arch with the posteriors as the most affected teeth (Table 2). The response rate was found to be 100%, no loss of cases or controls. The proportion by gender was observed to be 36.25% males versus 63.75% females in cases. In controls the males were 37.75% versus 62.25 %females. Maximum numbers of subjects in both the groups were aged 9-12 years followed by 15-18 years.

Table 1. DMF mean score pattern of children with dental caries

Pattern	No. of patients	Mean	Standard deviation	Range
Decayed teeth	381	2.60	2.20	1-14
Missing teeth	52	1.69	1.18	1-6
Filled teeth	19	1.47	0.96	1-4
DMF score	400	2.77	2.25	1-14

Table 3 shows that the educational status of fathers in the control group was significantly higher than that of the study group ($p<0.001$). Graduate and postgraduate fathers of children within the control group were more than those within the cases (42.75% vs. 22.75%, respectively). On the other hand, all fathers who had below university level of education were higher among the cases group than the control group. The occupation of fathers in the control group was significantly different from that in the study group ($p<0.001$). Government employed fathers were more among the control group than

the cases group (30.5% vs. 15.5%, respectively), while self-employed fathers were less among the control group than the cases (45% vs. 60.5%). The monthly income of fathers in the control group was significantly higher than that in the study group (p<0.001). The percentage of fathers who earned more than 10,000 Indian Rupees monthly (i.e. >161 US$) was higher among the control group than the cases group (42.5% vs. 22.75%) respectively. On the other hand, the percentage of fathers who earned less than 10,000 Indian Rupees monthly (i.e. < 161 US$) were less among the control group than the cases group. Table 3 also depicts the Chi square test and odds ratio pertaining to education, occupation and monthly income of fathers. In cases, whose father were illiterate (OR=1.06), just literate (OR=2.80), primary educated (OR=3.92), middle level and high school educated (OR= 1.64 and 1.37) respectively had a higher risk of dental caries than the control group. Similary pertaining to occupation, cases whose father were self employed (OR=1.87), unemployed (OR= 1.23) and with a monthly income of <2000(OR=1.09),2000-5000 (OR= 1.84) and 5000-10,000(OR=1.45) had higher risk of dental caries.

Table 2. Distribution of dental caries by location and affected teeth

Location	No. of patients	%
Affected arch		
• Maxillary	160	40.0
• Mandibular	203	50.8
• Both	37	9.3
Affected teeth		
• Anterior	48	12
• Posterior	336	84
• Both	16	4

4. DISCUSSION

In clinical examination of the present study mean DMFT score was found to be 2.77±2.25, with the major contributory factor being “D” component of DMFT score, this is in agreement with David et al. [5] who reported mean DMFT score as 0.5 with 91% contributed by “D” component. ”D” – decayed component of DMFT was the major contributory factor due to low perception of need for treatment, accessibility, availability and cost as factors which do play their role. Rehman et al. [17] reported a DMFT score of 3.27 with “D” as the main factor. Similarly Petersen et al. [18] reported a DMFT score of 8.1 and 2.4 respectively for 6 and 12 year old, probable explanation being that dental care is still considered to be neglected and expensive.

The most common arch affected in the oral cavity by dental caries in the present study was found to be mandibular arch with the posteriors as the most affected teeth. David et al. [5] also reported the mandibular arch to be the most affected by dental caries. Dental caries show some relation to arches regarding prevalence pattern and the mandibular arch is affected more often than the maxillary arch [19]. However, the reason for the difference between the arches in caries susceptibility has not been well documented.

Chan et al. [20] and Kuwanka et al. [21] found the maxillary arch with the anteriors as the most affected. Maxillary arch is more affected; probably the pull of gravity plays its role in draining the saliva from the maxillary arch and collecting around the mandibular arch. Mahejabeen et al. [6] found the posteriors to be the most affected teeth compared to anteriors confirming our finding, reason being the anatomical differences that include pits and fissures with broader surface area, accessibility and dexterity of brushing.

More than 100 risk factors have been found to be associated with dental caries. This study reflected a statistically significant difference regarding father’s income between the two study groups. This finding is similar to that reported by Chan et al. [20], Mitrakul et al. [22], Ravera et al. [23] and Scarpelli et al. [24] who noted that families with low incomes had significantly higher prevalence of dental caries among children (p=0.0142). Father, being the earning member, so his income definitely has an impact on health through a direct effect on the material conditions which are necessary for biological survival and the opportunity to control life circumstances [25]. Similar views were expressed by Sabbah et al. [26].

The present study revealed a statistically significant difference between both the study groups regarding father’s occupation (p<0.001). This finding was also ascertained by Namal et al. [27] (p<0.001), Tagliaferro et al. [28] and Da Silva et al. [29]. Father’s employment plays a basic defining role in the society as type of employment provides a primary source of status, purpose, income, social support, structure to life and means of participation in the society [25].

Table 3. Comparison between Father's socioeconomic variables in cases and controls

Father's	Controls (n=400)		Cases (n=400)		p-value	Chi - Square	Odds ratio (95%CI)
Socioeconomic variables	**No.**	**%**	**No.**	**%**			
Education							
• Illiterate	17	4.25	18	4.5	** **<0.001**	61.145	1.06 (0.539-2.091)
• Just Literate	4	1	11	2.75			2.80 (0.884-8.867)
• Primary	15	3.75	53	13.25			3.92 (2.170-7.081)
• Middle	48	12.00	73	18.25			1.64 (1.104-2.428)
• High School	85	21.25	108	27			1.37 (0.990-1.898)
• Intermediate	60	15	46	11.5			0.74 (0.488-1.112)
• Graduate	147	36.75	71	17.75			0.37 (0.268-0.515)
• Postgraduate	24	6	20	5			0.82 (0.448-1.518)
Occupation							
• Government employed	122	30.50	62	15.50	** **<0.001**	28.966	0.42 (0.296-0.590)
• Private sector	89	22.25	85	21.25			0.94 (0.674-1.319)
• Self-employed	180	45.00	242	60.50			1.87 (1.417-2.480)
• Unemployed	9	2.25	11	2.75			1.23 (0.503-2.998)
Monthly income (INR)*:							
• <2000	12	3.00	13	3.25	** **<0.001**	37.362	1.09 (0.489-2.410)
• 2000-5000	69	17.25	111	27.75			1.84 (1.312-2.587)
• 5000-10000	149	37.25	185	46.25			1.45 (1.093-1.922)
• >10000	170	42.50	91	22.75			0.40 (0.293-0.541)

** One US $ is almost equivalent to 62 Indian Rupees, ** Figures in bold depict statistically significant values. P value of probability, Chi square test, Odds ratio at 95% confidence interval*

Salwa and Sadhan [12] found a significant association between maternal education and dental caries, suggesting that mother's education was a key determinant on their children's health. However, the present study showed a statistically significant difference between both study groups regarding father's education ($p<0.001$). This finding was in agreement with that of Wan et al. [30] and Tadakamadla et al. [31], who deduced that, among all sociodemographic factors only father's education was found to be statistically associated with dental caries. This finding has also been well supported by Chan et al. [20] who stated that fathers who are well educated are in a better position to cater to the needs and at the same time education prepares for life by enabling practical, social and emotional development of the child [25]. In a developing country like India, role of the male as the head of the family is still very important despite the increase of women in the labor force [32].

This study had some limitations that should be addressed- it was hospital based and in some cases the information regarding the socioeconomic variables of fathers were provided by the accompanying person, rather than father himself. So an element of memory or re call bias was there. However the extensive evaluation with a case – control study design in an age group of 1 – 18 years having a large sample size (n= 800) provided an opportunity to study the impact of paternal characteristics which probably made the study more interesting and were the key strengths.

5. CONCLUSION

Paternal socioeconomic variables (Education, occupation, monthly income) are significantly associated with dental caries among their children. Fathers should be viewed not merely as providers but as an important influencing factor on the child's development as a whole.

6. RECOMMENDATIONS

Preventive and educative programmes should be properly planned, framed, implemented and in the spirit of United Nations Development Programme "Think Globally act locally" keeping

in view the inequality of paternal socioeconomic variables.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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