

Prevalence of Early Childhood Caries and associated Risk Factors from 1 to 12 years Old Children

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Abstract

The aim of this study was to assess the prevalence of early childhood caries in children of age 1 to 12 years old and to assess the risk factors and pattern of caries. A descriptive cross-sectional study was conducted in the department of paedodontics, Nishtar Institute of Dentistry, Multan. A questionnaire was prepared to ask the questions to caregivers. Different diagnostic tools were used to detect caries in children. Different statistical test like chi-square and ANOVA is performed to analyse the significant results. Out of 500 children, 320 were experienced early childhood caries. When results were analysed on gender basis, it was concluded that female have more carries lesion than male child. Bottle feeding and sweet consumption were observed in children who have the high score in caries. When we examined tooth pattern, more caries lesion found on maxillary anterior teeth (incisor) and mandibular molars. The prevalence of early childhood caries is high in the city of saints (Multan). Baby bottle feeding prevalence is 64 %. Caries is generally associated with plaque accumulation, tooth brushing, and malocclusion, bottle feeding and sweet consumption.

Key Words: Rampant Caries, Risk Factors, Baby bottle caries, Oral Hygiene, Incisor Caries

1. Introduction

Early Childhood Caries (ECC) is a serious public health Problem in both developing and industrialized countries. It continues to affect babies and preschool children all over the globe. [3-8]. It (ECC) is five times more common than any other systemic diseases (such as asthma) and it is seven times more common as hay fever[29].

Infection is the major cause of child death in most of countries. It affects both systemic as well as the dental health of a child. At the time of eruption of deciduous dentition approximately first 2 years of life, there is the acquisition of cariogenic bacteria (S.Mutans cocci) the phase is known as 'window of infectivity' in this time period (window) S.Mutans cocci prevalence is high in oral cavity that causes ECC. (Early childhood caries) [14]. It is thought that parents are responsible for the transformation of infectious bacteria in their child [1, 8]. Infection (bacteria) is transmitted by two ways either vertical (transmitted by caregivers in children either by father or mother, high sugar consumption or poor maternal oral health transmit oral bacteria) or horizontal

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transmission (neonatal factors). 13 to 16 month require to start clinical sign of carious lesion [31,32]

Children who have family history of dental diseases have greater chance of having infection in teeth (carious lesion). If child parents and siblings have high rate of carious lesion there is a greater chance that next child have risk to have carious teeth. [35,36]

Dental caries is the demineralization of enamel and dentine (hard tissue of tooth) by acid and is mediated by saliva. Early childhood caries is defined in previous paper's as "The presence of one or more decayed (non-fissured or fissured lesions), missing (due to caries lesions) or filled tooth surfaces in any primary tooth in a child of 71 months (six years) of age or younger". [6, 7, 11, 12]. ECC is most commonly found on maxillary incisors (on cervical surface of it) [15] Using a careful lift-the-lip examination, the presence or absence of ECC was recorded depending on the presence of "non-cavity caries/white spot lesions" or "cavity caries lesion [4]. ECC is a complex and multifactorial infectious disease [1-4] there are many factors which are responsible for ECC. Out of them four are the basic etiologic factors which play important role in development of dental caries. (1) Cariogenic bacteria (2) carbohydrates (sugar) (3) susceptible tooth surface and (4) time. [1]

Sugar containing diet and milk is more cariogenic than any other food. Cow and breast milk is less cariogenic than sucrose (sugar) [33] from previous data collection it can be concluded that low consumption of sugar approximately 40 to 55grams per person in a day have low carious infection [34]. Poor oral hygiene is associated with increased risk of dental caries and at the same time, proper tooth brushing (two times a day) after meals decreases the incidence of dental caries. [4]. It is believed that brushing does remove the dental plaque, where microorganism inhibits. Oral hygiene measures are neglected most of the time. Poor oral health is not only a medical but also a social issue.

ECC is more effect the maxillary incisor and first molar teeth, it does not affect mandibular incisor as much as maxillary incisor because of saliva. Submandibular and sublingual salivary duct are present there and continues saliva flow and tongue movement product them from infectious bacteria. [30]

ECC also called as baby bottle tooth decay, early childhood caries, early childhood dental decay, early childhood tooth decay, comforter caries, nursing caries, maxillary anterior caries, rampant caries, and many more [4, 12]. Carious treatment is also not getting importance and consequence of untreated caries are Abscesses, pain, malocclusions, long lasting psychosocial complication and complete tooth loss. [9, 10, 8, 14]. ECC is not self-limiting diseases. If ECC was left untreated, it becomes more intense and hard to treat and also does increase the cost of treatment. The quick outcome of dental caries if left untreated is tooth ache which affects children behaviour and routine life. Untreated caries has a chance to develop worse and have greater chances for the children having ECC to develop caries in secondary dentition. The consequence of caries is the loss of child front teeth which in direct effect the speech of the child as these years are important for a child to learn how to speak. Children with ECC have shown slow rate in physical development like height and weight. The pain caused by ECC may lead to a decrease in appetite, ultimately resulting in malnutrition. In fact, early extraction or loss of teeth often results in children suffering from psychological trauma from dental procedures required to restore their teeth. Taunting by siblings, peers, and even extended family members may lead to poor self-esteem [28].

ECC is a preventable diseases at early stage. There is a need to create dental awareness through dental education programs and need to develop a better treatment plan in order to carry out its prevention. Early Childhood Caries (ECC) is a serious public health Problem in many countries as mention above. ECC is prevalent around the globe. [3, 8] Prevalence of dental caries is approximately 60% all around the world [20]. In previous studies prevalence of ECC in India is approximately 51% and 54.1% respectively [16,17]. Available data on dental caries reveal that Pakistan has been classified as a low caries

country, on the positive side 50% of the children between the ages of 12-15 years are caries free and on the negative side 97% of all carious lesions remained untreated [13, 19]. In Karachi (city of Pakistan) ECC prevalence is 51 percent in the year of 2002 as well as in 2012 [18] Prevalence of caries is 60.90% in Lahore [20]. Peshawar is high incidence of ECC in 2015 it is 88.6% which is very high as compared with others [19]. In relatively a very short period of time (almost Twenty-five years) dental caries has undergone to a striking Reduction in most industrialized countries [7]. Many factors contribute to this decrease. Fluoride toothpaste is one of the factors which are responsible for the decrease in ECC decrease [2]. ECC can be prevented by educating the parents and caregivers about the risk factors associated with early childhood caries. The rationale behind this study was to investigate the risk factors of early childhood caries among the children of 1 to 12 years visiting Nishtar Institute of Dentistry Multan for general check-up and treatment. It also helps us to know the prevalence of ECC among children of Multan and to provide us the knowledge of prevention and controlling technique.

The main contribution of this study is to examine the relationship between caries and the risk factors associated with it. Also to educate the parents and caregivers to promote oral health in their child to reduce ECC.

It is monitory to educate parents about dietary habit of child and consequences of bottle feeding. Most of child do not visit dentist or they visit after 3 years of age it is important to visit a dental clinic or school after the first tooth erupt in oral cavity. Parents can be educated by organising a seminar, free dental check-ups, school camps and poster or television programs. [37]

From 19 century fluoride is used to prevent the caries. Fluoride containing toothpaste is recommended to prevent and reduce the prevalence of carious lesion. Excess use of fluoride and swallowing of it cause serious illness also that's why certain amount of fluoride is recommended. Different gels. Tablets teeth paste varnish droplets and froths are available [38,39].

2. Methodology

It is a study to determine the prevalence of ECC and educate the parents to prevent dental caries in children. It is a cross-sectional descriptive type study. Before conducting the research, a pre-research (synopsis) has been made. All the aspect and methods of research were organized and discussed with the supervisor. The synopsis includes the sample size, the age of patients; instruments used, target population, research mythology, consent form and a questioner. The research was conducted in the Department of Paedodontics, Nishtar Institute of Dentistry Multan. The study was completed in 8 months. 1st may to 30 December. Study Protocol and use of data for research will be explained to the patient's parents/guardian in order to get full informed consent. A questionnaire has been specifically designed to record findings of this study (Ethical committee of NID for dental research will approve the study. Total 500 patients of 1 to 12 years of age were examined in this study and data was collected, 1 Year to 12 years of old patients in the Department of Paedodontics, Nishtar Institute of Dentistry were examined for early childhood caries. Diagnostic instruments used for diagnosis of caries. Radiographic help also utilized in most of the cases. Data was collected by asking the questions from caregivers following the questionnaire and by observing the patients during the general dental check-up. Every patient visiting dental hospital for check-up is included in the study.it has been make sure that the study is not biased by adopting Non probability consecutive sampling technique. Different inclusive and exclusive criteria were designed. In inclusive criteria children with age of 1 to 12 years and both genders are included in caries while children who have white spot lesion, systemic diseases and missing primary teeth are excluded from this study.

3. Results

Data was analysed by using statistical software satatitica. Different graphs and tables are plotted to present the data onto readable form. All the data was recorded and rechecked to avoid any bias. Chi-square and ANOVA tests were performed to check the results significant or not. Out of 500 patients, 280 are females while 220 are males. Frequency of occurrence of ECC is 64%. Total 320 children have a bad experience of ECC. Children were divided into different age group to access the effect of ECC in different age. ECC is the most prevalent in age group of 5 to 9. Prevalence is tested by chi-square test and its shows significant results with the value of p is 0.42651. ANOVA test was performed to inquire the risk factors of ECC. Sweet consumption, malocclusion, bottle feeding, oral hygiene, and periodontal health were found risk factor for ECC.

ECC is most commonly found on maxillary anterior teeth and mandibular molars, it was also concluded from available data. (Shown in table)

Table 1. Prevalence of ECC

Results						
	baby bottle caries (ECC)	non baby bottle caries				Row Totals
male	130 (140.80) [0.83]	90 (79.20) [1.47]				220
female	190 (179.20) [0.65]	90 (100.80) [1.16]				280
Column Totals	320	180				500 (Grand Total)

The chi-square statistic is 4.1092. The p-value is .042651. The result is significant at $p < .05$.

It is shown that out of 500 pts 130 were male and 190 were female child. Among them 320 have a bad experienced of oral caries (ECC) which is statistically proved with significant p value.

Graphical representation of distribution of gender and prevalence of baby bottle caries (ECC).

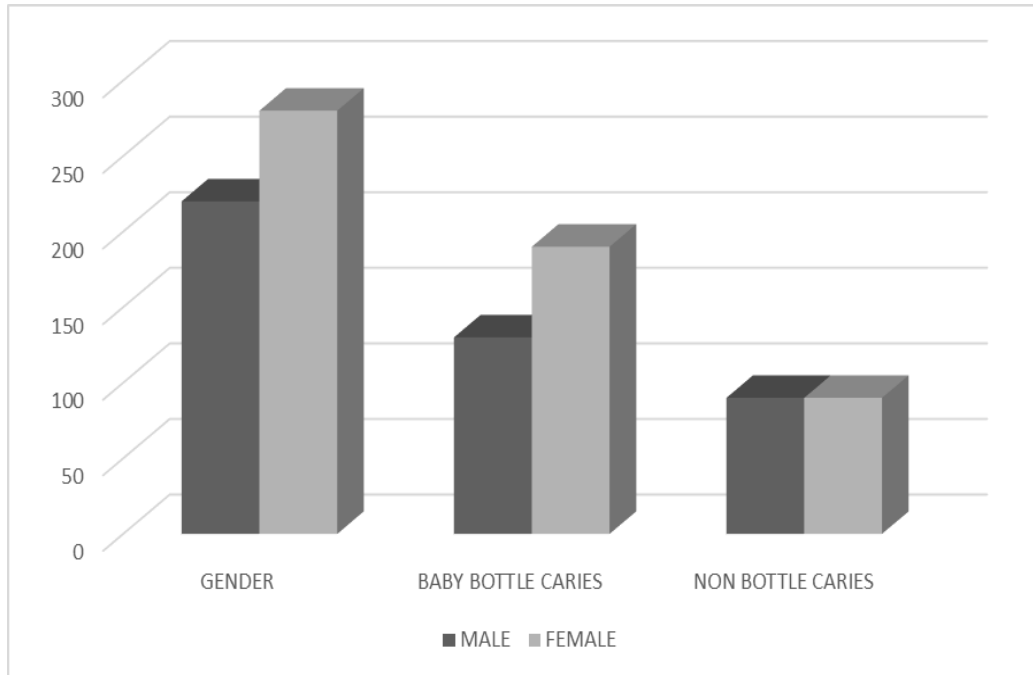


Figure 1. Prevalance of ECC among Gender

Table 2. Distribution of ECC among Male and Female

Gender :	Baby bottle caries (ECC)	Non baby bottle caries
Male:	130	90
Female:	190	90
Total:	320(64%)	180(36%)

Table 3. Risk factors of ECC and their Affect on Age Group

	1 Age Gp	2 Malocclusion	3 Oral hygiene	4 Bottle feeding	5 Sweet consumption	6 Periodontal health	7 Missing teeth
1	1 - 4 yes	20	50	180	180	140	120
2	1 - 4 no	170	140	10	10	50	70
3	5 - 8 yes	80	110	110	200	110	210
4	5 - 8 no	160	120	130	40	130	30
5	9 - 12 yes	40	60	30	60	60	0
6	9 - 12 no	30	10	40	10	10	70

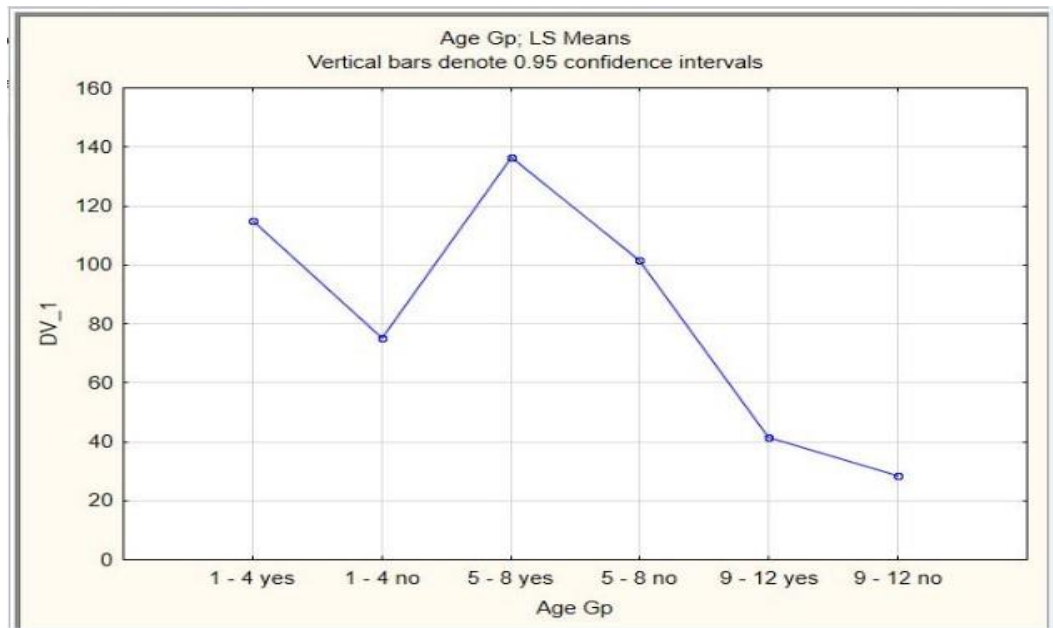


Figure 2. Graphical Results ANOVA

Early childhood caries and its associated risk factors were compared with each other's and it is concluded that children having age of 5 to 8 years experienced more caries lesion than any other child. All the risk factors were found in high in age group of 5 to 8.

Table 4. Teeth Surface Effected

1	age groups	mandibular incisor	maxillary incisor	mandibular molar	maxillary molars
2	1 to 4	30(15%)	100(52.9%)	90(47%)	40(21%)
3	5 to 8	30(12.5)	120(50%)	60(25%)	90(37%)
4	9 to 12	10(14%)	40(57%)	20(28.9%)	20(28.9%)

When child is diagnosed early childhood caries (ECC) it is also noted which tooth is effected in most of child. Result are evaluated and it is found that maxillary incisors and mandibular molars prone more carious lesion than any other teeth. There are different reasons behind it one of them when a child sucks through baby bottle nipple milk accumulated around incisor teeth and stay there over a night that make easy for microbes to produce acid there so ECC found to be high incidence on surface of incisors. Same is the case with molars.

Table 5. Brushing Habit of Child

Age groups.	yes	No	Seldom	supervised	Independent
1 to 4(190)	50	120	20	30	40
5 to 8(240)	110	20	110	20	200
9 to 12(70)	60	0	10	0	70

Oral hygiene habit is insufficient in children. They don't brush their teeth on regular basis when I have asked their parents about brushing they smile and said "kr lata hay jee kabi kabi" (do not brush periodically). They were not supervised or do not have proper guideless for brushing their teeth. Most of the child brush alone without any guideline. Only few of the parents know about brushing technique. In my opinion bad oral hygiene and lack of brushing is one of main risk factors that contribute in increasing prevalence of caries among children. We need to arrange a seminar or free camps to educate and guide parents about significance of brushing and make them aware about early childhood caries.

4. Discussion

This cross-sectional study was undertaken to investigate the prevalence of early childhood caries and its associated risk factors from 1 to 12 years old children in Nishtar Institute of Dentistry, Multan. It is estimated that prevalence of ECC is exceptionally high in children. Different risk factor of ECC were also considered in this study. The most common risk factor of caries is baby bottle feeding. Almost 64% of patient are feeding on baby bottle at night and day time and they also consume sugar (sucrose) in their milk. Amount of sweet (candies, chocolates *etc.*) consumption is also high in patients (children). Oral hygiene technique and preventive measure found inadequate and poor, which leads towards many oral diseases. Brushing habit among children were found not to be satisfactory, they do not brush or brush less frequently. In the age group of 1 to 4 years, children do not know proper brushing technique and they do not supervise during brushing, this lead to bad oral health and cause ECC. Gum diseases or periodontal health problem were diagnosed in children of age group of 8 to 12 years.

Age group of 5 to 8 are more effected by ECC the reason behind this is oral hygiene measure and consumption of more amount of sugar in the form of candies and chocolates. It is concluded that at this age child start their first school and parents neglect oral health of a child so caries started. Maxillary anterior and Mandibular molars teeth were observed more effected with ECC than the other teeth. The reason behind it, is baby bottle feeding. When a child feed on bottle at bed time, bottle nipple faces the anterior teeth and milk is collected there, so the bacteria, they destroy the tooth surface. Same is true for the molar teeth where more pits and fissure are found and food particles are collected their and cause bacterial attack more susceptibility [8, 19].

When our compare our study with previous studies (national and international) prevalence of ECC is almost same with a minor difference. When comparing the nationally with different cities of Pakistan, only minor difference in prevalence of ECC is observed. In a study from sadder town Karachi, Pakistan it is 51 % in 2012. In this study, bad oral hygiene and tooth brushing habit was studied [18]. Another study from Karachi shows that ECC rate is 29.1% only, in this study socioeconomic aspect of ECC is discussed and reported that there was an inverse relation between dental caries and family income [13]. Prevalence of ECC another city of Pakistan, Lahore is 60.90 % in 2013. In this study author explain that Plaque accumulation has a significant effect on prognosis of ECC [21]. From Peshawar, Pakistan it was reported that occurrence of ECC is 85% and second study show 88.9% have bad experience of ECC [19, 20].

According to the work done by Singh *et al.*, [22] under the title “Prevalence of early childhood caries among 3-5 years old pre-schoolers in schools of Marathahalli, Bangalore” shows that in India has less occurrence of ECC than Pakistan. The similar work done by Tyagi *et al.*, [23] shows that the prevalence of ECC was 51% and the main cause of ECC was baby bottle feeding. Li *et al.*, [24] from China conducted a research under the title “Associations of social and behavioural factors with early childhood caries in Xiamen city in China”. Their work shows that the prevalence of ECC in China is 31% which is less than Pakistan [24]. The work of Postma *et al.*, [25] from South Africa shows that ECC prevalence in South Africa is 32%. The research conducted by Schroth *et al.*, [26] from Canada under the title “Prevalence and risk factors of caregiver reported severe early childhood caries in Manitoba first nations children: results from the RHS phase” shows that 29.4% children had S-ECC. 65% parents responded that their child had already undergone treatment for caries. Caries was associated with bad oral hygiene, breast feeding, and sweet consumption. Gary *et al.*, [27] from the US show that the ECC prevalence in the US was 71.4% in the year 2012.

5. Limitations

Somewhere on your way you have to stop. Every case has some limitations you can't look at all the aspect of everything. In this study limitations are; this study is only observation study only a carious lesion is observed. Some of the diagnostic techniques were used but they are not including treatment procedures. The purpose of this study is to educate the parents and caregivers to prevent ECC and to know the prevalence of ECC in the population of Multan. The limitation of this study can be overcome by the detail study on caries lesion which included treatment and adopting prevention method of caries at early stage. Limitation can also be overcome by including dmft and dmf score or by including socioeconomic status of child's family or by adding other factors which help in progress of ECC. It can be overcome by further educating and motivating the parents in performing home dental care as well as ensuring regular dental visit of the children to the hospital for the provision of much needed dental treatment procedure. Specialized home dental care included use of dental floss, water picks, antibacterial mouth rinses and remineralizing gels such as tooth mouses and MI pastes.

6. Conclusion

It is concluded that female patient cares more about their teeth than male patients. Girl child and their parents visit the dentist more frequently than boys. When comparing the risk factors of ECC, it is found that most of the children fed on baby bottle at bed time and it is the main causal factor for ECC. Sugar consumption, the bad oral hygiene measure, malocclusion and periodontal diseases are some other risk factors for ECC. The high rate of caries lesion is observed in children who claimed to take more sweets, chocolate, and candies. To prevent ECC parents are advice to limit the sweet consumption in children. Oral hygiene measure is also one of the significant risk factors. It causes many health (oral as well as systemic) problems in all age groups. It is asked that does your child brush or not, is she/he brush twice a day and will you assist during brushing? And the answer to these questions was surprising. We come to know that there are many of child who does not brush, some brush once a week or two, parents also don't bother to assist their child, only a few of child brush their teeth regularly but still, there are children who don't know proper brushing technique. To solve this problem parents are educating about brushing technique and ask those to make sure that their child brush their teeth before going to sleep. Malocclusion and periodontal diseases are not directly linked with caries but they enhance it. It was overall concluded that incidence of caries in the city of Multan is high as compared to other cities and as compare to India but it is low when we compare it to US and European countries. The rise in ECC is due to lack of education and

availability of dental treatment. And one of the reason is ignorance of dental treatment by parents and caregivers, ignorance may be due to cost, time or any other reason. Many parents do not educate their children how to brush properly. There is a need to educate people

About the dental preventive method, proper brushing techniques, importance of teeth and consequences of sweet consumption.

References

- [1] S. Abdullah, bds, mcps, fcps, anser maxood, bds, bds, msc, fracds, noosheen asim khan bds, fcps, waheed ullah khan, bds, "Risk factors for dental caries in pakistani children", Pakistan, Pakistan Oral & Dental Journal, vol. 28, no. 2.
- [2] G. Campus, G. Sacco, M. Cagetti and S. Abati, "Changing trend of caries from 1989 to 2004 among 12-year old Sardinian children", *bmc public health* 2007, 7:28 doi: 10.1186/1471-2458-7-28.
- [3] A. Livny, R. Assali and H. D. Sgan-Cohen, "Early childhood caries among a bedouin community residing in the eastern outskirts of Jerusalem", *bmc public health* 2007, 7:167doi:10.1186/1471-2458-7-167.
- [4] A. Begzati1, M. Berisha and K. Meqa, "Early childhood caries in preschool children of Kosovo - a serious public health problem", begzati et al. *BMC public health* 2010, 10:788.
- [5] A. Arora, J. A Scott, S. Bhole, L. Do, E. Schwarz and A. S. Blinkhorn, "Early childhood feeding practices and dental Caries in preschool children: a multi-centre birth cohort study arora", et al. *BMC public health* 2011, 11:28 DOI: 10.1186/1471-2458-11-28.
- [6] E. Lenčová1, H. Pikhart and Z. Broukal, "Early childhood caries trends and surveillance shortcomings in the Czech Republic Lenčová", et al. *BMC public health* 2012, 12:547
- [7] C.-H. Chu, P.-L. Ho and E. Cm Lo, "Oral health status and behaviours of preschool children in Hong Kong", Chu et al. *BMC public health* 2012, 12:767
- [8] S. Lm Kumarihamy, L. D. Subasinghe, P. Jayasekara, S. M. Kularatna and P. D. Palipana, "The prevalence of early childhood caries in 1-2 yrs. olds in a semi-urban area of Sri Lanka", Kumarihamy et al. *BMC research notes* 2011, 4:336
- [9] S. Rj, S. Pj, W. Jc, C. Lekic and M. Me, "Prevalence of Caries Among Preschool-Aged Children in A Northern Manitoba Community", *J Can Dent Assoc.*, vol. 71, no. 1, (2005), pp. 27.
- [10] S. Feitosa, V. Colares and J. Pinkham, "The psychosocial effects of severe caries in 4 year-old children in Recife", Pernambuco, Brazil. *Cad saudepublica* 2005, vol. 21, no. 5, pp. 1550-1556.
- [11] American academy of paediatric dentistry definition of early childhood caries (ECC) originating council, council on clinical affairs Review council, council on clinical affairs adopted 2003 revised 2007, (2008).
- [12] N. Inayat, F. Mujeeb, M. A. Shad, S. Rashid and T. Hosein, "Experience of early childhood caries in children at Fatima Jinnah dental college and hospital", Karachi and its relationship with feeding practices. *J Pak Dent Assoc.*, vol. 19, (2010), pp. 35-40.
- [13] A. Charani, S. Mohsin, S. Sufia and A. A. Khan, "Prevalence of early child hood caries among 3-5 years old children of Clifton Karachi", *J Pak Dent Assoc.*, vol. 20, (2011), pp. 89-92.
- [14] J. T. Fukuda, DMD, A. L. Sonis, DMD, O. S. Platt, MD and S. Kurth, RN, "Acquisition of Mutans Streptococci and Caries Prevalence in Pediatric Sickle Cell Anemia Patients Receiving Long-term Antibiotic Therapy *Pediatr Dent.*, vol. 27, (2005), pp. 186-190.
- [15] S. Feitosa, V. Colares and J. Pinkham, "The psychosocial effects of severe Caries in 4-year-old children in Recife", Pernambuco, Brazil. *cad. Saúde pública, rio de janeiro, set-out*, vol. 21, no. 5, (2005), pp. 1550-1556.
- [16] M. Simratvir, M. Ga, T. Am, N. Singh and S. Chopra, "Evaluation of Caries experience in 3-6-yearold children, and dental attitudes amongst the care-givers in the Ludhiana City", *Journal of Indian pedod prev dent.*, doi: 10.4103/0970-4388.57097, vol. 27, no. 3, (2009) July-September, pp. 164-9.
- [17] R. Mahejabeen, P. Sudha, S. Kulkarni and R. Anegundi, "Dental caries prevalence among preschool children of Hubli: Dharwad City", *Journal of indian soc pedod prev Dent.*, vol. 24, (2006), pp. 19-22.
- [18] N. Dawani1, N. Nisar, N. Khan, S. Syed and N. Tanweer, "Prevalence and factors related to dental caries among pre-school children of Sadder Town", Karachi, Pakistan: a cross-sectional study dawani et al. *BMC oral health* 2012, 12:59
- [19] S. Ahmad, H. Khan, M. Khan and W. Maryam, "Prevalence and pattern of early childhood caries among school children in Peshawar", *JKCD*, vol. 6, no. 1, (2015) December.
- [20] U. Saleem, S. Bibi and B. Jamil, "Early childhood caries and its relationship with different risk factors in preschool children", *Journal of Postgrad Med Inst.*, vol. 29, no. 1, (2015), pp. 24-7.
- [21] B. Abdul Qayum Mirza, Bds, Mphil, A. Nawaz Chohan, Bds, Msc, M. Sajid, Bds, Msc and R. Akram Kahlown, Bds, Msc., "Dental caries prevalence in 3-8 year old children of army schools in Lahore", *Pakistan oral & dental journal*, vol. 33, no. 2, (2013) August.

- [22] S. Singh, N. Vijayakumar, H. R. Priyadarshini and M. Shobha, "Prevalence of early childhood caries among 3-5 year old pre-schoolers in schools of Marathahalli", *Bangalore dent res j (Isfahan)*, vol. 9, no. 6, (2012) November-December, pp. 710-714.
- [23] R. Tyagi, "The prevalence of nursing caries in Davangere preschool children and its relationship with feeding practices and socioeconomic status of the family", *Journal of Indian soc pedod prev-dent.*, vol. 26, (2008), pp. 153-7.
- [24] Y. Li, Y. Zhang, R. Yang, Q. Zhang, J. Zou and D. Kang, "Associations of social and behavioural factors with early childhood caries in Xiamen city in China", *International Journal of paediatr dent.*, Doi:10.1111/j.1365263x.2010.01093.x. Epub Dec.2010, (2011) March, vol. 21, no. 2, pp. 103-11.
- [25] P. Tc, A.-Y. Oa and V. Wyk Pj, "Socio-demographic correlates of early childhood caries prevalence and severity in a developing country-south Africa", *International dent j.*, vol. 58, (2008), pp. 91-7.
- [26] R. J. Schroth, S. Halchuk and L. Star, "Prevalence and risk factors of caregiver reported severe early childhood caries in Manitoba first nations children: results from the RHS phase", *int-jcircumpolar-health2013*, 72:21167, vol. 2, (2008-2010).
- [27] G. B. Hirsch, E. Burton, M. Frosh and T. Anselmo, "A simulation model for designing effective interventions in early childhood caries CDC - preventing chronic disease", vol. 9, (2012), 11_0219.
- [28] S. Zafar, S. Yasin Harnekar and A. Siddiqi, "Early childhood caries: etiology, clinical considerations, consequences and management", *International dentistry SA*, vol. 11, no. 4.
- [29] R. A. Bagramian, F. Garcia-Godoy and A. R. Volpe, "The global increase in dental caries", A pending public health crisis. *Am J Dent.*, vol. 22, no. 1, (2009) February, pp. 3-8.
- [30] O. Fejerskov and E. Kidd, "Dental caries: the disease and its clinical management", Hoboken (NJ): John Wiley & Sons; (2009).
- [31] P. W. Caufield, G. R. Cutter and A. P. Dasanayake, "Initial acquisition of mutans streptococci by infants: evidence for a discrete window of infectivity", *Journal of Dent Res.*, vol. 72, no. 1, (1993) January, pp. 37-45.
- [32] A. K. Wan, W. K. Seow, D. M. Purdie, P. S. Bird, L. J. Walsh and D. I. Tudehope, "A longitudinal study of *Streptococcus mutans* colonization in infants after tooth eruption", *Journal of Dent Res.*, vol. 82, no. 7, (2003) July, pp. 504-508.
- [33] J. Aarthi, M. S. Muthu and S. Sujatha, "Cariogenic potential of milk and infant formulas: a systematic review", *Eur Arch Paediatr Dent.*, vol. 14, no. 5, (2013) October, pp. 289-300.
- [34] Who J, Consultation FE. Diet, nutrition and the prevention of chronic diseases – Introduction. *World Health Organ Tech Rep Ser* 2003;916(i-viii):1-149.
- [35] D. M. Krol, "Dental caries, oral health, and paediatricians", *Curr Probl Pediatr Adolesc Health Care*, vol. 33, no. 8, (2003) September, pp. 253-270.
- [36] C. Bedos, J. M. Brodeur, S. Arpin and B. Nicolau, "Dental caries experience: a two-generation study", *Journal of Dent Res.*, vol. 84, no. 10, (2005) October, pp. 931-936.
- [37] M. W. Ng and I. Chase, "Early childhood caries: risk-based disease prevention and management", *Dent Clin North Am.*, vol. 57, no. 1, (2013) January, pp. 1-16.
- [38] G. N. Jenkins, "Recent changes in dental caries", *Br Med J (Clin Res Ed)*, vol. 291, no. 6505, (1985) November, pp. 1297-1298.
- [39] H. Çolak, C. T. Dülgergil, M. Dalli and M. M. Hamidi, "Early childhood caries update: a review of causes, diagnoses, and treatments", *Journal of Nat Sci Biol Med.*, (2013) January-June, vol. 4, no. 1, pp. 29-38.