Treatments Performed on First Permanent Molars in a Sample of Lebanese Children

Balsam El Noueiri¹, Samia Aboujaoude¹

ABSTRACT

Background: Dental caries remains one of the most prevalent worldwide chronic diseases and an expensive burden to healthcare services despite significant preventative measures. Objective: Dental caries is a multifactorial chronic disease that occurs in early childhood and persists until adulthood. The first permanent molars (FPMs) are the earliest permanent molars to erupt, making them vulnerable to caries among children and adolescents. Objective: The aim of this study is to determine the prevalence of different types of treatments performed on FPMs in 7–10-year-old Lebanese patients. Methods: In this retrospective study, a convenience sample obtained from the dental electronic health record system of 753 patients, aged between 7 and 10 years old who attended the department of Pediatric Dentistry at the Faculty of Dental Medicine–Lebanese University, between 2015 and 2019 was assessed. Preventive procedures (fissure sealants and preventive resin restorations) as well as therapeutic ones (apexogenesis, composite restoration, extraction, pulp capping, radicular treatment, pulpotomy, stainless steel crown, surgery, and emergency) were investigated. Data collected was statistically analyzed using SPSS version 25.0 (Armonk, NY: IBM Corp). Results: The 753 patients were divided into 364 girls (48.3%) and 389 boys (51.7%). These patients underwent a total of 2145 procedures. Procedures were equally divided between therapeutic procedures and preventive ones (51.6% versus 48.4%, respectively). The most commonly performed procedure was composite restoration (41.9%), followed by fissure sealant (34.5%) and preventive resin restorations (14%). Treatments corresponded to a similar sex distribution with slightly higher male patients (53.6%). No statistical association was found between sex and procedure type (p=0.7). Conclusion: In the present study, therapeutic treatments prevalence is relatively high. Thus, educating the parents and teachers on the importance of FPMs would reflect in increased preventive treatments at the expense of decreased therapeutic ones. Keywords: First permanent molars, fissure sealant, preventive resin restoration, composite restoration, dental extraction, stainless steel crown, pulp treatments.

1. BACKGROUND

Dental caries remains one of the most prevalent worldwide chronic diseases and an expensive burden to healthcare services despite significant preventative measures (1). Globally, it has been stated that dental caries is decreasing in most developed and developing countries due to prevention strategies and easy access to dental health services, while in underdeveloped and among underprivileged groups in developing countries, trends in dental caries have shown a notable increase in the incidence of the disease, with absence of caries treatments (2–5).

Dental caries occurs in early childhood and persists until adulthood, affecting all stages of dentition (primary, mixed, and permanent). The sooner a dental care treatment is defined and handled, the lower the burden is on the physical, psychological, and economic well-being of a person. The first permanent molars (FPMs) are con-
sidered the key to establishing permanent occlusion and play an important role in dental arch growth and the establishment of the stomatognathic system (6-10). Besides, FPMs represent an important index of caries prevention (11). Their decay constitutes the largest component of decayed missing filled tooth index (DMFT) among children and adolescents as they are the most susceptible permanent teeth to caries (6, 12).

As they are the earliest permanent molars to erupt while temporary teeth still exist, parents are often unaware that they are permanent, especially in absence of exfoliation of primary teeth. Considering the young age at which they emerge, their posterior position in the child’s mouth and the complex occlusal morphology (deep fissures and grooves), they are exposed to dental caries that often result in their destruction and premature loss (9, 13). Therefore, preventive measures such as sealing the fissures and grooves are insufficient when advanced caries remain untreated. A matter of fact, several authors stated that though extensive public resources have been poured into caries prevention, the worldwide prevalence of untreated caries remained unchanged during the last decades and represents a socio-economic burden (6, 14-16).

Pontigo-Loyola et al. (2020) declared that, when they assess the health status of FPMs, they can also provide information on the health status of full dentition in children and adolescents. Consequently, the performed dental treatments in all types could be indicative and informative on patients’ oral health especially in underdeveloped and underprivileged regions of the world where access to dental care is either absent or scarcely accessible (17).

Despite Lebanon had been considered until the recent past a developing country with a high-level of medical services, since the fall of 2019, Lebanon has been facing an economic crisis that has imposed many challenges on its healthcare system in its entirety (18). The access to dental health care became very difficult, especially with the absence of governmental and private financial supports. The evaluation of the treatments performed on the FPMs, could reflect the Lebanese Children oral health and their likelihood of accessing expensive dental care amidst a severe and prolonged economic depression.

2. OBJECTIVE

The aim of the current research is to determine the prevalence of different types of treatments performed on FPMs and to assess the severity of the previous lesions according to the performed treatments, in 7–10-year-old sample of Lebanese children attending the department of Pediatric Dentistry at the Faculty of Dental Medicine at the Lebanese University.

3. MATERIAL AND METHODS

A retrospective study was conducted to map all treatments performed on first permanent molars at the Department of Pediatric Dentistry at the Faculty of Dental Medicine–Lebanese University. Treatments comprised all procedures performed, preventive and therapeutic dental treatments, on first permanent molar between 2015 and 2019.

Population and Teeth sample

The population represents a convenience sample of 753 patients obtained from the dental electronic health record system.

Inclusion criteria were:
- Children aged between 7 and 10 years old,
- Children in mixed dentition,
- Presence of at least one first permanent molar,
- Children presenting at least one dental procedure on a first permanent molar,
- Children with free medical history.

Exclusion criteria were:
- Patients with no dental procedure on any first permanent molar.
- Children having a second permanent molar.
- Children presenting medical history.
- Children with incomplete charts.

Data collection

Collected data included basic characteristics (patient unique ID, gender, age, practitioner level) along with procedures performed. Preventive procedures included fissure sealants and preventive resin restorations. As for the therapeutic ones, they comprised apexogenesis, composite restoration, extraction, pulp capping, radicular treatment (root canal therapy), pulpotomy, stainless steel crown, surgery and emergency. All patients’ records were collected from the Dentrooper dental electronic health record system, from the faculty archives.

Ethical considerations

This study was approved by the Faculty of Dental Medicine, Lebanese University’s research committee under the protocol number n#6941. To protect patients confidentiality, analysis dataset was de-identified, with a unique ID for each case.

Statistical analysis

Data was collected, tabulated and statistically analyzed using SPSS version 25.0 (Armonk, NY: IBM Corp). Practitioners’ educational level, gender, tooth, treatment type, and treatment nature were reported as frequency/percentages. Chi-square test and Fisher’s exact test were used to evaluate associations between genders and types of dental procedures. Predictive analysis was attempted with treatment type as dependent, and practitioner level and gender as independent variables. The level of significance was set below an alpha = 5%. Tests were two-sided.

4. RESULTS

A total of 753 patients fit the inclusion criteria and were included in the study, divided into 364 girls (48.3%) and 389 boys (51.7%). These 753 patients underwent a total of 2145 procedures. Out of a total of 2145 procedures performed in the period spanning from 2015 to 2019, treatments corresponded to a similar sex distribution (slightly higher in boys (53.6%)).

Undergraduate trainees comprised more than two-third of all the trainees. This is expected as the number of residents is much less than that of undergraduate trainees. As for teeth involved, all treated teeth were equally distributed between the four first molars (Table 1). Procedures were equally divided between therapeutic procedures and pre-
Treatments Performed on First Permanent Molars in a Sample of Lebanese Children

Furthermore, the most commonly performed procedure was composite restoration (41.9%), followed by fissure sealant (34.5%); preventive resin restorations were also relatively common, being 14% of all procedures. All the other procedures were much less performed, with the least frequency for surgical exposure (<0.5%), ranging up to stainless steel crown restoration (6.5%) (Table 1).

As showed in Table 2, boys and girls maintained the same distribution of procedure type as with all procedures (around 46% for girls for overall procedures, preventive procedures, and therapeutic procedures). Nevertheless, no association was found between gender and procedure type (p=0.7).

Additionally, even when each procedure was evaluated on the individual level, no major differences were detected between both boys and girls (or between the two genders). It was noted that boys underwent a higher number of composite restorations (55.2%), fissure sealants (53.7%) and PRR (54.7%), while girls received more stainless steel crowns (53.6%), yet none of these differences were statistically significant (Table 2).

| Procedure Type | Girls Number of Procedures | Boys Number of Procedures | Total Number of Procedures | p |
|----------------|----------------------------|---------------------------|---------------------------|---|
| Preventive     | 478                        | 561                       | 1039                      | 0.7 |
| Therapeutic    | 518                        | 588                       | 1106                      | 0.0 |
| Apexogenesis   | 342                        | 397                       | 739                       | 0.464 |
| Composite restoration | 403 | 496 | 899 | 0.219 |
| Extraction     | 10                         | 5                         | 15                        | 0.127 |
| Fissure sealant| 342                        | 397                       | 739                       | 0.917 |
| Preventive resin restoration | 136 | 164 | 300 | 0.680 |
| Pulp capping   | 10                         | 8                         | 18                        | 0.436 |
| Radicular treatment | 0       | 1    | 1     | 0.991 |
| Pulpotomy      | 8                          | 3                         | 11                        | 0.080 |
| Stainless steel crown | 74 | 64 | 138 | 0.080 |
| Surgical exposure | 0       | 1    | 1     | 1.000 |
| Emergency      | 12                         | 10                        | 22                        | 0.443 |
| Total          | 996                        | 1149                      | 2145                      | 0.194 |

Table 2. Sex differences in procedures and procedure type

5. DISCUSSION

The main objective of this study was to determine the prevalence of different types of treatments performed on FPMs in a sample of 7–10-year-old sample of Lebanese children. Unlike caries affecting the FPMs at a young age, few reports discussed management options completed on them. Moreover, the findings of the present study represent the first report assessing this topic in Lebanon. Based on the evaluation of a sample of 753 children aged between 7 to 10 years old in a 5-year period, 2145 dental procedures on FPMs were noticed.

In the present study, the prevalence of preventive dental procedures (fissure sealant and preventive resin restoration) was 48.4%. This result was higher than what was reported by many other studies. For instance, Oulis et al. (19) found that only 8.3% of patients aged 12 years throughout Greece have received a preventive treatment on their permanent molars. Furthermore, a study conducted by Sarojini and Ravindran concluded that preventive procedures were used in 10.25% and 9.30% of patients aged respectively, 10 and...
8 years (20). A possible reason for our large finding can be attributed to the fact that the sample of children was treated in academic framework while other investigations were completed in private sectors.

As for the therapeutic procedures, in the present study, the prevalence was found to be 51.6% with composite restoration being the most commonly performed procedure (41.9%). Our result, and probably for the same reason, was one more time superior to what has been reported by Shin et al. who found a rate of 15.6% of restored FPMs in a sample of a South Korean population (21); furthermore, this may also be a result of high prevalence of dental caries among Lebanese children, as reflected in other reports. In fact, Doumit & Doughan (2018) suggested a higher prevalence of dental caries or treated caries in children between 6-8 as well as older ones, with 88% of children aged 6–8 years had caries history with FPM included. (22) Nevertheless, our findings are slightly inferior to the one of Ebrahimi et al. who conducted a study in Mashhad-Iran and concluded that out of the 700 examined children, aged between 7 and 9 years, 372 (53.1%) required restorations (23).

In the present sample, extraction of FPMs was found in 0.7% of cases. The result is in agreement with the one of Ebrahimi et al. (0.4%) (23). However, it is much lower when compared to what was reported by Halicioglu et al. (24) with a rate of 52.3% patients presenting at least one extracted FPM. This difference may be due to the dissimilarity in the sample size and age range investigated.

Besides, stainless steel crowns were found in 6.4% of the total number of the dental treatments. That percentage is superior to the one found by Ebrahimi et al. (1.7%) (23) but lower than the one reported by Shelton et al. (17.2%); this can be attributed to the large amount of data investigated by the authors (25).

Slightly like the present results that showed that 1.3% of children needed FPMs pulp care (pulp capping (0.8%), radicular treatment (0%), pulpotomy (0.5%)), Ebrahimi et al. (25) concluded that 2.4% of their sample needed pulp treatments.

It is important to note that the remaining dental procedures (apexogenesis, surgical exposure, and emergencies) in this study were extremely rare.

The present study is not without limitations. This was a convenience sample of patients attending the Faculty of Dental Medicine at the Lebanese University usually belonging to a middle/low socio economic level; thus, these results may not reflect the actual dental care of the whole Lebanese children. To confirm our findings, future larger prospective studies are needed, with multi-center and bigger sampling more representative of the general pediatric population. Moreover, given the importance of FPMs molars and of extensive treatments they appear to receive per our study, future research should also investigate the causes behind such high morbidity related to the FPM.

6. CONCLUSION

Within the limitation of the present study, therapeutic treatments represent a relatively high percentage in our sample of Lebanese children. Therefore, educating children, parents and teachers about the importance of FPMs would reflect in increased preventive treatments at the expense of decreased therapeutic ones.

- Author’s contribution: Both authors were involved in all steps of the preparation this article. Final proofreading was made by the first author.
- Conflict of interest: None declared.
- Financial support and sponsorship: Nil.

REFERENCES

1. Sheiham A, Alexander D, Cohen L, Marinao V, Moyer S, Petersen PE, et al. Global oral health inequalities: task group—implementation and delivery of oral health strategies. Adv Dent Res. 2011; 23(2): 259–267. doi: 10.1177/0022034511402084.
2. Kassebaum NJ, Bernabe E, Dahlia M, Bhandari B, Murray CJ,Marcenes W. Global burden of unattended caries: a systematic review and metaregression. J Dent Res. 2015; 94(5): 650–658. doi: 10.1177/0022034515573272.
3. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndye C. The global burden of oral diseases and risks to oral health. Bull World Health Organ. 2005; 83(9): 661–669.
4. Tinanoff N, Bazet RJ, Diaz Guillory C, Donly RJ, Feldens CA, McGrath C, et al. Early childhood caries epidemiology, aetiology, risk assessment, societal burden, management, education, and policy: Global perspective. Int J Paediatr Dent. 2019; 29(5): 238–248. doi: 10.1111/ipd.12484.
5. Abid A, Maatouk F, Berrezouga L, Azodo C, Uti O, El-Shamy H, Oginni A. Prevalence and Severity of Oral Diseases in the Africa and Middle East Region. Adv Dent Res. 2015; 27(1): 10–17. doi: 10.1177/0022034515582062.
6. Mathu-Muju KR, Kennedy DB. Loss of Permanent First Molars in the Mixed Dentition: Circumstances Resulting in Extraction and Requiring Orthodontic Management. Pediatr Dent. 2016; 38(5): 46–53.
7. Cobourne MT, Williams A, Harrison M. National clinical guidelines for the extraction of first permanent molars in children. Br Dent J. 2014; 217(11): 645–648. doi: 10.1038/sj.bdj.2014.1055.
8. ADA Division of Communications; Journal of the American Dental Association; ADA Council on Scientific Affairs. For the dental patient. Tooth eruption: the permanent teeth. J Am Dent Assoc. 2006; 137(1): 127. doi: 10.14219/jada.archive.2006.0031.
9. Gómez CI, Hernández RCV, León MV, Camacho SAM, Clausell RM. Dental caries in the first permanent molars in school children. Rev Med Electrón 2015; 37: 207–217.
10. Griffin SO, Jones JA, Brunson D, Griffin PM, Bailey WD. Burden of oral disease among older adults and implications for public health priorities. Am J Public Health. 2012; 102(3): 411–418. doi: 10.2105/AJPH.2011.300562.
11. Wright JT, Tampi MP, Graham L, Estrich C, Crall JI,Fontana M, et al. Sealants for Preventing and Arresting Pit-and-Fissure Occlusal Caries in Primary and Permanent Molars. Pediatr Dent. 2016; 38(4): 282–308. Erratum in: Pediatr Dent. 2017 Mar 15;39(2):100.
12. Periodicity of Examination, Preventive Dental Services, Anticipatory Guidance/Counseling, and Oral Treatment for Infants, Children, and Adolescents. Pediatr Dent. 2017; 39(6): 188–196.
13. Sánchez-Pérez L, Irigoyen-Camacho ME, Molina-Frechero
N, Zepeda-Zepeda M. Fissure Depth and Caries Incidence in First Permanent Molars: A Five-Year Follow-Up Study in Schoolchildren. Int J Environ Res Public Health. 2019; 16(19): 3550. doi: 10.3390/ijerph16193550.

14. Listl S, Galloway J, Mossey PA, Marcenes W. Global Economic Impact of Dental Diseases. J Dent Res. 2015; 94(10): 1355-1361. doi: 10.1177/0022034515602879.

15. Marcenes W, Kassebaum NJ, Bernabé E, Flaxman A, Naghavi M, Lopez A, Murray CJ. Global burden of oral conditions in 1990-2010: a systematic analysis. J Dent Res. 2013; 92(7): 592-597. doi: 10.1177/0022034513490168.

16. Kassebaum NJ, Smith AGC, Bernabé E, Fleming TD, Reynolds AE, Vos T, et al. Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. J Dent Res. 2017; 96(4): 580-587. doi: 10.1177/0022034517693566.

17. Pontigo-Loyola AP, Márquez-Corona ML, Minaya-Sánchez M, Lucas-Rincón SE, Casanova-Rosado JF, Robles-Minaya JL, et al. Correlation between the caries status of the first permanent molars and the overall DMFT Index: A cross-sectional study. Medicine (Baltimore). 2020; 99(5): e19061. doi: 10.1097/MD.0000000000019061.

18. Isma'eel H, El Jamal N, Al-Chaer E, Haj-All W, Hamadeh G. Reforming Healthcare Practice in View of the Economic Crisis in Lebanon: The Case of Cardiovascular Care. Mediterranean Journal of Emergency Medicine and Acute Care. 2021; 1(4): 1-12. doi: 10.52544/2642-7184(1)4003

19. Oulis CJ, Berdouses ED, Mamai-Homata E, Polychronopoulou A. Prevalence of sealants in relation to dental caries on the permanent molars of 12 and 15-year-old Greek adolescents. A national pathfinder survey. BMC Public Health. 2011; 11: 100. doi: 10.1186/1471-2458-11-100

20. Sarojini K, Ravindran V. Evaluation of commonly treated maxillary teeth with preventive resin restoration among children with mixed dentition. Int J Dentistry Oral Sci. 2021; 8(9): 4509-4515. doi: 10.19070/2377-8075-21000917

21. Shin JH, An UJ, Kim S, Jeong TS. The prevalence of molar incisor hypomineralization and status of first molars in primary school children. J Korean Acad Pediatr Dent. 2010; 37(2): 179-185.

22. Doumit M, Doughan B. Dental caries and fluorosis among children in Lebanon. Indian Journal of Dental Research. 2018; 29(3): 517. doi: 10.4103/ijdr.IJDR_475_17.

23. Ebrahimi M, Ajami BA, Sarraf Shirazi AR, Afzal Aghae M, Rashidi S. Dental treatment needs of permanent first molars in mashhad schoolchildren. J Dent Res Dent Clin Dent Prospects. 2010; 4(2): 52-55. doi: 10.5681/joddd.2010.014.

24. Halicioglu K, Toptas O, Akkas I, Celikoglu M. Permanent first molar extraction in adolescents and young adults and its effect on the development of third molar. Clin Oral Investig. 2014; 18(5): 1489-1494. doi: 10.1007/s00784-013-1121-1.

25. Shelton A, Yepes JF, Vinson LA, Jones JE, Tang Q, Eckert GI, et al. Utilization of Stainless Steel Crowns by Pediatric and General Dentists. Pediatr Dent. 2019; 41(2): 127-151.