

Assessment of Sequelae of Untreated Dental Caries Using PUFA Index in Children Visiting a Tertiary Center in Kathmandu

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ABSTRACT

Introduction

Dental caries is still a major health problem in most countries as it affects school aged children and adults also. Dental caries continues to be a major public health problem, especially in low- and middle- income countries. It can be prevented and treated with proper utilization of dental services. Untreated dental caries can have pain and infection with significant impact on general health.

Methods

This study was conducted to assess the untreated dental caries in children using the pufa/PUFA index. A hospital based cross sectional study was carried out in 297 children aged 2-12 years old. Caries status was assessed by dmft/DMFT index and untreated caries by pufa/PUFA index.

Results

The “untreated caries PUFA ratio” of the population was 30.69%. The mean dmft index was 5.51±3.59, mean pufa 1.39±1.48 and mean DMFT 0.43±1.03 mean PUFA 0.11±0.46 respectively for primary and permanent teeth. Primary dentition had more caries and pufa score than the permanent teeth.

Conclusions

There were untreated caries present in the children showing lack of timely utilization of dental services.

Keywords: dental caries; dmft index; pufa index.

INTRODUCTION

Dental caries is one of the major chronic diseases affecting almost whole of mankind. It can be treated with proper restoration and can also be prevented by implementing preventive programs

targeting the population. Nontreatment of caries can have severe consequences such as pain, abscess formation, space infection, etc., which leads to loss of function and absence from school.¹ Untreated caries can also cause

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changes in the health status, quality of life, growth, developmental patterns, and school performance of children; in severe cases, it can cause cellulitis or even brain abscess.^{2,3,4} Even in economically developed countries the treatment of decayed primary teeth still remains an on-going public health challenge.⁵ The unmet dental care needs of rural children, particularly of lower socioeconomic status (SES), pose an important risk factor for undernutrition, which is the primary cause of illness and premature mortality.^{4,6} However, in developing countries large proportion of caries remains untreated leading to innumerable consequences.^{7,8}

For several decades dental researchers are following and teaching DMF index developed by Klein, Palmer and Knutson in 1938 for assessing dental caries which had been adopted by World Health Organization for the National surveys.⁹ The classical DMFT/dmft index provides information on caries and restorative and surgical needs but does not provide information on the clinical consequences of untreated dental caries, such as pain, pulpal involvement and dental abscess.^{3,7} Untreated decay of the permanent teeth has been considered as the most prevalent condition world over and untreated decay of deciduous dentition as 10th most prevalent condition.¹⁰ There are new indices developed and proposed to assess caries but the indices to measure the consequences of untreated dental caries still lacks in the literature.^{9,11} Monse et al in 2010 developed new index to assess the prevalence and severity of oral conditions related to untreated caries called as PUFA index for permanent teeth and pufa index for primary teeth.¹²

Few authors have reported PUFA/pufa index as a compliment to the classical caries indices that can address the neglected problem of untreated caries and its consequences.^{1,13} Furthermore, PUFA/pufa data may be used as diagnostic

index that presents the correct data on the consequences of advanced stages of dental caries for planning, monitoring, and evaluating the treatment plan by the health care providers^{5,7,14} specially for the populations with neglected caries treatment and its prevention.¹⁵ It has been reported that dental caries was high among preschool children so there is need for diverting attention in order to promote early detection and primary prevention of caries prevalence and progression in primary dentition.¹⁶ Therefore, it is important to know the prevalence of untreated dental caries to encourage the community to raise awareness and educate the population about the clinical implications and the importance of implementing preventive programs and importance of timely treatment of dental caries. Thus the objective of the study was to determine the clinical effects of untreated caries in children using PUFA/pufa index.

METHODS

This study was a hospital based cross sectional observational study done in the tertiary care center in Kathmandu Valley. The patients visiting the Department of Pedodontics and Preventive Dentistry from September 2021 to February 2022 were included in the study. 297 patients with age range of 2-12 years visiting with chief complaint of dental caries and detected with presence of dental caries were included in the study. The patients reporting with complain of physiological mobile tooth/ pulpal involvement due to trauma and patients with craniofacial syndromes were excluded from the study.

The patients were examined in the dental set up in well illuminated dental chair with autoclaved mouth mirror and explorer. Data was collected by a proforma with the first part as sociodemographic details and second part as clinical indices for dental caries as dmft/ DMFT Index¹⁷ and pufa/ PUFA Index.¹²

DMFT /dmft index¹⁷

- D/d: lesion in a pit or fissure or smooth tooth surface with detectable cavitated soft floor or wall in permanent/primary tooth, temporary restoration present in a tooth, secondary caries in restored tooth
- M/m: a permanent/primary tooth that is extracted due to caries
- F/f: a permanent/primary tooth that is filled due to caries

PUFA/pufa index¹²

- P/p: Pulpal involvement is recorded when the opening of the pulp chamber is visible or when the coronal tooth structures have been destroyed by the carious process and only roots or root fragments are left. No probing is performed to diagnose pulpal involvement
- U / u: Ulceration due to trauma from sharp pieces of tooth is recorded when sharp edges of a dislocated tooth with pulpal involvement or root fragments have caused traumatic ulceration of the surrounding soft tissues, e.g., tongue or buccal mucosa
- F/f: Fistula is scored when a pus releasing sinus tract related to a tooth with pulpal involvement is present
- A/a: Abscess is scored when a pus containing swelling related to a tooth with pulpal involvement is present

Ethical approval was obtained from Institutional Review Committee of Nepal Medical College. Written informed consent was obtained from a parent/ guardian of each child before the participation.

Data analysis was done using SPSS version 20.0. Descriptive statistics were obtained and frequency distribution were calculated.

Pearson's Chi square test was used to test for association. The 'Untreated Caries, PUFA Ratio' for the population was calculated as $PUFA + pufa / D + d \times 100$

RESULTS

A total of 297 children were examined of which 158 (53.2%) were male and 139 (46.8%) were female. The age of the children ranged from 2 to 14 years with mean age 7.48 ± 2.43 years. (Table:1)

| Gender | Frequency | Percentage |
|---------|-----------|------------|
| Males | 158 | 53.2% |
| Females | 139 | 46.8% |
| Total | 297 | 100% |

In the patients diagnosed with dental caries in the studied population the "untreated caries PUFA ratio" was 30.69%. The studied population showed higher mean score of dmft and pufa in primary teeth compared to the permanent teeth. Mean dmft score in the studied population was $6.01 \pm 3.71 \pm 1.03$ and mean pufa score was 1.70 ± 1.59 whereas mean DMFT score was 0.44 ± 1.03 and PUFA score was 0.11 ± 0.48 ; in primary and permanent teeth respectively.

The d/D component in the primary dentition was 5.51 ± 3.59 and in permanent dentition was 0.43 ± 1.03 respectively. There were patients presenting with missing (0.33 ± 0.85) and filled (0.16 ± 0.56) due to caries in primary dentition but these scores were not present in permanent dentition in the examined children. It was found that the pulp involvement was maximum (1.39 ± 1.48) in the pufa score followed by abscess (0.19 ± 0.52) and fistula (0.10 ± 0.36) in the primary dentition. Pulpal involvement in the permanent teeth was less than the primary teeth and none of the permanent teeth presented with ulceration, abscess or fistula. (Table 2)

| Caries status | Primary dentition (n=286) Mean±SD | Permanent dentition (n=186) Mean±SD |
|------------------------|--|--|
| Decay (d/D) | 5.51±3.59 | 0.43±1.03 |
| Missing (m/M) | 0.33±0.85 | - |
| Filled (f/F) | 0.16±0.56 | - |
| dmft/DMFT | 6.01±3.71 | 0.44±1.03 |
| Pulp involvement (p/P) | 1.39±1.48 | 0.11±0.46 |
| Ulceration (u/U) | - | - |
| Fistula (f/F) | 0.10±0.36 | 0.01±0.73 |
| Abscess (a/A) | 0.19±0.52 | 0.01±0.73 |
| pufa/PUFA | 1.70±1.59 | 0.11±0.48 |

Among the children diagnosed with dental caries the number of primary teeth (n=286) presented more caries than the permanent teeth(n=186).

In primary dentition the male patients presented with more caries index (dmft) whereas females(79.4%) presented with higher number of untreated caries with higher pufa score .The difference was not statistically significant(p>0.05) (Table 3)

DISCUSSION

Dental caries can be treated with minimally invasive procedures/restorations/pulp-therapy and even extraction as a last resort if the tooth cannot be saved but can also be prevented if preventive programs are implemented timely. However dental services may not be used because of perceived discomfort and hesitation to undergo dental treatment, which may lead to

| Dentition | Dental caries index | Male (n=155) n (%) | Female (n=131) n (%) | Total n (%) | p-value |
|-----------------|---------------------|--------------------|----------------------|-------------|---------|
| Primary (n=286) | dmft | 152 (98.1) | 127 (96.9) | 279 (97.6) | 0.706 |
| | pufa | 111 (71.6) | 104 (79.4) | 215 (75.2) | 0.129 |

p-value <0.05 statistically significant.

In the permanent teeth (n=186) females presented with more caries 25.9 % than males (13.9%) and also more untreated dental caries (10.6 %). This difference was statistically significant. (Table 4)

untreated dental caries.¹⁸ When untreated caries progresses into dental pulp it can lead to pain, discomfort while eating food, infections which can lead to absence from the school resulting in poor academic performance of the child.^{7,9,19}

| Dentition | Dental caries index | Male (n=101) n (%) | Female (n=85) n (%) | Total n (%) | p-value |
|---------------------|---------------------|--------------------|---------------------|-------------|---------|
| Permanent (n = 186) | DMFT | 14 (13.9) | 22 (25.9) | 36 (19.4) | 0.039* |
| | PUFA | 3 (3.0) | 9 (10.6) | 12 (6.5) | 0.035* |

*p-value <0.05 statistically significant

To detect the consequences of untreated caries in primary dentition of children in Poland, Baginska et al. evaluated the efficacy of the pufa index and reported a strong association between the dmft and pufa indices.²⁰ The purpose of this study was to use dmft/DMFT index in harmony with PUFA index so that it can better present information regarding the untreated dental caries and thus, may provide more data that can help determine treatment needs of those affected by caries.

This hospital-based study done in tertiary care center was conducted to assess the untreated caries in the children of 2 to 12 years old children. The patients reporting with the dental caries were selected and the consequences of untreated dental caries was evaluated using the pufa/PUFA index.

In the studied population “untreated caries pufa ratio ($\text{pufa} + \text{PUFA}/\text{d} + \text{D} \times 100$) was 30.6% indicating progressive odontogenic infection due to untreated dental caries. Prasai et al²¹ have reported 31% Chepang children in Nepal reported odontogenic pain due to untreated caries this value was almost same with our observation. However, this ratio is relatively less than the ratio observed in previous studies carried out in different population^{1,10,12,14,20,22,23} but was more than few reported studies.^{5, 19,24}

The mean pufa score was higher in the primary teeth (1.70 ± 1.59) than the permanent teeth (0.11 ± 0.48) in the studied population. There are alike reports in the literature where the primary teeth presented with a greater number of untreated caries than the permanent teeth.^{3,7,19} The low prevalence of untreated caries in permanent teeth might be due to the age group selected in the current study who undergo physiological changes with transition from primary to mixed dentition. With the exfoliation of the primary teeth²⁵ and newly erupted permanent teeth not

getting enough time in the oral flora to develop or progression of dental caries would have presented a smaller number of untreated caries than primary teeth.¹⁹

When viewed individually, the “decayed” component of dmft/DMFT was majorly responsible for the score of the cumulative index analogous to other reported studies conducted in different population.^{10,16,26} The missing and filled component in primary teeth was 0.33 ± 3.59 and 0.16 ± 0.56 respectively whereas Missing and Filling (permanent teeth) component was not present in the studied population. The main component of the pufa / PUFA value of this study was pulpal involvement, similar finding was reported by Karki et al⁸ where the pulpitis was most common sequel of untreated dental caries in the Nepalese children residing in different regions of Nepal and in different population.^{1,12,14} Very few cases of other components like “f/F” and “a/A” of pufa/PUFA were observed. It has been suggested that it may be because of the intermittent nature of abscess could have led to the underestimation of “a/A”.²³ The u/U component was not present in the both primary and permanent teeth in our studied population. The u/U component in pufa/ PUFA index stands for traumatic ulceration in the surrounding soft tissue, therefore it has also been suggested not to consider it as the complication of untreated carious.²⁷

We have observed higher pufa score in the primary teeth than permanent teeth and also higher “d” and “p” component than “D” and “P” score. The possible explanation could be that unlike the permanent teeth most deciduous teeth with untreated caries remain asymptomatic until the exfoliation due to their anatomical variation and also partly due to negative attitude of parents towards treatment of the primary teeth due to its exfoliative nature.²³ Nevertheless children with a pufa score more than zero have significantly

lower quality of life than children with zero pufa score,⁴ and an increased risk of below normal BMI⁶ i.e. with the pufa/PUFA scores increasing, it has a detrimental effect on the oral health related quality of life of the individual.

Dental caries was higher in males in the primary teeth (statistically non-significant) whereas females presented with more caries than the males in the permanent teeth in this study. The prevalence of dental caries was more in females than in males in a study done in different Nepalese population.^{26,28-30} In the present study no significant difference was found for pufa score for primary teeth between males and females like in other reported studies³ but showed statistical difference in the DMFT and PUFA score of permanent teeth between two gender. The higher caries rate in females may be due to the fact that the teeth eruption is faster in females than the males.³¹

PUFA/pufa assesses four stages of clinical relevance concerned with untreated caries. It is a measure of quantification of clinical sequelae only relied on objective signs, but does not help to record the subjective parameters such as pain and discomfort.^{2,23} Pufa codes 'f' and 'a' refer to the same inflammatory process of the tooth but the required treatment will be the same either endodontic treatment or extraction depending upon the prognosis.²⁴ Therefore few authors suggests modification of the index by either eliminating u and combining f and a component, incorporating missing teeth due to caries in pufa index or pulpal involvement-root-

sepsis(prs) index where f ,u and a component are combined as root infection.^{14,15,20,24} However, few authors^{1,5,10,14,23} have suggested pufa as complimentary to dmft index. It can provide valuable data for planning of preventive services for the children who are under higher risk category and provision of treatment to those with urgent treatment needs.

CONCLUSIONS

Despite the study being conducted in the hospital setup, around one third of the study population showed unrestored carious lesion in their teeth. This finding indicates a lack of awareness and importance of timely dental treatment that led to the progression of carious lesions to pulp involvement and other consequences. Increase in the pulpal involvement in children with primary dentition emphasizes the need for parental awareness and proper preventive measures for caries in the early childhood as their permanent teeth will too be in higher risk of caries.

The study population was from the locality visiting same hospital therefore the result may not be generalized. Apart from the shortcomings described by few researchers, this new index (PUFA) would provide qualitative and quantitative information about untreated dental caries in an individual or populations based on clinical examination. It is easy to use, fast, and safe; it doesn't require any equipment, and when used along with the DMFT/DMFS index, it would provide additional data for health planners for effective planning and treatment.

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