Evaluation of Health Status of the First Permanent Molars of Children Aged 6 to 12 years in Benghazi, Libya

Majda Elfseyie[1*], Rogaia Alaskandrani[1], Rasmia Huew[1], Saied Elsenussi[1]

[1]Department of Pediatric Dentistry, Faculty of Dentistry, University of Benghazi (UOB), Benghazi, Libya

Abstract: Dental caries is considered the most prevalent oral disease among children; the first permanent molar is particularly more susceptible tooth to the decay in the dental arch. Aims of this study were to determine caries-free status and DMFT index of the first permanent molars (FPMs) among Libyan children. A total of 375 children aged between 6 to 12 years were examined for caries incidence based on the guideline provided by the World Health Organization (WHO). Data were analyzed by using Chi-square tests and the Kruskal Wallis test. The prevalence of carious FPMs among all groups was (45%), while the incidence of sound FPMs was (55%). The lowest rate of carious FPMs was observed in 6 years of children (0.9%). However, the highest rate was observed in 12 years of children (8.9%). There were statistically significant between the frequency of (one-two-three-four) molar involved in the DMFT index and the age (P <0.05). In both children aged 10 and 12 years the incidence of involved four molars was the highest rate (10.7%). The DMFT index of FPMs of all samples was (1.80±0.081). Hence, in 12 years children were significantly (P <0.05) the highest rate (2.66±0.21) compared with the other group. In addition, it was high compared to WHO standards in 2010 (>1). Moreover, caries incidence was increased with age. According to these findings, it is strongly recommended efficient plans to provide oral health services for Libyan children. Besides that FPMs require special attention during clinical examination, demands careful prevention measures including fissure sealants, topical; fluoride application, and home care.

Keywords: Dental caries, FPMs, DMFT, Oral health, CF.

INTRODUCTION

Dental caries is considered the most prevalent oral disease among children; the first permanent molar is particularly more susceptible tooth to the decay in the dental arch due to unlimited sugar consumption and inadequate health service, therefore this tooth have been introduced as index for caries activity (Nazir et al., 2019; Yaghooti et al., 2017). The incidence of dental caries is considering high in developing countries compared with developed countries (Ali et al., 2013). Despite, caries incidence decreased in the last few years in developed countries due to many reasons including changes in diet habit, oral hygiene measures, increased awareness about oral health, fluoride application and preventing care programs. In the developing countries, the prevalence of dental caries is increasing as results of high sugar intake and limited health services. The most common epidemiologic indicator for evaluation and measurement of dental caries is the decayed, missing, and filled teeth (DMFT) index; this index does not show the true incidence of tooth caries in a community. Therefore, the percentage of caries free (CF) will be used as a complementary index to illustrate the prevalence of caries in individuals (Gorgi et al., 2017). The first permanent molars (FPMs) are the earliest tooth erupted of permanent dentition, they erupt while temporary teeth still exist in the oral cavity; therefore their eruption turning the primary into a mixed dentition (Pontigo-Loyola et al., 2020). The FPMs is used to assess caries activity, oral health status as well as to determine the most vulnerable groups for caries based on World Health Organization (WHO) (Yaghooti et al., 2017). The FPMs is considered as the most important tooth in the mouth because it plays an important role in establishing of occlusion and maintenance the space. Thus, the other permanent teeth will be erupted and the early loss of it will affect the other definitive teeth and the physical growth in children. In addition, FPMs may be mistaken by the parents with temporary molars because it erupts without replacing any temporary teeth. As result of these the hygiene of these teeth is mostly neglected (Chirca et al., 2015). The average time of eruption of FPMs start at 6 years because of early eruption of FPMs lead to increase caries susceptibility. In addition, tooth morphology is considered a causative factor for early caries attack and lead to early extraction of it if not treated (Poureslami et al., 2017). However, the missing of third molar is common anomaly because of their impaction need an extraction or it may be congenital missing. This enhance of keeping FPMs safe, if it lost early lead to malocclusion of other teeth (Ali et al., 2013). Many studies were conducted over the world to assess

occlusal irregularities which play an important role in planning dental service for the society (Elfseyie, 2013). A study was conducted in Mexico, showed a strong correlation between the comprehensive DMFT and FPMs, and reported that the general status of caries can be inferred on the basis of FPMs; this might be useful in national surveys, the decision to use an abbreviated DMFT Index protocol can serve to evaluate the benefits of reduced effort for data collection in terms of the possible loss of data (Pontigo-Loyola et al., 2020). Although caries incidence was high in the world, a few studies were conducted in Libya, and little data was published, especially in Benghazi. It is necessary to obtain baseline data regarding the condition of FPMs which may serve an important role in controlling, preventing and organizing oral health care services. Therefore, the objective of the current study was to determine DMFT index of FPMs in children age groups living in Benghazi, Libya.

MATERIAL AND METHODS

This cross sectional study was conducted in Pediatric Clinic Department of Faculty of Dentistry. Ethical approval was given by Ethical Research Committee of the Faculty of Dentistry. A consent form was signed from children's parents, who agreed to include their children in the study. The selection of subjects was convenient because all children should met inclusion and exclusion criteria. The inclusion criteria were children's age ranged from 6 to 12 years. The exclusion criteria were all children with mental or physical problems and medical compromised were excluded. The clinical examinations of dental caries were based on diagnostic criteria which are recommended by WHO (1986). In this study, only FPMs was included, this molar called the first permanent molar FPMs is named by Kunzel (1988) (Chirca et al., 2015). All selected children were examined for dental caries by using dental explorer and a plane mouth mirror and cotton rolls to remove debris and plaque. FPMs were evaluated starting from the upper right side of dental arch and ending at the lower left side of the dental arch. A dental chart was used to record CF and DMFT index. It is resulted from adding the total number of decayed, missing, and filled teeth; this index expressed by letters D, M, and F which represented decayed teeth, missing teeth due to decayed and filled teeth, respectively. Based on WHO criteria, a tooth is considered as decayed if it restored teeth with recurrent caries or teeth with temporary dental dressing. Teeth extracted due to caries were considered as missing teeth (Gorgi et al., 2017). To ensure the reproducibility of the study, calibration between the examiners was done on (10%) of sample. Cohen's Kappa was used to measure the level of intra-examiner agreement (0.84-89). Statistical analysis of data was performed by using SPSS software (version 16, SPSS Inc., Chicago, IL, USA). Chi-square tests were used to analyze the data and p-value less than (0.05) was considered statistically significant. The Kruskal Wallis test was applied for age groups against DMFT index, and the Student's t test was used to compare the differences among the means at significant level (0.05).

RESULTS

The total sample of three hundred and seventy five subjects was classified by age as following: 6, 7,8,9,10,11 and 12 years' age groups, which consisted of 34,44,72,68,66,41,50 subjects respectively. The distribution of caries incidence, the prevalence of sound FPMs were (825 teeth; 55%) while the incidence of carious FPMs was (675 teeth; 45%), which included the decayed teeth DT, MT, FT was (41.7%), (1.3%), and (2%) respectively as shown in Figure 1.
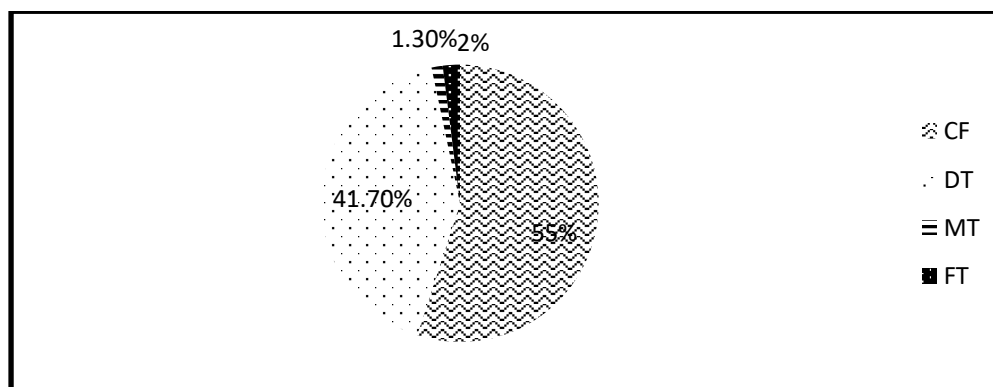

Figure 1 Distribution of caries incidence in all groups

The highest rate of CF was observed in children aged 8 years (10.9%), whereas the lowest rate of CF was observed in 12 years children (4.5%). The lowest rate of incidence of carious FPMs was found in children aged 6 years (0.9%), while the highest rate of carious FPMs was found in children aged 10 and 12 years was (9%, and 8.9% respectively) as shown in Figure 2.
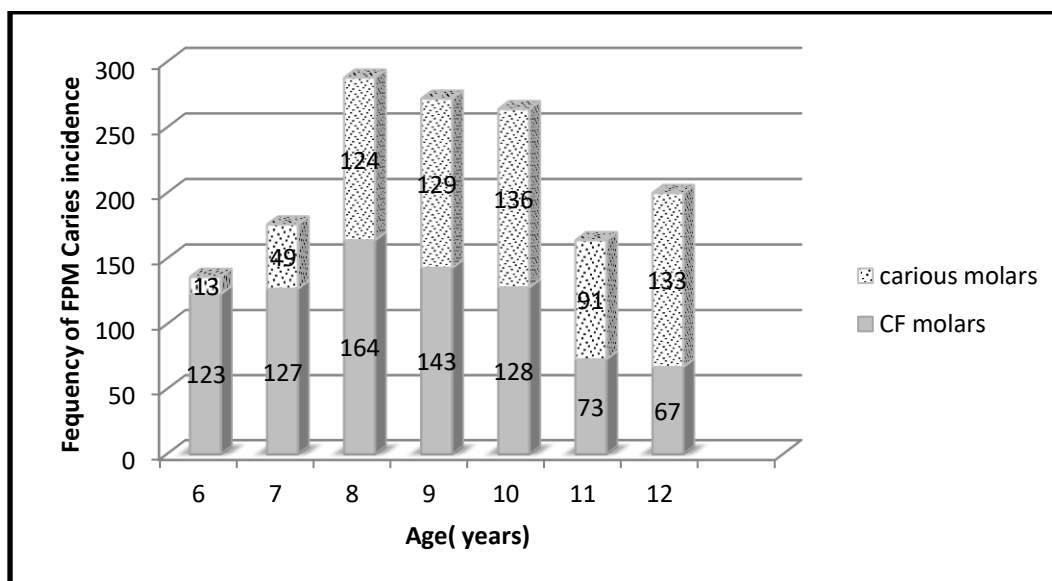

Figure 2: Distribution of caries according to the children's age

As can be observed in the results presented in Table 1, DMFT index of FPMs in whole samples was (1.80±0.081). The DMFT was significantly (P <0.05) the highest rate (2.66±0.21) in children aged 12 year, followed by the children aged 11 year (2.22±0.23). However, it was significantly (P <0.05) the lowest rate in children aged 6 years (0.38±0.25). The incidence of DT was higher in the children aged 10 years compared with other age groups. Whereas, the lowest rate of DT was recorded in children aged 6 years (1.9%). The prevalence of MT was higher in children aged 11 years compared to other age groups. However, the prevalence of MT in children aged 6, 7 years was zero. The highest prevalence of FT was observed in children aged 11 years, while in children aged 7 was zero.

Table 1: The distribution of the DMFT index of first permanent molars

Age (years)	DMFT[2] (Mean ±SE)	DT[1] N %	MT[1] N %	FT[1] N %	Total N %
6	0.38[d]±0.25	13 (1.9)	0 (0.0)	0 (0.0)	13 (1.9)
7	1.11[c]±0.22	47 (7)	0 (0.0)	2 (0.3)	49 (7.3)
8	1.72[b]±0.17	117 (17.3)	1 (0.1)	6 (0.9)	124 (18.4)
9	1.90[b]±0.18	126 (18.7)	1 (0.1)	2 (0.3)	129 (19.1)
10	2.06[b]±0.18	128 (19)	5 (0.7)	3 (0.4)	136 (20.1)
11	2.22[ab]±0.23	73 (10.8)	8 (1.9)	10 (1.5)	91 (13.5)
12	2.66[a]±0.21	121 (17.9))	5 (0.7)	7 (1.0)	133 (19.7)
Total	1.8±0.08	625 (92.6)	20 (3.0)	30 (4.4)	675 (100)

DMFT: Decayed, Missing, Filled Teeth Index; DT: Decayed teeth; MT: Missing teeth; Filled teeth.[1]Pearson Chi-square=32.50, p =0.001.
[2]Mean ±SE. [a-d] means with different superscripts in DMFT index are differ significantly (P <0.05).

A statically significant (P < 0.05) was found between the frequency of FPMs (one–two-three-four) molar involved in DMFT and the age. The highest rate was found in four molars incidence (49.8%) and the lowest rate was one molar incidence (6.5%). In children aged 6 years, the frequently of FPMs with three molars involved was (0.9%)

however, the frequent of four molars involved did not reported at that age. In both children aged 10, 12 years the incidence of involving four molars were highest rate (10.7%) as shown in Table 2.

Table 2: Number and frequency of molars, DMFT (%) in relation to age groups

Age/year	Frequency of FPMs and DMFTindex				Total
	1 molar	2 molars	3 molars	4 molars	N %
	N %	N %	N %	N %	
6	3 (0.4)	4 (0.6)	6(0.9)	0(0)	13 (1.9)
7	4 (0.6)	6 (0.9)	15 (2.2)	24 (3.6)	49 (7.3)
8	11 (1.6)	20 (3.0)	33 (4.9)	60 (8.9)	124 (18.4)
9	9 (1.3)	28 (4.1)	36 (5.3)	56 (8.3)	129 (19.1)
10	9 (1.3)	22 (3.3)	33 (4.9)	72 (10.7)	136 (20.1)
11	2 (0.3)	22 (3.3)	15 (2.2)	52 (7.7)	91(13.5)
12	6 (0.9)	28 (4.1)	27 (4.0)	72 (10.7)	133(19.7)
Total	44 (6.5)	130 (19.3)	165 (24.4)	336 (49.8)	675 (100)

Pearson chi-square (x^2) =32.193, P value =0.021.

DISCUSSION

In this study, the prevalence of sound FPMs amongst all groups was (55%). CF in children aged 6 years was (8.2%). This result is agreed with Global goals for oral health 2020 to increase the proportion of caries free 6 year's children (Hobdell et al., 2003). A similar studied was conducted on children aged 6 years in Taiwan and showed that caries free of FPMs was (48%) (Warren et al., 1997). Another study was conducted on 6 years children in South Africa reported that (39.7%) were caries free. While in Sudanese children free caries was 39% (Abuaffan et al., 2018). Which is below the goal of (50%) set by the Department of Health for the year 2000 (van Wyk and van Wyk, 2004). In the present study, CF in children aged 7 years was (8.5%), and the highest rate of CF was observed in children aged 8 years (10.9%). Whereas in children aged 9 years was (9.5%). However the lowest rate of CF was observed in 12 years children (4.5%). These findings are consistent with the finding reported in Jeddah, Saudi Arabia showed the four sound FPMs were varied according to age with the highest (33%) in 9 years and the lowest (16.5%) in the oldest children 12 years (Al-Samadani and Ahmad, 2012).

In the current study, the incidence of carious FPMs (45%), which divided into DT, MT and FT which were 41.70%, 1.30% and 2%, respectively. It seems to be higher percentage of DT in comparison with missing and filled one, this may be due dietary habits of more sugar consumption, low concentration of fluoride in drinking water, inadequate oral hygiene, limited the access to public preventive and restorative programs. These findings is slightly lower than the results in Benghazi, higher caries (61.9%) (Al Sharbati et al., 2000). Nevertheless, in another study on the prevalence of dental caries was (57.8%) in the same region (Huew et al., 2011). In addition the results reported in Sudanese children aged 6-14 years, carious FPMs was (61%) (Abuaffan et al., 2018), and in South West Coast of India carious FPMs was (83.8%) (Thushara Sudhakaran, 2016). Moreover, in Iranian children aged 12 years carious FPMs were 66.04% (Poureslami et al., 2017). A similar finding was reported in Dammam, Saudi Arabia 49.8% had carious molars (Khan et al., 2017). These finding might be due to the differences in the amount of fluoride in water, food cultures and oral hygiene habits. In contrast with another study from Pakistan, it showed a lower caries prevalence was (30.6%) among 8-12 years children (Ali et al., 2013), and in Benghazi city, Libya caries-free teeth in the permanent dentition were 63.8%, while caries teeth were 36.2% (Elfseyie et al., 2020). In the current study, the highest rate of carious FPMs was observed in 12-year children (8.9%) compared to other ages. These findings are in agreement with the results reported in Iranian children aged 12 years, showed that the higher carious FPMs (53.12-66.04%). Therefore the children at these ages need restoration and/or extraction of this tooth services (Poureslami et al., 2017). Hence, the decreased in parent awareness of these teeth lead to early loss, therefore, it is absolutely necessary to provide health, educational and dental treatment for the children.

In this study, the DMFT of all samples was (1.80±0.081). Hence, in children aged 12 year was significantly (P <0.05) the highest rate (2.66±0.21), followed by the children aged 11 years DMFT was (2.22±0.23). On the other hand, this result is disagreed with the Global Oral Health Data Bank and WHO Oral Health, 2000, reported that the incidence of DMFT in 12-year in Libya was very low (<1.2). In addition, it disagreed with WHO Health 21 policy for Europe who has been formulated goals for the 2020 Year, on average no more than (1.5) of DMFT should be observed in children aged 12 years. A statically significant was found between the caries incidence and the age especially in 12 years children, because their FPMs have been in the oral cavity since 6 years (Petersen, 2004a). According to National Oral Health Survey (2002-2003), caries prevalence in India was 51.9% (mean dmft=2), 53.8% (mean DMFT=1.8) and 63.1% (mean DMFT=2.4) at ages 5, 12 and 15 years respectively (Arora et al., 2015). This finding of increased rate in several developing countries may be due to high consumption of sugars and inadequate fluorides application (Petersen, 2004b). Another study in Libya showed that DMFT of 12 years children was (1.68 ±1.86), it was met the WHO goal for 2000 (Huew et al., 2011), and in Tripoli, a study conducted on 392 children with aged ranged from 6 to12 years, showed that, the highest rate (P <0.05) of DMFT was observed in 12 years children (Kabar et al., 2019), and in Benghazi DMFT index was (1.80±.081) and the highest rate was in left side of the mandible (0.51±.026) (Elfseyie et al., 2020). This may be due to changing life-styles, living conditions and a more sugar consumption. While in South Africa the DMFT of (1.1) for the children aged 12-years, and in Libyan children aged 6 to 12 years DMFT index was 1.21±0.19 (Elfseyie et al., 2020).

However, it was below than the (1.5) set by the Department of Health for this group for the year 2000 (van Wyk and van Wyk, 2004), may be due to improved oral hygiene by using fluoridated toothpaste, mouth wash, and topical application of fluorides. In the present study, the lowest rate of DMFT was found in children aged 6 years (0.38±0.25). These finding are in agreement with WHO Health 21 policy for Europe has been formulated goals for the 2020 Year. By that year, at least 80% of 6-year children should be caries free (Petersen, 2008). A similar result of the lowest rate (P <0.05) of DMFT was reported in 6, 7 years children in Tripoli, Libya (Kabar et al., 2019).

In the current study, the lowest rate of DT was found in children aged 6 years (1.9%). However, the higher rate of DT was found in 10 years children (19%) followed by the 9 years was (18.7%) and 12 years was (17.9%). This result is disagreed with Global goals for oral health 2020 which is the reduced of DMFT in 12 years children particularly DT component (Hobdell et al., 2003). The high level of DT is an importance to concern due to the fact of the extraction is most used procedure in public clinic; therefore the application of fluoride is very necessary. The prevalence of MT was higher in children aged 11 years in compared to other age groups. Whereas, the prevalence of MT in children aged 6, 7 years was zero.

In this study, statically significant was found between the frequency of (one–two-three-four) molars involved in DMFT and the age (P <0.05). The four molars involved were the highest rate (49.8%). While, the lowest rate was one molar involved (6.5%). The four molars involved did not reported at age of 6 years. In both children aged 10, 12 years the incidence of involved four molars were highest rate (10.7%). A similar finding was reported in children aged 8 to 12-years, in Pakistan (1.8%) of children had all (four) first molars affected by caries (Ali et al., 2013). Another study conducted in Sri Lanka in 13-16 years children, and showed (36%) of cases had sound four FPMs, and (11%) had caries in all four (FPMs) (Warnakulasuriya, 1991).

CONCLUSION

The DMFT of total sample was high and the highest rate was observed in children aged 12 years. In addition, it was high in compared to WHO standards in 2010 (>1). Moreover, caries incidence was increased with age. According to these finding FPMs require special attention during clinical examination, demands careful prevention measure including fissure sealants, topical; fluoride application and home care as well as plan should be start to provide an early intervention to educate the children and their parents about the etiological factors and eating habits and consumption of sugars, thus it is strongly recommended to start oral health programs to provide oral health care for Libyan children.

ACKNOWLEDGMENT

CONFLICT OF INTERESTS

None declare

REFERENCES

1. Abuaffan AH, Hayder S, Hussen AA, Ibrahim TA (2018). Prevalence of dental caries of the first permanent molars among 6‑14 years old Sudanese children. *Indian Journal of Dental Education* 11(1):13-16.
2. Al-Samadani KH, Ahmad MS (2012). Prevalence of first permanent molar caries in and its relationship to the dental knowledge of 9–12-year olds from Jeddah, kingdom of Saudi Arabia. *ISRN dentistry* 2012(391068.
3. Al Sharbati M, Meidan T, Sudani O (2000). Oral health practices and dental caries among Libyan pupils, Benghazi [1993-1994]. *EMHJ-Eastern Mediterranean Health Journal* 6(5-6):997-1004.
4. Ali NS, Ali NS, Khan M, Qamruddin I, Askary H, Sajwani A (2013). Prevalence Of Dental Caries In The First Permanent Molars In Children Between 8-12 Years. *Journal of Pakistan Dental Association* 22(2):119-123.
5. Arora B, Khinda VI, Kallar S, Bajaj N, Brar GS (2015). Prevalence and comparison of dental caries in 12 year old school going children in rural and urban areas of Ferozepur city using sic index. *Dent Oral Craniofac Res* 1(2):38-41.
6. Chirca EM, Rodica L, Georgescu D-E (2015). The prevalence of caries in first permanent molar in a group of school children aged 6 to 7 years in piteşti. *Prevalence* 1(4th.
7. Elfseyie M (2013). A study of occlusal features of Malay adults and 12 year old school children/Majda TM Elfseyie, Universiti Teknologi MARA.
8. Elfseyie M, Elsenussi S, Alaskandrani R, Huew R (2020). Estimate of DMFT index using teeth most affected by dental caries in Benghazi, Libya. . *International Journal of Applied Dental Sciences* 6(2): 159-162.
9. Elfseyie M, Elshebani S, Elsenussi S, Alaskandrani R (2020). Caries Incidence, by DMFT Index of Libyan School Children Concerning Socio-demographic Variables and Oral Health Behavior. *International Journal of Sciences: Basic and Applied Research (IJSBAR)* 52(2):9.
10. Gorgi Z, Abbasi A, Mohsenzadeh A, Damankeshan A, Sheikh Fathollahi M (2017). A survey on DMFT index of the first permanent molar in 12-year-old students of Larestan, Iran, in 2014. *Journal of Occupational Health and Epidemiology* 6(1):32-39.
11. Hobdell M, Petersen PE, Clarkson J, Johnson N (2003). Global goals for oral health 2020. *International dental journal* 53(5):285-288.
12. Huew R, Waterhouse PJ, Moynihan PJ, Maguire A (2011). Prevalence and severity of dental caries in Libyan schoolchildren. *International Dental Journal* 61(4):217-223.
13. Kabar AM, Elzahaf RA, Shakhatreh FM (2019). Prevalence and Risk Factors of Dental Caries Among 6 To 12 Years Old Children In Tripoli City, Libya. *Sch J Dent Sci* 6(4):223-233.
14. Khan S, Farooq I, Arjaie A, Khabeer A, Farooqi A (2017). Prevalence of firts permanent molar caries among 8 to 12 years old school-going Children living in dammam, kingdom of Saudi Arabia. *Ann Jinnah Sindh Med Uni* 3(1):18-21.
15. Nazir MA, Bakhurji E, Gaffar BO, Al-Ansari A, Al-Khalifa KS (2019). First Permanent Molar Caries and its Association with Carious Lesions in Other Permanent Teeth. *Journal of Clinical & Diagnostic Research* 13(1): ZC36-ZC39.
16. Petersen PE (2004a). Challenges to improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *International dental journal* 54(S6):329-343.
17. Petersen PE (2004b). Improvement of oral health in Africa in the 21st century-the role of the WHO Global Oral Health Programme. *African Journal of Oral Health* 1(1):2-16.
18. Petersen PE (2008). Changing oral health profiles of children in Central and Eastern Europe–Challenges for the 21st century.

19. Pontigo-Loyola AP, de Lourdes Márquez-Corona M, Minaya-Sánchez M, Lucas-Rincón SE, Casanova-Rosado JF, Robles-Minaya JL *et al.* (2020). Correlation between the caries status of the first permanent molars and the overall DMFT Index: A cross-sectional study. *Medicine* 99(5):e19061.
20. Poureslami P, Pouradeli S, Poureslami H, Shahrokhi E (2017). Evaluation of health status of first permanent molar teeth among 12-year-old students in rural areas of south of Kerman, Iran, 2016. *Journal of Oral Health and Oral Epidemiology* 7(1):33-38.
21. Thushara Sudhakaran MNH, ShruthiAttavar and Gowrish. S. Bhat (2016). Prevalence of Caries in First Permanent Molars in South West Coastal Population of India. *International Journal of Current Research and Academic Review* 4(3):106-113.
22. van Wyk PJ, van Wyk C (2004). Oral health in South Africa. *International Dental Journal* 54(S6):373-377.
23. Warnakulasuriya S (1991). Caries susceptibility of first permanent molars and treatment needs in Sri Lankan children, aged 13-16 years, in 1986. *Community dental health* 8(2):167-172.
24. Warren J, Hand J, Yao J (1997). First-molar caries experience among Taiwanese first-grade children. *ASDC Journal of dentistry for children* 64(6):425-428.
25. Yaghooti K, Mohamad M, Irannezhad M (2017). The prevalence of caries in the first permanent molars among students of 7 and 12 years of age in Rafsanjan, Iran, in 2009-2010. *Journal of Occupational Health and Epidemiology* 6(1):25-31.