Pediatric Dentistry: Past, Present, and Future

Nikolaos Kotsanos, Haim Sarnat, and Kitae Park

Contents

N. Kotsanos et al. (eds.), *Pediatric Dentistry*, Textbooks in Contemporary Dentistry,
https://doi.org/10.1007/978-3-030-78003-6_1

1

1.1 Brief Historical Overview

Meeting the oral among other health needs, in a humane manner, and successfully preventing oral disease of children and adolescents, including those with disabilities, is a right for the youth. It is also a measure of a high standard of living and is seen nowadays in many societies across the globe while it remains a goal for many others. Its fulfillment has taken long efforts of dental educating and planning pediatric dental services, and the pioneering attempts to set the foundation for today's level of care should be acknowledged.

The first organized child dental treatment efforts seem to have started at the end of the eighteenth century in New York and Paris by private practitioners' initiatives. Examination of 5- to 12-year-old children was recorded in 1850 in Belgium, and, on the other side of the Atlantic, the Baltimore College of Dentistry in 1840 and the Harvard School of Dental Medicine in 1867 were founded. Thus, over time, dental education moved from a largely proprietary to science-based education housed within the university and/or academic health center structure [1]. In the early 1900s Europe, following the publication of the first epidemiological studies in children recording massive caries rates, the first school-based dental care was established in Strasbourg by the Danish dentist E. Jessen, and this model for child oral care was then followed in several countries, particularly in Scandinavia, focused at that time on the permanent teeth only [2].

At the same time, dental clinics were established in order to provide free care to impoverished children by philanthropists, Forsyth in Boston and Eastman in Rochester at US East coast. In the second quarter of the twentieth century, the first books devoted to "pedodontics" were published, and new such departments established in US dental schools (Fig. 1.1), which, beyond theoretical courses, included clinical training. Thus, by the end of World War II, pediatric dentistry was already a separate discipline.

Before then, local anesthesia was neither standardized nor as efficient as nowadays. Behavior management and guidance was during the third quarter of the twentieth century progressively based on knowledge and principles of child psychology, when the concomitant evolution of the latter allowed for it. The progress of dental science and research and the emphasis on psychological and behavioral aspects have had a great impact in changing the image of dentistry for children and adults alike. The development of post graduate programs had centered in a more total patient care approach in pediatric dentistry [3]. The dental treatment was mainly restorative, in maintaining carious primary teeth or the space from their premature loss. As for available restorative materials, the approach could not be primarily aesthetic at a time that only few children had access or happily accepted orthodontic treatment (Fig. 1.2).

Fig. 1.1 A dental surgery of the second quarter of the twentieth century. Museum items

Fig. 1.2 Orthodontic treatment with bands bearing brackets at the third quarter of the twentieth century

Preventive dentistry and its teaching acquired its decisive role in that third quarter of the twentieth century [4], mainly connected to oral hygiene measures for dental decay. Artificial fluoridation of drinking water was established in some countries, starting with the USA, and the global spread of the use of fluoridated toothpaste significantly reduced caries in children. This was at first in industrialized countries, where fluoride toothpaste consumption has come to be today around 300 ml per person (three normal size tubes). The effec-

tiveness of brushing in dental and gingival health has since been connected with a healthy mouth and a bright smile in modern culture (Fig. 1.3).

The acid etching of enamel, which was first described in 1955, was a further breakthrough. It proved to be the decisive technology for the continuous improvement of composite resins. Mainly these were the aesthetic restorative materials contributing to a more conservative approach in restoring carious teeth including sealing vulnerable fissures for caries reduction. Thus, the end of the twentieth century saw a shift from mainly restorative to preventive, cosmetic, and orthodontic procedures in children and adolescents [5, 6], which continues to date.

Fig. 1.3 The bright smile reflects health and communication in modern societies

Overview

Milestones of pediatric dentistry in the twentieth century (from beginning to end):

1. Epidemiological recording of dental caries documents extent.
2. Pediatric dentistry textbooks get published.
3. Effective formulated local anesthesia is introduced.
4. Postgraduate pediatric dentistry programs are developed.
5. Communicative behavior management is widely taught.
6. Topical fluorides prevail and major caries decrease is evidenced in children.
7. Etching the enamel boosts fissure sealing and composite as restorative.
8. The rights of the child concept are adopted.

The American Academy of Pediatric Dentistry was founded as early as 1947 and affected the academic and professional developments in other parts of the world. Two decades later, the International Association of Paediatric Dentistry was established in 1969 [7], and after another two decades, the European and the Australasian Academies were founded in 1990 for the better coordination of the already existing national pediatric dental societies in those continents. Their major contributions are the political influence and advocacy for child oral health as well as the issuing of guidelines for improved and evidence-based dental care for children (Fig. 1.4). Throughout the second half of the twentieth century, pediatric dentistry was increasingly recognized as a specialty of dentistry in many countries and this trend continues to date.

Fig. 1.4 Logos of world leading pediatric dentistry bodies

1

1.2 Child Oral Health. Inequalities and the Dental Services

Dental caries is the most common chronic disease in childhood [8]. For about 2/3 of the twentieth century, it posed a physical as well as a social problem for children and adults in the industrialized countries. Implementing preventive programs achieved some caries reduction in the child population after that time. For example, the mean dmfs (sum of decayed, missing, and filled primary tooth surfaces) of 4-year-olds in southern Sweden was reduced from 8 to 2 between 1967 and 1980 [9]. At the same trend, 70% of the Danish 5-year-olds in 1998 were caries-free, while the mean DMFS (same index for permanent teeth) of 12-year-olds was reduced to 1.5 [10]. Similar reductions had been observed in the USA in the 1970s. The average DMFS of children aged 5–17 years decreased from 7.1 to 4.8 with a dramatic decrease in the number of extracted first permanent molars [11]. It was remarkable that this trend was irrespective of systemic ways of fluoride use (Fig. 1.5).

In other parts of the world this improvement came somewhat delayed. In Italy, for example, a report for preschool children showed caries decline in the last decade of the past century [12]. In China this seemed to occur in the first decade of the current century, while caries experience among 35- to 45-year-old and 65- to 74-year-old groups was still on the rise [13]. At about the same period with China, i.e., 1992–2016, a decline started showing in 2–5- and 11–15-year-olds in India [14] (Fig. 1.6). Other reports however find caries levels to be relatively low in many emerging Asian countries, even though, for the most part, carious and periodontal needs remain there largely unmet [16]. Notwithstanding the diversity of dental caries reports in the various parts of Africa, caries does not seem to be among the prime factors influencing oral health-related quality of life [17].

Regarding restorative needs, a decrease of multisurface cavities, endodontic treatment needs, and placement of preformed metal crowns in primary teeth has been noted in university pediatric dentistry clinics of countries showing significant caries decline. Though these are still widely performed there today, the most frequent recipients are those socioeconomically worse and minorities like immigrants [18–20]. Before, caries indices were high because dental caries, by affecting the majority of children in the early and mid-twentieth century, was considered a disease of modernization; there was a higher prevalence in developed countries and in individuals with higher socioeconomic status. In the late twentieth and the twenty-first century, this pattern of caries prevalence and severity changed in developing

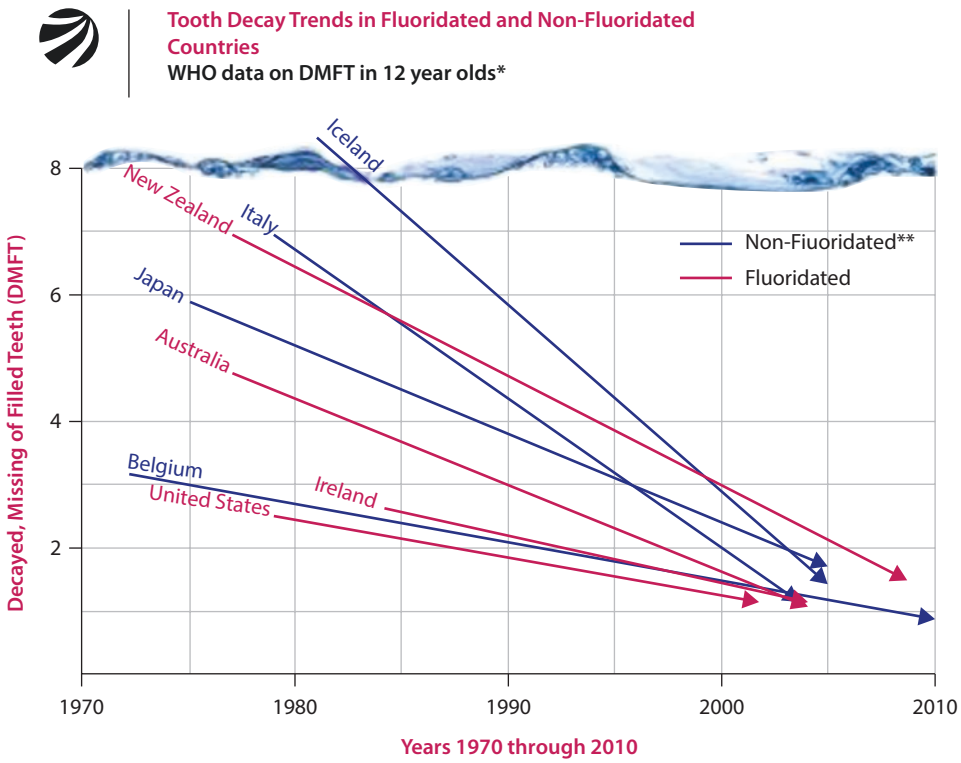

Fig. 1.5 Tooth decay (DMFT) trends of 12-year-olds in fluoridated and non-fluoridated countries. (Accessed at ► https://fluoridealert.org/studies/caries01)

* World Health Organization (WHO). Collaborating Centre for Education, Training, and Research in Oral Health, Malmö University, Sweden, http://www.mah.se/CAPP/ (accessed June 10, 2012).

** No water or salt fluoridation.

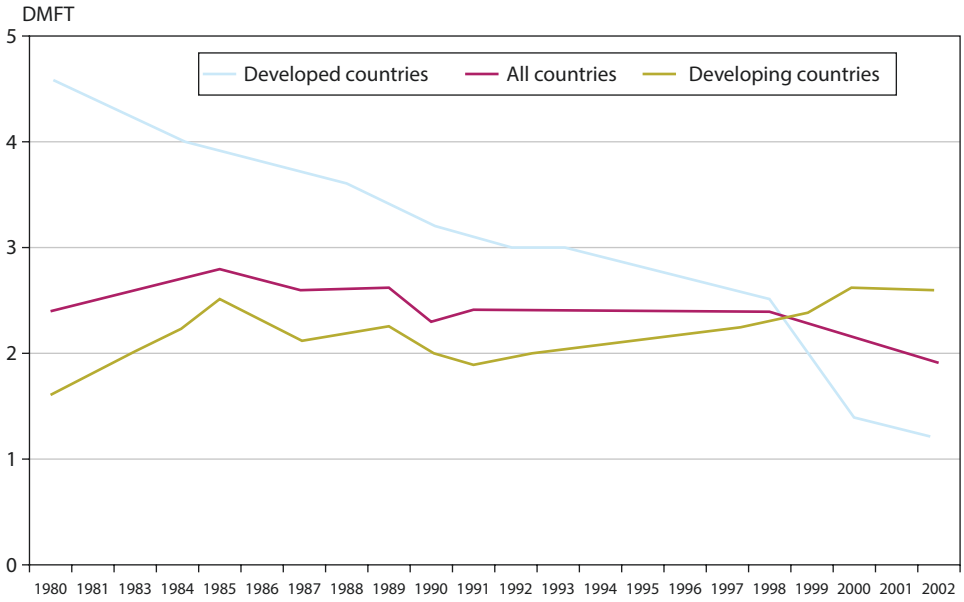

Fig. 1.6 The changing pattern of caries incidence in 12-year-olds in developed and developing countries during the last two decades of the twentieth century and beyond [15]

and developed countries; low income, low education levels, and lower classes of occupations have been consistently related to high caries risk [21–25]. To effectively combat this established discriminative caries pattern, contemporary research and clinical efforts are directed toward reliably targeting high-risk children, i.e., with active disease before being symptomatic. Interventions that begin early and combine multiple strategies hold greatest potential [26].

Within this frame, refugee populations except for being subject to worse physical, mental, and social health outcomes experience difficulties accessing health services in their new country [27]. Further, in most low- and middle-income countries, oral health-care demands are beyond the capacities of their health-care systems, while in the private sector there may be an uneven distribution of dental services in the expense of rural areas [28]. Despite being largely preventable, oral diseases are still a major public health problem in child populations in many parts of the world [29].

Special needs children have, or are at risk, for chronic physical, developmental, behavioral, or emotional conditions, which can impact on their oral health and usually require increased and/or special services for dental and periodontal disease. Studies of special care needs children show much higher prevalence of caries compared to children in the general population. In two studies reporting on disabled children in Kuwait and children with autism in South Africa, the teeth most affected were the first permanent molars and their periodontal and restorative needs were mostly unmet [30, 31].

Although there is little longitudinal data on the history of oral diseases/conditions other than caries, there has been some progress in the prevalence and treatment

Fig. 1.7 Contemporary orthodontic treatment with tooth-colored material. (Courtesy of Dr. Manoukakis)

of periodontal disease and anomalies of occlusion. The idealization of smile aesthetics nowadays, which promotes images of healthy teeth and gums, helps the adoption of good oral hygiene habits (Fig. 1.3). Consequently, it is very likely that the gingival health has improved [32]. Regarding orthodontics, it seems now attractive, considering the large increase of acceptance and frequency of children under orthodontic treatment (Fig. 1.7). While it has a positive impact on the oral health-related quality of life of adolescents [33], treatment requirements – compliance to treatment, long duration, costs – pose a burden to many population groups.

Dental auxiliary personnel were introduced several decades ago in industrialized countries for various reasons including the reduction of costs, which are higher

for dental education than any other health profession. One such example was in Australia's health-care system in the mid-1960s, in trying to address the then difficult-to-meet treatment needs for child dental disease. Today, oral health therapists and hygienists comprise one quarter of the dental workforce providing fissure sealants, restorations and primary tooth extractions, oral health instruction, fluoride applications, scale and cleans, and some periodontal services [34]. Thus, much of the less complex dental treatment needs are not provided by dentists themselves, and this, along with the caries decline, means that their involvement with restorative procedures has decreased significantly.

Lastly, upcoming social changes bring about other issues. As many families nowadays have limited free time, either because both parents are occupied at work or because they escort children in several organized extracurricular activities (Fig. 1.8), they become more selective in search of high-quality services for their children. Even though restorative procedures show reduction, the emphasis on quality and the increase in preventive, cosmetic, and orthodontic services compensate for it.

The recent pandemic of airborne Covid-19 with even asymptomatic carriers spreading the disease has challenged dentistry among other health professions. Concerns regarding dentists' and patients' safety during the outbreaks limited dental care to emergencies compromising preventive appointments. Among other impacts [35], the aerosols produced in several dental procedures imposed a higher level of protection than before, necessitating the use of FFP2/FFP3 masks and other protective gear. The production of successful vaccines has somewhat eased fears for dental visits, but the risk of similar viral future threats calls for constant alertness.

Fig. 1.8 Appointment delays with families of limited free time

1.2.1 Trends in Pediatric Dentistry in the Future

Future trends for the practice of pediatric dentistry based on research advances may include the following:

1. Predominance of prevention of dental caries by early identifying high caries risk, informing and engaging parents, promoting oral health care at home, use of fluoride and other prevention technologies, application of fissure sealants, and establishment of efficient recall system.
2. Increased intervention in orthodontic anomalies and smile aesthetics, which already are of high interest among parents and children.
3. Improved accessibility and dental care for people with disabilities, alongside with extending the dental neglect concept to them.
4. Increased use of new technology dental equipment (e.g., evolution of laser devices [36], sophisticated electronic anesthesia techniques that increase efficiency and acceptance by children, etc.).
5. Therapeutic approaches based on the principles of preventive dentistry including minimally invasive operative approaches lead to painless and often pleasant dental procedures for children. This improved dentist's image will further reduce phobic young adults.
6. Exclusive use of tooth-colored materials with ever-improving bonding and with emphasis on safety (lack of toxicity), while these principles increasingly apply to preformed crowns.
7. Molecular biology and engineering bring potential applications in the dental practice with regeneration of dental tissue by the stem cell technology.
8. Better understanding the microbiome of the human body and its environment will allow development of preventive health measures for oral and general health.

1.3 Addressing Children's Rights

A growing body of evidence leads to the view that children's development, following the social transformation of childhood in modern societies, is influenced both by family and by the social and cultural norms of society. Thus, children's health, development, achievements, and social attainments have come to require the interest, guidance, and protection of both families and society [37].

In the United Nations Convention on the Rights of the Child [38], the term "child" refers to anyone under the age of 18. It was signed on November 20, 1989 and is commemorated on this date as world's children's day,

and it is the most widely ratified human rights treaty (about 200 countries currently). Its purpose is to defend children's rights and protect them from exploitation phenomena, violence, and abuse. Oral health is not specifically mentioned but is nevertheless implied under general health and wellbeing. The reference to health rights in articles 23–25 briefly includes:

- No child is deprived of the right of access to highest attainable standard of health.
- The child receives periodic review of the treatment.
- Disabled children have effective access to and receive health-care and rehabilitation services.

On the other hand, article 22 states these health rights also apply to children with refugee state, further to those for protection and humanitarian assistance. Undergraduate pediatric dentistry programs in most schools contain some clinical training on patients with disabilities. One of postgraduate orientations in pediatric dentistry is the training at competency level of oral care of these individuals at least up until early adulthood.

Recognizing the need to prevent severe early childhood caries, which remains a very frequent cause of oral inflammation and pain in many population groups, impacts on child's quality of life [39]. The first dental visit has been set to be when the first tooth erupts and not later than the child's first birthday [40]. This is for informing and educating parents on proper child tooth care because the above severe disease undermines the rights of the children, affecting not only their physical but also their psychological health. The definition of health by the WHO includes the general state of the individual, which includes avoiding dental fear and anxiety.

Informed consent of the parent and perhaps the patient is another issue. It is the legal instrument that protects the right of the patient – defended by the parent or legal guardian in case of a minor – to a repressive approach and treatment without her/his approval. While this is in a positive direction for children's' rights, with particularly skeptical and difficult-to-convince parents, dentists may be more prone to sedation techniques for treating more challenging young dental patients, cooperation-wise. This poses the risk of moving to more defensive pediatric dentistry approaches.

It is important for all health-care providers (including dental providers) to be knowledgeable and alert about signs and symptoms of child abuse and neglect and to know how to respond [41]. Physical abuse, sexual abuse, bite marks, bullying, and human trafficking all constitute abuse issues. All findings when there is reasonable suspicion of abuse should be reported for further investigation. The dentist should also look for adequate clothing and general and oral hygiene. Poor diet and lack of medical and dental care should be cause for suspecting neglect. The American Academy of Pediatric Dentistry defines dental neglect as "the willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral heath essential for adequate function and freedom from pain and infection" [42].

Overview

In general, a contemporary practicing dentist should:

- Embrace risk assessment tools being prevention-minded
- Utilize changing technology for improved patient care
- Appreciate evidence-based advances in biomedical and behavioral sciences
- Be willing to interact professionally with other health-care providers
- Be committed to ethics both in treatment choices and electronic patient record use

1.4 Breadth of Knowledge in Pediatric Dentistry

Guiding and caring each child to stay orally healthy is a serious responsibility and has an educating influence for her/his psychological maturation. If done effectively, it earns the trust of the parents, is rewarded with great satisfaction, and promotes good oral health in the long run. To adequately train the new dentists for this task (Fig. 1.9), the discipline of pediatric dentistry needs to draw and transfer knowledge from other non-dental disciplines, primarily from the fields of medicine and child psychology, so that they acquire:

Fig. 1.9 University dental school setting for pediatric dentistry clinical training (prior to the covid-19 era)

1. Good dental knowledge, in prevention of oral diseases, restoring dental cavities, wear and various defects, pulp treatment, dental materials, oral surgery, preventive orthodontics, and certain principles of prosthetic dentistry
2. Basic knowledge of pediatrics, anesthesiology, general medicine and oral pathology, growth and development, as well as nutrition
3. Knowledge of mental, emotional development, and child psychological issues, because each child requires different management, depending on age, maturity, and other physical abilities

It is apparent, however, that the dentist has an obligation to recognize the limits of his/her knowledge either in dental/medical or in the behavior management skills. In cases where the patient's needs exceed those limits, the dentist must refer the patient to a specialist pediatric dentist. Moreover, the level of dental care provided to the child should be of quality that can be certified. Dental care and treatment options should not be empirical or even based only on expert opinion. Today it is evidence-based as far as possible, which means knowledge that comes from randomized control trials, systematic reviews, and meta-analyses. Research today is deemed to fill the gaps in the documentation of knowledge in pediatric dentistry, as in other fields of medicine.

Pediatric dentistry has widely expanded its content, due to the recognition of the importance of child oral health and its effect on normal physical and psychological development. Its effective practice requires the pediatric dentist to collaborate with various other pediatric specialties. The extensive level of education in pediatric dentistry is not possible to be integrated in undergraduate dental programs and it is taught in postgraduate specialization programs. These, according to the principles of international bodies of pediatric dentistry [43–45], aim to specialize the trainee in all aspects in order to be able to:

- Care of all the oral needs of infants, children, and adolescents, including the medically compromised and the young people with disabilities
- Search for continuous improvement of his/her knowledge by continuing clinical education and acquire adequate teaching ability for disseminating this knowledge
- Participate in interdisciplinary groups for the caring of children with special needs, e.g., the craniofacial anomalies
- Use the authority and expertise to advocate for patient safety, improved outcomes, and intelligent regulatory oversight
- Support training programs, advising accreditation boards, and sponsoring programs to enhance success throughout their career
- Be competitive in pursuing and advancing collaborative research

Engagement with pediatric dentistry ascribes the practicing dentist with an additional important social role as an educator, trainer, and protector of the vulnerable groups, often in collaboration with the pediatrician and many other clinicians and scientists. Along with progress in recognizing children's rights, this is still important because access to care remains a serious public health problem, even in population sections of industrialized countries. This role includes:

- Dynamic interventions for impoverished, neglected, or abused children
- Undertaking interventions on preventing of dental caries, which remains a plague for certain groups of unprivileged child populations, by individual or collaborative voluntary activities (Fig. 1.10)
- Counseling parents and children on obesity, an epidemic of our time, discussing healthy eating habits and regular exercise

Fig. 1.10 Voluntary outreach service to underprivileged children as a joint action of local pediatric dental society members working on a company-sponsored caravan transformed to a dental surgery

References

1. DePaola DP. The evolution of dental education as a profession, 1936–2011, and the role of the journal of dental education. J Dent Educ. 2012;76(1):14–27.
2. Poulsen S, Koch G. Pediatric oral health care: the perspectives, Ch 1. In: Pediatric dentistry; a clinical approach. 2nd edn, Koch G and Poulsen S (eds), Wiley-Blackwell, Chichester 2009.
3. Casamassimo PS. The practical importance of pediatric dentistry, Ch. 1. In: Casamassimo PS, Fields Jr HW, McTigue DJ, Nowak AJ, editors. Pediatric dentistry; infancy through adolescence. 5th ed. St Louis: Elsevier; 2013.
4. Gerbert B. Planned change and the future of the dental education system. J Dent Educ. 1986;50(10):585–93.
5. Association of Pedodontic Diplomats. Survey of orthodontic services provided by pedodontists. Pediatr Dent. 1983;5:204–6.
6. Christensen GJ. The future of dental practice. J Dent Educ. 1986;50:114–8.
7. Gelbier S. History of the International Association of Paediatric Dentistry. Part 3: Samuel D. Harris and some early pressures for international developments. Int J Paediatr Dent. 1995;5:123–5.
8. Oral health in America: a report of the Surgeon General. J Calif Dent Assoc. 2000;28(9):685–95.
9. Stecksen-Blicks C, Borssen E. Dental caries, sugar-eating habits and tooth-brushing in 4-year-old children 1967-1997 in the city of Umea, Sweden. Caries Res. 1999;33:409–14.
10. Holm AK, Poulsen S. Oral health in children and adolescents. Ch 2. In: Koch G, Poulsen S, editors. Pediatric dentistry; a clinical approach. Copenhagen: Munksgaard; 2001.
11. National caries program. National Institute of Dental Research: The national dental caries prevalence survey: The prevalence of dental caries in the United States. US department of Health and Human Services, NIH Publication No 82–2245, Dec. 1981.
12. Ferro R, Besostri A, Olivieri A. Survey of caries experience in 3- to 5-year-old children in Northeast Italy in 2011 and its trend 1984-2011. Oral Health Prev Dent. 2017;15(5):475–81. https://doi.org/10.3290/j.ohpd.a38976.
13. Liu J, Zhang SS, Zheng SG, Xu T, Si Y. Oral health status and oral health care model in China. Chin J Dent Res. 2016;19(4):207–15. https://doi.org/10.3290/j.cjdr.a37145.
14. Mehta A. Trends in dental caries in Indian children for the past 25 years. Indian J Dent Res. 2018;29(3):323–8. https://doi.org/10.4103/ijdr.IJDR_615_17.
15. Petersen PE (2003) The World Oral Health Report 2003. www.sciencedirect.com/topics/medicine-and-dentistry/dmft-index. Accessed on 21/14/2020.
16. Saekel R. Comparison of oral health status in Asia: results for eight emerging and five high income countries or regions and implications. Chin J Dent Res. 2016;19(4):191–206. https://doi.org/10.3290/j.cjdr.a37144.
17. Malele-Kolisa Y, Yengopal V, Igumbor J, Nqcobo CB, Ralephenya TRD. Systematic review of factors influencing oral health-related quality of life in children in Africa. Afr J Prim Health Care Fam Med. 2019;11(1):e1–e12. https://doi.org/10.4102/phcfm.v11i1.1943.
18. Waldman HB. Are minority children getting their fair share of dental services? ASDC J Dent Child. 1990;57(5):380–4.
19. Blen M, Narendran S, Jones K. Dental caries in children under age three attending a university clinic. Pediatr Dent. 1999;21(4):261–4.
20. Ferrazzano GF, Cantile T, Sangianantoni G, Ingenito A, Rengo S, Alcidi B, et al. Oral health status and Unmet Restorative Treatment Needs (UTN) in disadvantaged migrant and not migrant children in Italy. Eur J Paediatr Dent. 2019;20(1):10–4. https://doi.org/10.23804/ejpd.2019.20.01.02.
21. Armfield JM. Socioeconomic inequalities in child oral health: a comparison of discrete and composite area-based measures. J Public Health Dent. 2007;67(2):119–25.
22. Traebert J, Guimarães Ldo A, Durante EZ, Serratine AC. Low maternal schooling and severity of dental caries in Brazilian preschool children. Oral Health Prev Dent. 2009;7(1):39–45.
23. Christensen LB, Twetman S, Sundby A. Oral health in children and adolescents with different socio-cultural and socio-economic backgrounds. Acta Odontol Scand. 2010;68(1):34–42. https://doi.org/10.3109/00016350903301712.
24. Ferro R, Cecchin C, Besostri A, Olivieri A, Stellini E, Mazzoleni S. Social differences in tooth decay occurrence in a sample of children aged 3 to 5 in north-east Italy. Community Dent Health. 2010;27(3):163–6.
25. Marcenes W, Kassebaum NJ, Bernabé E, Flaxman A, Naghavi M, Lopez A, et al. Global burden of oral conditions in 1990–2010: a systematic analysis. J Dent Res. 2013;92:592–7.
26. Edelstein BL, Hirsch G, Frosh M, Kumar J. Reducing early childhood caries in a Medicaid population: a systems model analysis. J Am Dent Assoc. 2015;146(4):224–32. https://doi.org/10.1016/j.adaj.2014.12.024.
27. Riggs E, Rajan S, Casey S, Kilpatrick N. Refugee child oral health. Oral Dis. 2017;23:292–9. https://doi.org/10.1111/odi.12530.
28. Saliba NA, Moimaz SA, Garbin CA, Diniz DG. Dentistry in Brazil: its history and current trends. J Dent Educ. 2009;73(2):225–31.
29. Watt RG, Mathur MR, Aida J, Bönecker M, Venturelli R, Gansky SA. Oral health disparities in children: a canary in the coalmine? Pediatr Clin N Am. 2018;65(5):965–79. https://doi.org/10.1016/j.pcl.2018.05.006.
30. Shyama M, Al-Mutawa SA, Morris RE, Sugathan T, Honkala E. Dental caries experience of disabled children and young adults in Kuwait. Community Dent Health. 2001;18(3):181–6.
31. Naidoo M, Singh S. The Oral health status of children with autism Spectrum disorder in KwaZulu-Nata, South Africa. BMC Oral Health. 2018;18(1):165. https://doi.org/10.1186/s12903-018-0632-1.
32. Dye BA, Tan S, Smith V, Lewis BG, Barker LK, Thornton-Evans G, et al. Trends in oral health status: United States, 1988-1994 and 1999-2004. Vital Health Stat. 2007;11(248):1–92.
33. Ferrando-Magraner E, García-Sanz V, Bellot-Arcís C, Montiel-Company JM, Almerich-Silla JM, Paredes-Gallardo V. Oral health-related quality of life of adolescents after orthodontic treatment. A systematic review. J Clin Exp Dent. 2019;11(2):e194–202. https://doi.org/10.4317/jced.55527.
34. Teusner DN, Satur J, Gardner SP, Amarasena N, Brennan DS. Variations in Australian dental therapy practice by practitioner and workplace characteristics. Int Dent J. 2018;68(4):235–44. https://doi.org/10.1111/idj.12382.
35. Campagnaro R, Collet GO, Andrade MP, Salles JPDSL, Calvo Fracasso ML, et al. COVID-19 pandemic and pediatric dentistry: fear, eating habits and parent's oral health perceptions. Child Youth Serv Rev. 2020;118:105469. https://doi.org/10.1016/j.childyouth.2020.105469.
36. American Academy of Pediatric Dentistry. Policy on the use of lasers for pediatric dental patients. Pediatr Dent. 2017;39(6):93–5.
37. Children's Health, The Nation's Wealth. Assessing and improving child health. National Research Council; Institute of Medicine. Washington, DC: National Academies Press (US); 2004. https://doi.org/10.17226/10886.
38. Convention on the rights of the child. At: https://www.unicef.org/sites/default/files/2019-04/UN-Convention-Rights-Child-text.pdf

39. Chen KJ, Gao SS, Duangthip D, Lo ECM, Chu CH. Prevalence of early childhood caries among 5-year-old children: a systematic review. J Investig Clin Dent. 2019;10(1):e12376. https://doi.org/10.1111/jicd.12376.
40. American Academy of Pediatric Dentistry. Periodicity of examination, preventive dental services, anticipatory guidance/counseling, and oral treatment for infants, children, and adolescents. Reference manual 2018/19, 40 (No. 6); 194–204.
41. American Academy of Pediatric Dentistry. Oral and dental aspects of child abuse and neglect. Reference manual 2018/19, 40 (No. 6); 243–9.
42. American Academy of Pediatric Dentistry. Definition of dental neglect. Reference manual 2018/19, 40 (No. 6);13.
43. European Academy of Paediatric Dentistry. Curriculum guidelines for education and training in paediatric dentistry. At: www.eapd.eu/uploads/files/Curriculum%20guidelines%20for%20Education%20and%20Training%20in%20Paediatric%20Dentistry.pdf.
44. Australasian Academy of Paediatric Dentistry. Mission and vision. At: www.aapd.org.au/viewStory/Mission-and-Vision.
45. American Academy of Pediatric Dentistry. Residency programs. At: https://www.aapd.org/resources/member/residentresources/residency-programs/.