ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

# An Observational Survey of Children Aged One to Five Years with Chronic Malnutrition and Dental Condition

**Monika Pandey[1], Raj Soni[2], Sanjana Bhargava[3], Sneha Sanwal[4], Nandita Gautam[5*]**

[1]Private Practitioner, Department of Pediatric and Preventive Dentistry, Prayagraj
[2*]MPH School of Health System Studies, Tata Institute of Social Sciences, Mumbai
[3]Private Practitioner, Department of Pediatric and Preventive Dentistry, Bhopal
[4]Graduate, Institute of Dental Sciences, Bareilly
[5*]Department of Dentistry, Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur
Email-[5]Nanditagautam63552@gmail.com

## ABSTRACT:

**Introduction-**Malnutrition in children below the age of five is a significant public health issue in India. The reality that India has one of the highest rates of underweight children worldwide is evidence of this. **Methodology:** A cross-sectional, analytical, observational study including 82 kids between the ages of 12 and 71 months was carried out. Due to the necessity for research that assess nutritional status as a risk factor for dental caries, this form of epidemiological study was selected. The dmft index, which was used in accordance with the World Health Organization's recommendations, was utilized for documenting dental caries experiences in order to determine the prevalence and severity of caries. Additionally, active visible white patches were noted. The examinations were carried out in duplicate for each child with the goal of achieving inter-examiner agreement using the Kappa statistic, which demonstrated good agreement (K= 0.81). **Results-** The sample's distribution among the various nutritional status groups showed no discernible difference (P >.05). Of the 82 kids, 42 had visible white patches. The average salivary flow was 0.35 0.14 ml/min (0.010 to 0.66 ml/min), which is considered to be very low. 69 of the 82 children who participated in the study showed poor to very low salivary buffering ability. **Conclusion:** This study demonstrated a relationship between malnutrition and saliva flow rate that warrants further investigation in malnourished children.

**Keywords:** under-five children, Malnutrition, Caries, Saliva.

## INTRODUCTION:

In India, undernutrition in children the age of five is a serious public health issue. This is demonstrated by the reality that India has one of the highest rates of underweight children in the world, approximately double that of Sub-Saharan Africa.[1] It has also been noted that India's malnutrition issue is a concentrated one, meaning that a relatively small number of states, districts, and villages bear a disproportionately large portion of the disease's burden.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

Just 5 states and 50% of villages bear around 80% of the disease's burden.[1] Malnutrition is thought to be responsible for over 2.3 million deaths of children aged 6 to 60 months per year in underdeveloped nations, or about 41% of all deaths in this age group.[2] According to the latest research carried out on children between the ages of 3 months and 3 years old in 130 districts using data from Demographic and Health Surveys in 53 countries between 1986 and 2006, the variance in mild underweight has a stronger correlation with child mortality than the variance in severe underweight.[3] The research team came to the conclusion that the frequency of moderate underweight amongst preschoolers in developing countries merits more attention as a helpful indication of changing public health conditions.[3] Because of this, it's critical for the health system to identify malnutrition early in order to plan and carry out prompt interventions at the community level.

Between 1990 and 2015, Millennium Development Goal 1 (Target 2) is to cut in half the number of people who experience hunger as indicated by the overall incidence of underweight in children below the age of five.[4] Despite the existence of numerous intervention programmes in India, the prevalence of undernutrition amongst children under the age of five has not improved much. The nutritional condition of young children is also being impacted by the current dietary trends, which is leading to a rise in the prevalence of adult noncommunicable illnesses like obesity, diabetes, hypertension, and coronary heart disease.

By analyzing caries experience stratified by the severity of malnutrition, the current study aimed to figure out the impact of chronic undernutrition on the oral health status of children aged 1 to 5 years. It also wanted to find out whether there was a relationship between nutritional status and both the quality and quantity of saliva.

## METHODOLOGY:

82 kids between the ages of 12 and 71 months participated in an observational, analytical, cross-sectional study that was carried out at the Varun Arjun Medical College's Department of Paediatrics and Rohilkhand Hospital, Banthara, Shahjahanpur. Due to the necessity for research that assess nutritional status as a risk factor for dental caries, this form of epidemiological research was selected. The simplicity and low cost of this system are additional benefits. The university's human research ethics committee approved the research. The sample included 82 male and female children between the ages of 12 and 71 months who were enrolled in the paediatrics programme at Rohilkhand Hospital and Varun Arjun Medical College in Banthara, Shahjahanpur. These kids were picked due to the fact they were all identified as having primary malnutrition. As children from the hospital's surrounding communities were screened to attend the OPD, the convenience sample method was used in the present research.

These children and families are classified as living in poverty and extreme poverty and dealing with conditions of numerous vulnerabilities based on their housing and

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

socioeconomic circumstances. Primary schooling made up the majority of the parental education. The environment that the child is raised in has a significant impact on how it grows and develops. Due to their rapid growth and lack of passive immunity, children under the age of five are more susceptible to dietary issues. This deficit thereby expresses harmful environmental influences on children's health, such as inadequate housing conditions, sanitation, hygiene, and food, in addition to reflecting a long-standing framework of food shortage. Children aged 1 to 5 who were enrolled in the paediatrics programme at the Varun Arjun Medical College and Rohilkhand Hospital in Banthara, Shahjahanpur, and whose parents or legal guardians signed a statement of informed permission approving the children's participation in the study were considered for the study. Teachers, carers, health professionals, and unpaid interns were also excluded, as were kids between the ages of 1 and 5, those whose parents or guardians did not sign a statement of informed permission, and kids with certain conditions.

The kids were weighed barefoot and in light clothing in the presence of their mothers or other carers using an electronic scale that had already been calibrated (150 kg capacity; 100 g precision). A non-flexible, metric tape with a maximum length of 2 m and a precision of 0.1 cm was used to measure height. For the calculations of height for age, weight for height, and weight for age, each measurement was taken twice, with the mean being utilised. The benchmark for assessing nutritional status was the World Health Organization's recommendations. Children categorised as having enough nutritional status had a cutoff point (z-score) between +1.5 and 1.5 standard deviations of the reference median; those classified as having mild malnutrition had a z-score of 1.5; those categorised as having moderate malnutrition had a z-score of 2; and those classified as having severe malnutrition had a z-score of 3. The investigators kept their knowledge of the kids' nutritional condition a secret throughout the whole experiment in order to avoid bias.

Using standardised procedures, qualified examiners conducted the dental examination. The data collection was carried out on a dental chair with ordinary lighting in the Department of Dentistry at Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur. The kids' teeth were cleaned with a toothbrush and fluoride toothpaste before to the assessments. When the checkups, areas with non-cavitated lesions (white spots - areas of demineralization of the enamel with the loss of translucence - opaque white coloration without cavitation) could be seen by using a flat mouth mirror, a tongue depressor, and gauze (to clean and dry the teeth). No exploratory probes were used to avoid the transference of microorganisms from one surface to another and the possibility of damaging the demineralized surface of the enamel.

The dmft index, which was used in accordance with the World Health Organization's recommendations, was used to record dental caries experiences in order to determine the prevalence and severity of caries. Additionally, active visible white patches were noted. Each child had their exams done twice with the intention of determining inter-examiner agreement

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

using the Kappa statistic,[23] which showed good agreement (K= 0.81). The 4th version of the Oral Health Surveys - Basic Methods guidelines included the specifications for determining prevalence. The dmft index was used to calculate the prevalence and severity of dental caries. Any indication of cavities on a smooth surface in children younger than three indicates severe early childhood caries. Severe early childhood caries is defined as having four or more areas affected by dental caries at three years of age, five or more surfaces affected at five years of age, and six or more surfaces affected at six years of age. These conditions must be present on the maxillary anterior primary teeth.

Utilising two aspirator tubes attached to a 15-ml Falcon tube, samples of the subjects' unstimulated saliva were taken from them for five minutes. The child's tongue was covered by one aspirator tube, and the aspirator device was covered by the other. For the purpose of determining salivary flow, the amount of saliva was measured after 5 minutes. Between 9 and 11 AM, pickups were made, and the time of the most recent meal was noted. The collection of the saliva sample had to happen at least an hour after the last meal. The volume of saliva was measured. The salivary flow volume was calculated and expressed as ml/minute. The following categories were considered in the analysis of salivary flow: <0.1 ml/minute = xerostomia; 0.1 to 0.6 ml/minute = very low flow; 0.7 to 0.9 ml/minute low flow; 1.0 to 2.0 ml/minute = normal flow; and >2.0 ml/minute = high flow.

In order to titrate and determine the salivary buffering capacity (SBC), an aliquot of 1 ml of saliva was added to a test tube containing 3 ml of hydrochloric acid (HCl 5 mM). This was done after measuring the salivary flow. In a q 220 vortex tube agitator, the saliva/acid mixture was agitated for 15 seconds. The SBC was then calculated using a portable pH metre to estimate pH. 5.5 = very high buffering capacity; 5.4 to 5.0 = good buffering capacity; 4.9 to 4.5 = medium decent buffering capacity; 4.4 to 4.0 = low buffering capacity; and 3.9 = extremely low buffering capacity.

The distribution of the data was examined using the Shapiro-Wilk normality test. The proportions of the various levels of malnutrition among the children were compared using the Chi-squared test. The mean salivary flow and age were compared using an ANOVA. The dmft index and buffering capacity categories were compared using the nonparametric Kruskal-Wallis test. For all tests, the level of significance was fixed at 5% (P .05). ANOVA revealed a difference in the mean salivary flow when the Tukeys post hoc test was used.

## RESULTS:

In the examination of the oral health status of the children at the Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur, stratified according to the level of nutrition, there was not a significant distinction in the proportions of the sample distributed between the various nutritional status classifications (P >.05) (Table 1). The mean dmft index was 1.38 among those with an appropriate nutritional status, 3.04 between the ones with mild malnutrition, and 2.5 among those with moderate. The mean dmft index of the children in this

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

study was 4.57. Girls in the present investigation (n = 40) had a mean dmft of 1.87, whereas the boys had a much higher index (2.83). Forty two of the 82 children had active white spots Mean salivary flow was 0.35 ± 0.14 ml/minute (range: 0.10 to 0.66 ml/minute), which is in the very low category. Sixty nine of the 82 children studied exhibited low to very low salivary buffering capacity. The Shapiro–Wilk normality test for the comparison of age and salivary flow demonstrated normal distribution in all groups except the severe malnutrition group. In the comparison of buffering capacity and dmft index, none of the groups demonstrated normal distribution. Thus, the comparison of age and mean salivary flow was performed using ANOVA, whereas the comparison of buffering capacity and dmft index was performed using the nonparametric Kruskal–Wallis test. A 5% significance level ($P$ <.05) was adopted for all tests (Table 2).

Table 1: Nutritional status of sample.

| NUTRITIONAL STATUS | N | % |
|---|---|---|
| Mild malnutrition | 24 | 29.3 |
| Moderate malnutrition | 22 | 26.8 |
| Adequate nutritional status | 18 | 22.0 |
| Severe malnutrition | 18 | 22.0 |
| Total | 82 | 100.0 |
| Source: data from present study. | | |

Table 2- Comparison of salivary flow, buffering capacity and dmft (decayed, missing and filled teeth) index among different nutritional status categories.

| | Mild Malnutrition | | Moderate Malnutrition | | Adequate Nutrition | | Severe Malnutrition | | *P* value |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| SALIVARY FLOW (mL/min) | 0.39 | 0.15 | 0.34 | 0.11 | 0.39 | 0.12 | 0.27 | 0.13 | .012 |
| BUFFERING CAPACITY | 3.73 | 1.02 | 3.75 | 1.47 | 3.20 | 0.52 | 3.67 | 0.92 | .243 |
| Dmft | 3.04 | 4.40 | 2.50 | 4.03 | 1.39 | 2.40 | 2.44 | 4.73 | .669 |

SD = standard deviation. Source: data from study. p < 0.05,.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

Table 3- Correlations with nutritional status.

| **Variables** | **Coefficient (r)** | ***P* value** |
|---|---|---|
| Nutritional status × salivary flow | —.267∗ | |
| Nutritional status × buffering capacity | —0.078 | .486 |
| Nutritional status dmft (decayed, missing and filled teeth | —0.091 | .419 |

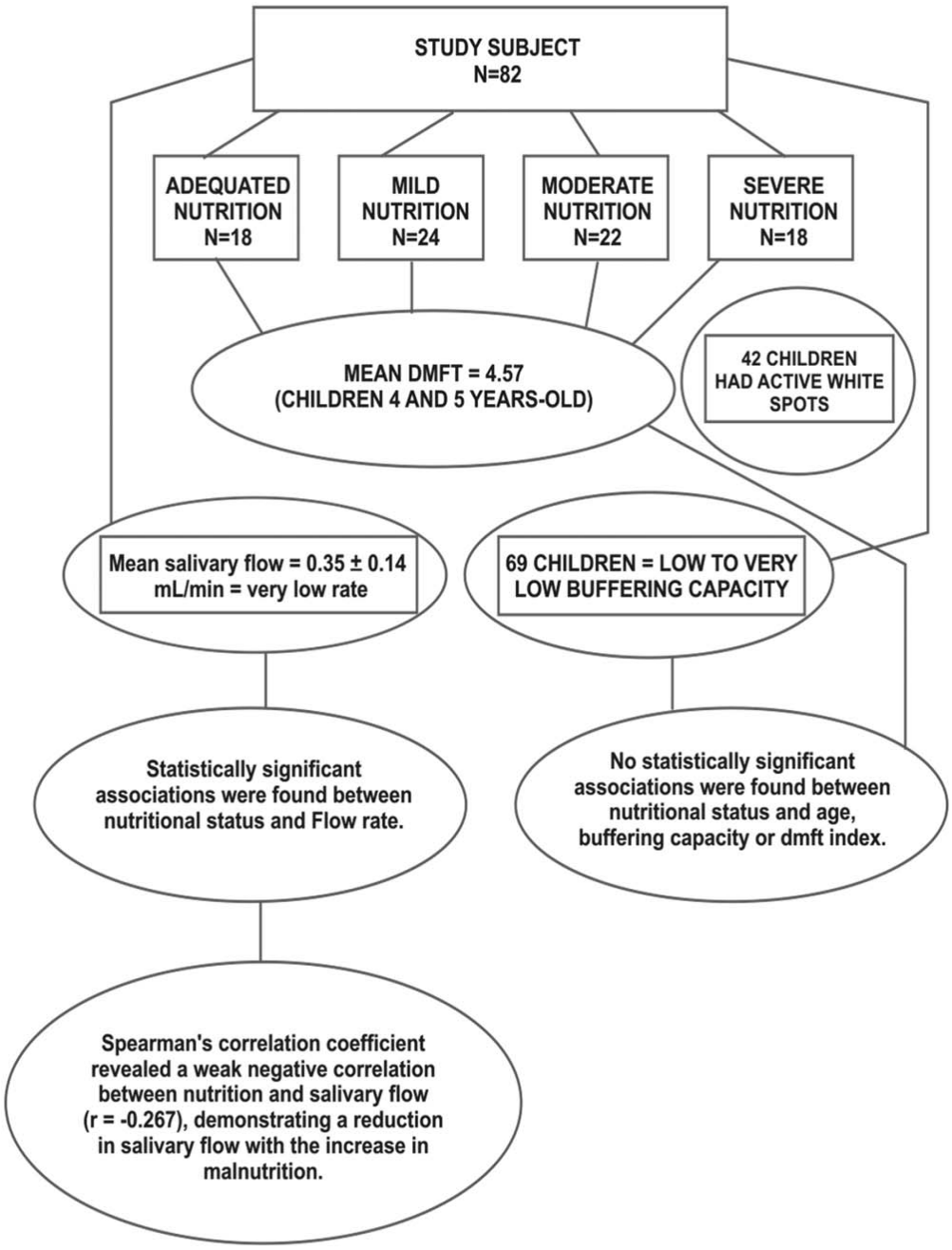


Figure 1. Nutrition Status, dmft (decayed, missing and filled teeth), Salivary flow rate and Buffering capacity of children.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

## DISCUSSION:

The 2020 to 2021 Survey was carried out Department of Pediatrics and Department of Dentistry, Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur has the second most frequent low weight for age rate (5.9%) in the country, behind only the northern region (8.5%).[29] In the city of Shahjahanpur, 50% of the population live in subnormal conditions and a large part of this group resides in the seventh administrative district of the city. In this district, which is where, more than 81,000 individuals inhabit informally constructed communities and approximately 10% of these individuals have some nutritional problem.[5,6] Although the prevalence of malnutrition has diminished greatly in Brazil, it continues to be an important public health problem, especially in some "pockets" of poverty found on the outskirts of large cities, as demonstrated in the present study.[7,8] The role of malnutrition among children in less privileged social classes is of the utmost importance, as these children are deprived not only of a healthy diet, but are also often deprived of culture, education and affectivity, which causes even greater harm.[8]

Early childhood caries is recognized as a significant public health problem,[11,35] the prevalence of which varies across populations.[9}] In Department of Dentistry at, Varun Arjun Medical College and Rohilkhand Hospital, Banthara, Shahjahanpur,, approximately 53.4% of 5-year-old children have caries experience and the mean dmft index among these children is 2.43 teeth, with a predominance of the decayed component, which accounts for more than 80.0% of the index.[16] The mean dmft index among the malnourished children was like the national average and the decayed component was also predominant. High dmft scores was found in malnutrition children like in other dental studies in low- and middle-income countries.[10,11,12]

The results, in this study, showed no statistically significant association between nutritional status and dmft index ($P$ >.05) in accordance within 3 studies,different from other studies.[13,14]

Since the National Oral Health Survey only reports the dmft for 5-year-old children, the national average dmft index reported was 2.43. The mean dmft index of the children in this study was 4.57 for 5-year-old children, which was higher when compared to the National Oral Health Survey and is also higher that the average for the northeastern region (2.89).[15] This high index may be explained by environmental factors that exert an influence on both malnutrition and dental caries, such as socioeconomic aspects and inadequate diet/nutritional status (vitamin D, C, B, and A deficiencies).[8,9] Chronic malnutrition in early childhood is strongly associated with poorer cognitive and educational outcomes throughout childhood, lower wages, and productivity in adulthood.

Like data described in other studies,[15,16] girls in the present investigation (n = 40) had a mean dmft of 1.87, whereas the boys had a much higher index (2.83). This association may be due to socio-cultural and psychosocial factors, as previous studies report greater awareness and self-care among the female sex,[16]

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

Forty two of the 82 children had active white spots, which suggests a high concentration of *Streptococcus mutans* as well as an insufficient protective effect of saliva, inadequate oral hygiene and deficient nutrition (defects in the enamel due to inadequate nutrient intake).[53,54] Mean salivary flow was 0.35 ± 0.14 ml/minute the salivary flow rate, storage capacity, and salivary components, especially proteins.[10] Protein and vitamin A deficiencies are associated with atrophy of the salivary glands, consequently reducing the defense capacity of the oral cavity against infection and the buffering capacity of acids stemming from plaque.[17]

The salivary flow rate is directly related to caries through oral depuration as well as in terms of buffering capacity and antimicrobial components.[18] Sixty nine of the 82 children studied exhibited low to very low salivary buffering capacity. According to other studies,[8,17,18] malnutrition, particularly the inadequate intake of proteins and micronutrients, such as vitamins, zinc and iron, limits the protective effect of saliva in the oral cavity by altering its composition, which may have occurred in the present sample.

A limitation of this study was its sample size. The possible influence of potential confounders determined the establishment of strict inclusion/exclusion criteria, which may explain the limited number of participating children. In the present study, the risk of experiencing dental caries was elevated, since a reduction in salivary flow rate and decreased buffering capacity was observed in undernourished children as have been previously described.[9,10] Therefore, the results of this study showed that reduction in salivary flow rate had a correlation with the increase in malnutrition. This finding is extremely important because children with moderate and severe malnutrition should be better evaluated about salivary conditions to reduce caries and possibly other opportunistic diseases, since saliva is an important means of defense of the organism. Restricting the study sample to children from lower social classes while reducing the possibility of confounding bias may have implications for the external validity of the study. Thus, caution should be exercised when extrapolating the results of this study to different populations with other social classes or age groups.

## CONCLUSION:

Dental caries and malnutrition are public health problems that are concentrated in less privileged socioeconomic groups. The prevalence of caries was high in the present study, beginning in the first year of life and increasing in a constant manner thereafter. No significant differences in dental caries were found among the different categories of nutritional status. The relationship between weight/height and dental caries could also be confounded by other factors. However, salivary flow was found to diminish with the increase in malnutrition, which could aggravate the vulnerability of these children regarding both dental caries and opportunistic infections. This studied showed that there is a correlation between malnutrition and saliva flow rate which should be looked with more attention in the malnutrition children.

## REFERENCES:

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

1. World Bank. India, Undernourished children: A call for reform and action. Available from: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,contentMDK:20916955~pagePK:146736~piPK:146830~theSitePK:223547,00.html.

2. Schroeder DG, Brown KH. Nutritional status as a predictor of child survival: Summarizing the association and quantifying its global impact. Bull World Health Organ 1994;72:569-79.

3. Bhagowalia P, Chen SE, Masters WA. Effects and determinants of mild underweight among preschool children across countries and over time. Econ Hum Biol 2011;9:66-77.

4. Park K. Health care of the community. In: Park K, editor. Park's Textbook of Preventive and Social Medicine. 21st ed. Jabalpur: Bhanot Publications; 2011. p. 830-1.

5. Barbosa JM, Cabral PC, de Lira PI, et al. Socioeconomic factors associated with overweight in a low-income population of northeast Brazil. Arch Latinoam Nutr 2009;59:22–9.

6. SilveiraKB,AlvesJF,FerreiraHS,etal.Associationbetween malnutrition in children living in slums, maternal nutritional status, and environmental factors. J Pediatr 2010;86:215–20.

7. Bundy DAP, Silva Nd, Horton AP, Patton GC, Schultz L, Jamison DT. In: Bundy DAP, Silva Nd, Horton S, Jamison DT, Patton GC, editors. Source Child and Adolescent Health and Development. 3rd edition. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017 Nov. Chapter 1.

8. Lira MCS. Estado nutricional de crianças segundo critérios do SISVAN em municípios do estado de Alagoas. O Mundo da Saúde 2017;41:68– 76.

9. Janakiram C, Antony B, Joseph J. Association of undernutrition and early childhood dental caries. Indian Pediatr 2018;55:683–5.

10. American Academy of Pediatric Dentistry. AAPD 2010-11 definitions, oral health policies, and clinical guidelines 2010. Policy on early childhood caries (ECC): classifications, consequences, and preventive strategies. Available in: https://www.aapd.org/media/policies_guidelines/p_eccclassifications.pdf. (Accessed 10 November 2018).

11. Corrêa-Faria P, Martins-Ju´nior PA, Vieira-Andrade RG, et al. Factors associated with the development of early childhood caries among Brazilian preschoolers. Braz Oral Res 2013;27:356–62.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed ( Group -I) Journal Volume 11, S Iss 2, 2022

12. Bissar A, Schiller P, Wolff A, et al. Factors contributing to severe early childhood caries in south-west Germany. Clin Oral Investig 2014; 18:1411–8.

13. Tsang C, Sokal-Gutierrez K, Patel P, et al. Early childhood oral health and nutrition in urban and rural Nepal. Int J Environ Res Public Health 2019;16:2456–67.

14. Khanh LN, Ivey SL, Sokal-Gutierrez K, et al. Early childhood caries, mouth pain, and nutritional threats in Vietnam. Am J Public Health 2015;105:2510–7.

15. Vandana K, Raju SH, Badepalli RR, et al. Prevalence and risk-factors of early childhood caries among 2-6-year-old Anganwadi children in Nellore district, Andhra Pradesh, India: A cross-sectional survey. Indian J Dent Res 2018;29:428–33.

16. Jiang YY. Prevalence of early childhood caries among 2- to 5-year-oldpreschoolers in kindergartens of weifang city, china: a cross-sectional study. Oral Health Prev Dent 2017;15:89–97.

17. Słotwin´ska SM, Słotwin´ski R. Host response, malnutrition and oral diseases. Part 2. Cent Eur J Immunol 2014;39:522–4.

18. Fonteles CS, Dos Santos CF, da Silva Alves KS, et al. Comparative proteomic analysis of human whole saliva of children with protein- energy undernutrition. Nutrition 2012;28:744–8.