Relationship between Socioeconomic Status and Dental Caries among School Children in Riyadh City, Saudi Arabia

Al-Maha Mohammed AlHussain*, Nouf Mohammed AlYemni*, Mona Saud Aldawsari*, Loulwa Khaled Alwabel*, AlaMajeid AlAbduldaym*, Lougin Khaled Brekeit*, Shahzeb H Ansari**

Abstract

Objectives: To determine the association between socio-economic indicators and caries status of the school children, in Riyadh city, Saudi Arabia. *Materials and Methods:* A cross-sectional descriptive study was conducted among 433 randomly selected school children from Riyadh city. Socioeconomic statuswas assessed through interviewing the children using a structured, close-ended questionnaire. Caries status was assessed by using the DMFT (Decayed, Missing, and Filled Tooth) index. All the responses obtained from questionnaire were coded and analyzed. Means and standard deviations were computed for the DMFT score. One-way ANOVA (Analysis of Variance) and Tukey's multiple comparison tests were performed to determine significant differences between mean DMFT scores and socio-economic variables. *Results:* Children showed an overall mean DMFT score of 5.04 ±0.32. The socioeconomic indicators such asoccupational status of the mother ($p<0.001$), education level of the mother($p = 0.001$) and father (p=0.014), type of accommodation ($p = 0.002$), presence of domestic help at home (p<0.001),number of siblings ($p=0.003$) and family income (p<0.001) were found to be associated with the DMFT scores of the children. *Conclusion:* Study is suggestive of clear association between socioeconomic status of the children's family and their caries status. Several socio-economic indicators have been implicated in the association of dental caries status of the children.

Keywords: Association; DMFT Index; Education; Income; Father; Mother; Occupation; Socio-Economic Status.

Introduction

Dental caries is a malicious condition of the teeth which has recently been recognized as a global pandemic [1]. According to a report published in a WHO bulletin, dental caries is a well-recognized problem in industrialized nations that affects 60-90% of school going children and a vast majority of the adult population as well [2]. The same report also posits that the incidence and severity of dental caries differs not just from country to country but also within different regions of the same country. It further observes that the current patterns of oral disease including dental caries on the global and regional level have distinct risk profiles across different countries which are associated with living conditions, lifestyles and how preventive oral care strategies are implemented. Epidemiological studies conducted on the global level from the 1980s reveal that caries has been on a decline in 12 year old adolescents that live in high or middle income countries whereas a contrast is seen in the pre-school children where caries has been largely stable or even increased slightly [3].

One such study [4] was done in Japan to evaluate the correlation between socio-economic factors and dental caries in developing countries. This study revealed that the DMFT index which is an indicator of caries prevalence, showed a positive correlation with various socio-economic variables explored in the study including life expectancy, adult literacy rate,

Author's Affiliation: *Dental interns Riyadh Colleges of Dentistry and Pharmacy, An-namuthajiya Campus, P. O Box: 84891, Riyadh 11681, Kingdom of Saudi Arabia. **Lecturer, Department of Preventive Dentistry, Riyadh Colleges of Dentistry and Pharmacy, An-namuthajiya Campus, P. O Box: 84891, Riyadh 11681, Kingdom of Saudi Arabia**.**

Reprints Requests: Al-Maha Mohammed AlHussain, Dental interns Riyadh Colleges of Dentistry and Pharmacy, An-namuthajiya Campus, P. O Box: 84891, Riyadh -11681, Kingdom of Saudi Arabia.

E-mail: pankajdatta97@gmail.com

Received on 16.01.2017, **Accepted on** 27.01.2017

school attendance rate, population employed in the public sector, age group of 15-64 years and degree of urbanization. A similar study was conducted in Sao Paulo, Brazil [5] to explore the association between dental caries among school children and various socioeconomic indices at the town level. This study examined 15,385 children from 129 different towns and cities in Sao Paulo and observed dental caries from two perspectives, from the DMFT index and the care index which is the proportion of decayed teeth that have already been filled. The variables used to assess the socio-economic indices were child development index, human development index, illiteracy rates among subjects older than 20 years of age, household income etc.

The results showed that a higher DMFT index was associated with low child development index and un-fluoridated water supply so this indicates that socioeconomic status and dental caries are significantly correlated. Another study [6] conducted on school children attending public schools in the south of Brazil in 2002 revealed high DMFT, low educational level of the mother and low family income were associated with dental pain thus establishing a correlation between the socio-economic status of the child and dental pain. Another research done in four different provinces of China studied the prevalence of dental caries in 5 year old Chinese children and its association with education level of the parents and household income [7].

The results could not establish a correlation between the parents' education level and dental caries, however it showed that children's DMFT scores were significantly impacted by household income. A similar research done on 856 children aged 36 to 71 months old in the Lausanne Children's Hospital in Switzerland [8] wherein their parents or legal guardians were asked to fill a questionnaire that contained questions pertaining to their socio economic status, dental care and dietary habits proved that early childhood caries (ECC) can be taken as an indicator of inequalities in the socio-economic backgrounds of people with ECC being more common in the poor. The results demonstrated that ECC was more common in children who hailed from poorer socioeconomic backgrounds than those from higher ones.

All these studies and more point towards an important fact; that socioeconomic status plays some role in caries prevalence. This present research aims to study whether any association exists between the socioeconomic status of school children in Riyadh city and the prevalence of dental caries among them.

Materials and Methods

Ethical Clearance

Study proposal submitted to research centre of Riyadh Colleges of Dentistry and Pharmacy and ethical approval was obtained. Study registered with the registration number FIRP/2016/59. Prior permission was obtained from the school authorities for examining the children. Verbal consent of the school children was obtained before oral examination.

A cross-sectional survey was conducted amongschool children (n=433) studying in grade three and above from various schools in Riyadh city, Saudi Arabia. Directory of the schools was used to select few schools based on ease and access.

Questionnaire

A simple structured, closed ended-questionnaire was prepared in Arabic language and pilot tested for cognition and rendition of responses among 20 students from different classes. Questionnaire consisted of age, gender of the child, socio-economic variables such as parental education, parental occupation, and family income, type of accommodation, number of siblings, domestic helpers, and number of cars. Three trained investigators interviewed all the children by using questionnaire.

Clinical Examination

All the children were examined in the class rooms facing towards natural light by using disposable mouth mirrors and explorers. Clinically obvious carious lesions and permanent restorations without any signs of decay and those teeth extracted for the reason of tooth decay were considered for DMFT index. Caries experience of the child is recorded by using DMFT (Decayed, Filled and Missing Tooth) index by three trained and calibrated examiners. Diagnostic criteria for DMFT index were discussed with all the examiners and Calibration exercise was undertaken before the start of the study.

Statistical Analysis

Skewness and kurtosis, and Shapiro-Wilks tests showed approximately normal distribution of the data. Hence parametric tests were applied for inferential statistics. Means and standard deviations were computed for the DMFT score. Inferential statistics of one-way ANOVA (Analysis of Variance) and Tukey's multiple comparison tests were applied

to determine significant differences between mean DMFT score and socio-economic variables. A p value of <0.05 was con-sidered significant. Statistical analysis of the data was carried out by using SPSS version 21.

Results

Out of the 433 children examined, there were 392 (91.5%)females and only 41 (9.5%) males. Majority of them 244 (56.4%) were from the age group of 9-10 years and the least were in the age group of 13-14 year 86 (19.9%). Most of the student's fathers were working in public sector 304 (70.2%), and mothers were unemployed 295 (68.1%). Most of the parents (42.3% Mothers, and 46.4% fathers) students had university level educational qualification. Nearly 347 (80.1%) students belonged to the family income group of less than 10000 SAR.

Most of the study participants 157 (36.3%) were having 3-4 siblings as shown in Table 1.

Table 1: Socio-demographic characteristics of the study subjects

		N	%
Gender	Female	392	90.5
	Male	41	9.5
Age	9 - 10 years	244	56.4
	11 - 12 years	103	23.8
	13 - 14 years	86	19.9
Father's occupation	Unemployed	47	10.9
	Private sector	58	13.4
	Public sector	304	70.2
	Owns small business	15	3.5
	Owns large business	9	2.1
Mother's occupation	Unemployed	295	68.1
	Private sector	23	5.3
	Public sector	106	24.5
	Owns small business	9	2.1
Father's Education	Illiterate	11	2.5
	Primary and middle school	104	24.0
	Secondary school	117	27.0
	University	201	46.4
Mother's Education	Illiterate	29	6.7
	Primary and middle school	148	34.2
	Secondary school	73	16.9
	University	183	42.3
Total Family income (Saudi Riyals)	Less than 10000	347	80.1
	Above 10000	86	19.9
Number of Siblings	1-2 siblings	89	20.6
	3-4 siblings	157	36.3
	5-6 siblings	101	23.3
	More than 6 siblings	86	19.9

Distribution of study subjects according to their accommodation, maids and drivers, and number of car in possession have been shown in Figures 1, 2 and 3, as shown below.

Mean DMFT score of the study participant was found to be 5.04±3.2, with minimum score of zero and maximum score of 13, as shown in figure 4.
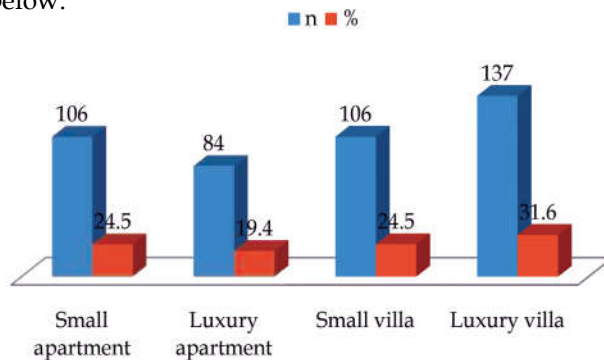

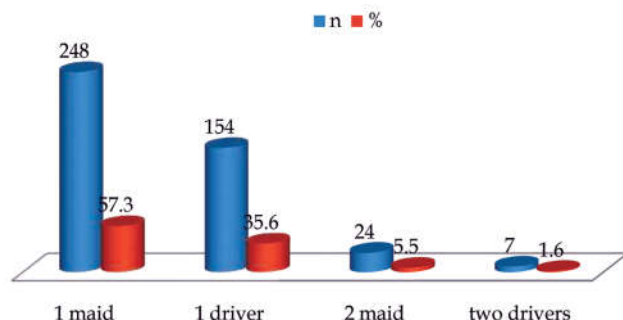**Fig. 1:** Distribution of study participants according to their accomodation type

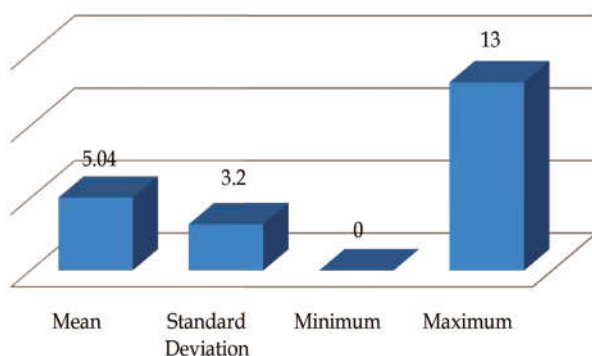**Fig. 2:** Distribution of study participants according to their domestic help

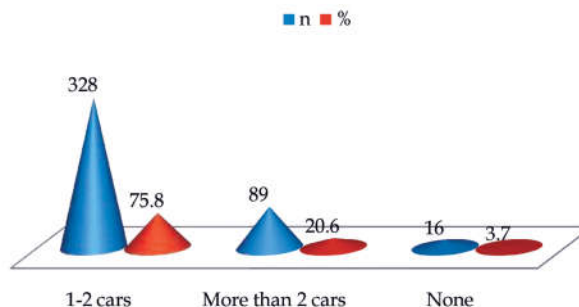

Fig. 3: Distribution of study participants according to Car possession

Fig. 4: DMFT score of study participants

Evaluation of the association of caries status with the occupation of the child's father and mother as an indicator of socio-economic status Mean DMFT score was found to be high among children whose fathers have their own large business 6.66±3.64, followed by other occupational groups. Similarly, mean DMFT score was higher among children whose mothers were working private sector 6.09±2.61, followed by other occupational groups as shown in Table 2. There was no statistically significant difference evident between different occupational groups of fathers by one-way ANOVA, $F_{(4,428)} = 1.793$, $p=0.129$, whereas mothers occupational groups showed a statistically significant differenceas determined by one-way ANOVA $F_{(3, 429)} = 7.645$, $p=<0.001$.

Table 2: Children's DMFT score and parental occupational groups

Groups	Father		Mother	
	Mean	**SD**	**Mean**	**SD**
Unemployed	5.89	3.33	5.41	3.19
Private sector	5.31	3.23	6.09	2.61
Public sector	4.85	3.20	3.95	3.11
Owns small business	4.40	1.72	3.11	2.71
Owns large business	6.44	3.64	0	0

Table 3: Comparison of Children's DMFT score among occupational groups of parents by ANOVA

Variables		Sum of Squares	DF	Mean Square	F	p
Father	Between Groups	73.12	4	18.281	1.793	0.129
	Within Groups	4363.04	428	10.194		
Mother	Between Groups	225.141	3	75.047	7.645	**<0.001**
	Within Groups	4211.025	429	9.816		

A Tukey's post hoc test revealedstatistically significant difference in mean DMFT score between children's of the mothers who were unemployed and those mothers working public sector (p<0.001), as well as between the mothers working in public sector and private sector (p=0.017). Hence it can be suggestive that there is an association between mother's occupation and DMFT score of the child.

Evaluation of the association of caries status with the education level of both parents as an indicator of socio-economic status

Children' s whose parents had university level educational qualification showed lower mean DMFT (father 4.43±3.31) and (mother 4.50±3.17) scores, as shown in Table 4.

Table 4: Children's DMFT score and parental education

Educational groups	DMFT SCORE			
	Father's Education		Mother's Education	
	Mean	SD	Mean	SD
Illiterate	4.91	3.53	5.86	3.20
Primary and middle school	5.87	2.93	5.53	3.20
Secondary school	5.38	3.04	5.08	3.13
University	4.43	3.31	4.50	3.17

Table 5: Comparison of Children's DMFT score among educational groups of parents by ANOVA

Parent		DMFTS score				
		Sum of Squares	DF	Mean Square	F	P
Father	Between Groups	158.346	3	52.78	5.29	**0.001**
	Within Groups	4277.821	429	9.97		
Mother	Between Groups	108.631	3	36.21	3.59	**0.014**
	Within Groups	4327.535	429	10.08		

Children's DMFT scores showed statistically significant differences with father's [F (3, 429) =5.29, p=0.001] and mothers [F (3, 429) =3.59, p=0.014] education by one-way ANOVA, as shown in Table 5.

Further analysis with Tukey's post hoc test revealedstatistically significant difference in child's mean DMFT score between fathers with university education and primary/middle school education (p=0.001). Similar statistical significant difference was found between mother with university education and primary/middle school education (p=0.018). Hence it can be noted that there is a relationship between the levels of education of both parents with the caries status of their children.

Children's DMFT scores and socio-demographic characteristics are presented in Table 6. Children's living in small villa (4.53±3.18), having single driver (4.13±3.09), and those without having car (4.88±2.80), having 1-2 siblings (4.18±2.88) with family income of less than 10000 SAR (4.78±3.23) showed lower mean DMFT scores.

Evaluation of the association of caries status with the other sociodemographic variables.

Table 6: Children's DMFT score and socio- demographic characteristics

Characteristics		DMFT score	
		Mean	SD
Accommodation	Small apartment	6.07	3.02
	Luxury apartment	4.96	3.16
	Small villa	4.53	3.18
	Luxury villa	4.70	3.24
Domestic help	1 maid	5.60	3.12
	1 driver	4.13	3.09
	2 maids	4.42	2.92
	2 drivers	7.57	4.50
Number of car	1-2 cars	4.96	3.20
	More than 2 cars	5.38	3.28
	None	4.88	2.80
Siblings	1-2 siblings	4.18	2.88
	3-4 siblings	4.99	3.09
	5-6 siblings	5.11	3.35
	More than 6 siblings	5.97	3.34
Family income	Less than 10000	4.78	3.15
	Above 10000	6.12	3.23

Table 7: Comparison of Children's DMFT score among different socio-demographic characteristics

Characteristics		DMFT score				
		Sum of Squares	DF	Mean Square	F	P
Accommodation	Between Groups	155.591	3	51.864	5.198	**0.002**
	Within Groups	4280.576	429	9.978		
Domestic help	Between Groups	259.736	3	86.579	8.893	**<0.001**
	Within Groups	4176.430	429	9.735		
Number of cars	Between Groups	12.920	2	6.460	.628	0.534
	Within Groups	4423.246	430	10.287		
Siblings	Between Groups	140.371	3	46.790	4.673	**0.003**
	Within Groups	4295.795	429	10.014		
Family income	Between Groups	123.416	1	123.416	12.334	**<0.001**
	Within Groups	4312.751	431	10.006		

Socio-demographic characteristics such as accommodation [F (3,429) =5.198, p=0.002],domestic help[F (3, 429) = 8.893, p<0.001], number of siblings [F (3, 429) =4.673, p=0.003], and family income[F (1, 431)=12.334, p<0.001] showed statistically significant difference with regards to DMFT score of the child. However, number of cars [F (2, 430) =0.628, p=0.534] is the only factor did not show any significant difference, as shown in Table 7.

Further analysis with Tukey's post hoc test revealedstatistically significant differences between DMFT scores of children living small apartments and small villa (p=0.002), as well between small apartment and large villa(p=0.005). Similarly, DMFT score of children varied significantly between the families having one driver and one maid (p<0.001), and one driver and two drivers (p=0.023).DMFT score also showed significant difference between children having 1-2 siblings and more than 6 siblings (p=0.001).

Discussion

This study was conducted among school children in Riyadh city to determine whether anassociation exists between the various variables that are commonly perceived as indicators of the socioeconomic status and the caries status of children. To the best of our knowledge, this is the first research conducted in Riyadh which tries to examine the various socioeconomic variables that might play a part in the prevalence of dental caries. The data collection process consisted of two parts; one that assessed the socioeconomic indicator variables and oral examination to assess the DMFT index of each child individually.

The results of the studyrevealed that the caries status of the child was not associated with the employment status of the father but was related to that of the mother. This finding is consistent with a study conducted on 12 year old school children in East Jerusalem [9] wherein no significant difference was found in the DMFT index of children based on their father's employment level but the results were significant for the mother's employment level. Children with employed mothers in private sector had shown less caries compared to other counterparts.

However, the results of this study are in line with that of the previous studies with regards to the education level of the father. Present study revealed that the caries status of the child is associated with the education level of both the father and the mother.

Several other studies confirm this finding. For example, a cross-sectional study conducted in tribal, rural, suburban and urban school children in the Indian state of Tamil Nadu [10] reported that a statistically significant relationship between DMFT scores in the urban group and the mother's education level. Another study conducted on pre-school children in a closer geographical and cultural setting, in Abu Dhabi [11] showed statistically significant relationship between the education level of both parents and the caries experience of their child. Recent study conducted among pre-school children in Riyadh [12] revealed a significant association between DMFT scores employment status of both parents as well as the education level of the mother. These last two studies partly agree with the findings of this study. This can be explained due to the fact that parents' level of awareness and the subsequent grooming of their children to dental care depended on their education level.

The type of accommodation was also examined as an indicator of socioeconomic status. Results revealed a statistically significant difference in the DMFT scores of children living in various different types of dwellings which implied that there exists an association between the type of accommodation and caries status. This association may have developed as a natural extension of the association between the employment status of the mother and the educational status of both parents. A study conducted on school children in Brazil examined the relationship between social deprivation, income inequality, social cohesion and dental caries. This study found an inverse relationship between the caries status of the children and the number of maids present in the household [13].

Another finding in this study that was consistent with several other studies is the association between the number of siblings of a child and his/her caries status. This variable helped determine family size, house density or crowding index. The results revealed a statistically significant difference in the DMFT scores between these groups indicating an association between the numbers of siblings (house density/ crowding index). A study conducted on pre-school children in Sri Lanka [14] concurred with these findings as it revealed that the family size is significantly associated with the caries status of the examined children. Another study [12] concluded that lower levels of parent education and more number of children in the family could be risk factors for increased caries experience.

This study has some identifiable limitations which need to be taken into consideration. Firstly, the

analyses in this study were cross-sectional and all findings were mere associations which do not necessarily translate into causation. The study was limited to a small segment of the Saudi population and its results cannot be considered to be conclusively representative of the entire population of Saudi Arabia. Moreover, all the researchers in this study were females hence most of the female school children were part of the study. Only few male students of lower classes were considered in the present study due to the fact that females were not allowed to enter male schools in higher classes. Despite these limitations, this study is important because it is the first study in the investigated area which closely examines the socio-economic variables which particularly determine the socioeconomic status of people in this area. Further research is warranted to determine the direction of the correlation between caries status and the various socio-economic variables that have been examined in this study. All the socio-economic information obtained from the younger children may not accurately reflect actual status.

Conclusion

Within the limitations study it can be concluded that there is a clear association between socioeconomic status of the children's family and their caries status. Socioeconomic variables like parents' education level, mother's occupation, presence of domestic help in the house, number of siblings and type of accommodation appear to have a bearing on caries experience among children studied in this research.

Acknowledgements

References

1. Edelstein BL. The dental caries pandemic and disparities problem. BMC Oral Health. 2006; 6 Suppl 1:S2.

2. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C: The global burden of oral disease and risks to oral health. Bulletin of the World Health Organization. 2005; 3:661-669.

3. Boing Antonio Fernando, BastosJoãoLuiz, Peres Karen Glazer, Antunes José Leopoldo Ferreira, Peres Marco Aurélio. Social determinants of health and dental caries in Brazil: a systematic review of the literature between 1999 and 2010. Rev. bras. epidemiol. 2014 Nov; 17(Suppl 2):102-115.

4. Miura H, Araki Y, Haraguchi K, Arai Y, Umenai T. Socioeconomic factors and dental caries in developing countries: A cross-national study. Social Science & Medicine. 1997; 44(2).

5. Peres MA, Peres KG, Antunes JLF, Junqueira SR, Frazao P, Narvai PC. The association between socioeconomic development at the town level and the distribution of dental caries in Brazilian children. Pan American Journal of Public Health. 2003; 14(3).

6. Nomura LH, Bastos JLD, Peres MA. Dental pain prevalence and association with dental caries and socioeconomic status in schoolchildren, Southern Brazil, 2002. Brazilian Oral Research. 2004; 18(2).

7. Guan Y, Zeng X, Tai B, Cheng M, Huang R, Bernabe E. Socioeconomic inequalities in dental caries among 5 year-olds in four Chinese provinces. Community Dental Health. 2015; 32(3).

8. Baggio S, Abarca M, Bodenmann P, Gehri M, Madrid C. Early childhood caries in Switzerland: a marker of social inequalities. BMC Oral Health. 2015; 15.

9. Sgan-Cohen HD, Bajali M, Eskander L, Steinberg D, and Zini A. Dental Caries Status, Socio-Economic, Behavioural and Biological Variables among 12-Year-Old Palestinian School Children. Journal of Clinical Paediatric Dentistry. 2015 Summer; 39(4):331-335.

10. John, J. Baby et al. "Dental Caries and the Associated Factors Influencing It in Tribal, Suburban and Urban School Children of Tamil Nadu, India: A Cross Sectional Study." Journal of Public Health Research. 2015; 4(1):361.

11. Al-Hosani E, Rugg-Gunn A. Combination of low parental educational attainment and high parental income related to high caries experience in pre-school children in Abu Dhabi. Community Dent Oral Epidemiol. 1998; 26:31–36.

12. Al-Meedani, Laila A., and Yousef H. Al-Dlaigan. "Prevalence of Dental Caries and Associated Social Risk Factors among Preschool Children in Riyadh, Saudi Arabia." Pakistan Journal of Medical Sciences. 2016; 32(2):452–456.

13. Pattussi M.P,Marcenes W, Croucher R, Sheiham A. Social deprivation, income inequality, social cohesion and dental caries in Brazilian school children, Social Science & Medicine, 2001; 53(7): 915-925.

14. Wellappuli N, Amarasena N. Influence of family structure on dental caries experience of preschool children in Sri Lanka. Caries Res. 2012; 46(3): 208–212.

15. Amanlou, Massoud et al. "Association of Saliva Fluoride Level and Socioeconomic Factors with Dental Caries in 3-6 Years Old Children in Tehran-

Iran." Iranian Journal of Pharmaceutical Research/ :
IJPR. 2011; 10(1):159–166.

16. Gil, Giovana S et al. "Reliability of Self-Reported
Toothbrushing Frequency as an Indicator for the
Assessment of Oral Hygiene in Epidemiological
Research on Caries in Adolescents: A Cross-Sectional
Study." BMC Medical Research Methodology. 2015;
15:14.

17. Retnakumari N, Cyriac G. Childhood caries as
influenced by maternal and child characteristics in
pre-school children of Kerala—an epidemiological
study. ContempClin Dent. 2012; 3:2–8.

18. Hujoel PP, Cunha-Cruz J, Banting DW, Loesche WJ.
Dental flossing and interproximal caries: a
systematic review. J Dent Res. 2006; 85(4):298-305.

19. Costa SM, Vasconcelos M, Abreu MHNG. High
Dental Caries among Adults Aged 35 to 44 Years:
Case-Control Study of Distal and Proximal Factors.
International Journal of Environmental Research and
Public Health. 2013; 10(6):2401-2411.

20. Petry P.C., Victora C.G., Santos I.S. Adults free of
caries: A case-control study about wareness/
consciousness, attitudes and preventive practices.
Cad. SaúdePública. 2000; 16:145–153.