International Journal of Medical Toxicology & Legal Medicine Volume 27, No. 2, 2024
e-ISSN: 0974-4614
p-ISSN: 0972-0448

Evidence-based Assessment and Intervention into Adolescent Oral Health Care Access

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Received: 05.08.2024 Revised: 17.09.2024 Accepted: 09.10.2024

ABSTRACT
Adolescent oral health is animportant piece of one's body, playing heavily into the overall quality of life through vital activities such as eating, conversing, and socializing.Adolescent oral health is an important piece of one's body, playing heavily into the overall quality of life through vital activities such as eating, conversing, and socializing. This review investigates the application of dental care among adolescents, recognizing key factors that impact access and discrepancies in oral health outcomes. Because adolescence is an important time for establishing lifelong oral health behaviors, many adolescents face barriers to dental care due to socioeconomic status, cultural influences, psychological factors, and geographical constraints.As such, there is a higher burden of oral diseases —dental caries (tooth decay), periodontal disease (gum disease or severe gum inflammation), malocclusion, and oral cancer—among these less privileged groups. Public health interventions, such as school-based programs, community water fluoridation, and policy changes removed disparities in oral health outcomes.Today, recent advancements in dental care, such as the emergence of Teledentistry, minimally invasive dentistry strategy, mobile health (mHealth) applications, and personalized care, offer hopefulapproaches for addressing these challenges. Beginning to blend oral health into primary care and using behavioral interventions that include motivational interviewing, are necessarycomponents of advancing the positives for improving oral health behaviors and reducing barriers to care. Conclusions This review identified the necessity of targeted public health approaches, technology-based solutions, and culturally sensitive service provision to address current disparities in dental service access for adolescents and includes aspects relevant to reducing oral disease burden.

Keywords: adolescent, oral health, dental care, public health interventions, oral diseases.

1. INTRODUCTION

Good oral health speaks for quality life generally, and dental care is an essential part of a person's health and well-being. One can use it: the mouth, being the window to the body, plays a very vital role in various cardinal activities such as eating, speaking, and socializing, which impact improved psychological well-being. (Baiju, 2017; Mariño et al., 2020). Such impoverished oral health may lead to a range of disorders, including dental caries, periodontal diseases, and oral cancers, which are painful, cause discomfort within the mouth, and impair function (Janakiram et al., 2018). The promotion of oral health and the prevention of its antagonistic consequences necessitate good access to dental care as well as the encouragement of preventive measures (Salawu & Omitoye, 2019).

Health behaviors concerning oral hygiene and dental care are developed early on during adolescence, which paves the way for keeping it throughout their lives (Silk & Kwok, 2017). During this period of development, individuals undergo important physical, social, and behavioral changes that can have deep impacts on their oral

health. The changes include increased independence from parental control, changes in eating patterns, as well increased chances for engaging in risky behaviors such as smoking tobacco and drinking alcohol (Frech, 2012; Tseveenjav et al., 2015). Adolescents are more likely to experience dental issues due to poor oral hygiene habits, a high consumption of sugary foods and beverages, and restricted access to preventive dental care. In addition, people may put their oral health performances at a particular level of ambiguity because of various hazards associated with alluring concerns, dental anxiety, and societal pressures. (Albandar & Tinoco, 2002).

However, tooth care cannot have been overemphasized at this point, despite the fact that many adolescents are denied access to proper dental care. People return before receiving dental care for a variety of reasons, such as socioeconomic problems with the low-income population, racial disparities in social classes, and geographic distance to medical facilities, which is a result of the impact of culturally conservative behaviors on people. (Lawal et al., 2022). These disparities manifest in inequitable health outcomes, further disenfranchising populations that will bear the burden of dental decay, periodontal diseases, and other oral diseases at higher levels compared to more advantaged groups. Studies have found that a key driver of dental care access is social determinants of health; therefore, public health interventions and those writing policies have to be cognizant of these disparities placed on underrepresented populations in the field of dentistry — the mouth reflects the body. (Silk & Kwok, 2017).

The best time to act is during adolescence to promote healthy dental habits that may last throughout adulthood. Effective oral health promotion techniques are required at this time to stop the development of chronic dental diseases and enhance overall health outcomes. To understand the structural variables in oral health at this most important life period, however, much more work is needed as the literature on the literacy and dental health behavior of adolescents is inadequate. (Baker et al., 2018; Fleary et al., 2018).

This review aims to inform the development of future research and policy initiatives to promote oral health among adolescents and investigate all the interactions between socioeconomic, cultural, behavioral, and technological contexts that shape their oral health. Understanding more about the possibilities and difficulties in teenage dental care, perhaps we can start to reduce health inequalities and help secure better outcomes by providing an improved future for this at-risk group.

2. LITERATURE REVIEW

2.1 Importance of Oral Health During Adolescence

Adolescence is a critical period for the establishment of health behaviors that may persist into later life and even could be related to oral health (Lau et al., 1990). can have short- and long-term effects such as pain, infection, and social impairment which result in a decrease in quality of life(Petersen & Kwan, 2011). Oral health behaviors are affected by major physical, emotional, and social changes during this developmental stage. Hormonal changes make periodontal diseases riskier(R. H. A. Mohammed & El Seed, 2024), and the intake of more sugary products in nutrition turns to raise dental caries at a greater rate(Ervin et al., 2012). Furthermore, behaviors such as tobacco use frequently begin in adolescence and contribute to poor oral health (Akinkugbe, 2019).

Oral health and self-esteem / social relationships are highly correlated. Problems like dental caries, malocclusion, and periodontal diseases can affect adolescents' appearance, leading to social withdrawal and reduced self-confidence (Kaur, 2017). Hence, it is important to maintain good oral health during adolescence for their physical as well as psychological fitness.

Programs designed for adolescents can successfully embed oral health messages that will last a lifetime. Educational programs must focus on correct brushing techniques, regular visits to a dentist, and healthy food habits. These interventions can be effectively administered and reinforced through schools and community-based programs (Sanadhya et al., 2014; Yar et al., 2024).

2.2 Factors Influencing Oral Health during Adolescence

2.2.1 Socioeconomic Status and Oral Health

Socioeconomic status turns out to be a very vital benchmark in measuring the quality of oral health, mainly during adolescence. This review includes a large body of research support for the view that lower socioeconomic status is strongly associated with more deterioration in oral health state, such as higher rates of dental caries and periodontal diseases, and other oral health issues overall. (de Lucena et al., 2021). Because they lack dental insurance, this puts them in an even more vulnerable position where they are unable to pay for the necessary services. The differences in oral health then become extremely noticeable when dental care is neglected. Adolescents from low-income backgrounds are therefore more likely to experience difficulties while attempting to receive dental care (Shomuyiwa & Bridge, 2023).

The relationship of SES to dental health does not simply revolve around availability to care. Accordingly, low SES also characterizes unhealthy eating patterns, insufficient knowledge about dental health, and higher exposure to risk factors such as smoking and sweet food, thus further aggravating oral health problems. (Bethesda, 2021). Furthermore, adolescents from less affluent families are less likely to obtain preventative

dental treatment, which increases the risk of untreated dental issues and other serious health issues down the road.
(Singh et al., 2019).
One is educational gratification, which speaks generally to SES. The higher the parental education level, the more emphasis parents would put on oral cleanliness, taking kids for periodic visits to the dentist, and taking preventive measures like fluoridated toothpaste and dietary behavior. (Minervini et al., 2023). |The allowance of the development of community-based health services models, adding oral health into the package of overall health interventions, and improving public insurance may reduce the barriers of cost, closing the gap in oral health outcomes among populations of different socioeconomic status (Høiseth & Jasbi, 2024; Northridge et al., 2020).

2.2.2 Cultural Influences on Oral Health

The three oral habits that were previously described are significantly influenced by beliefs and attitudes on the provision of dental care, which demonstrate respect for cultural influence. Certain cultures—especially those that do not place a high priority on dental care—may not give much thought to maintaining good oral hygiene, and as a result, behaviors will emerge that reflect the qualities that are highly valued(Cruz et al., 2009; Purohit et al., 2024). Language barriers and the absence of cultural competence among dental professionals represent substantial impediments to accessing dental care for individuals from varied cultural backgrounds. (Bowen, 2015). Furthermore, cultural and family beliefs significantly explain oral health practices and access to dental care in poor neighborhoods, which are more equally represented in adolescent populations (Purohit et al., 2024). Furthermore, eating habits that are heavily influenced by social norms and cultural traditions determine good oral posture. Thus, such culturally influenced eating behaviors should be considered to prevent oral diseases in adolescents.

Psychological Barriers to Dental Care Utilization

Adolescents face considerable barriers to receiving dental care due to psychological issues such oral anxiety and terror. Odontophobia, or dental phobia, is the result of poor previous experience or fear of pain and often is the cause of dental visit avoidance, leading to exacerbating pre-existing oral health issues (Cianetti et al., 2017). Adolescents may also experience social anxiety (Levin et al., 2007) due to the aesthetic changes in their teeth, which would deter them from availing themselves of dental services, most especially if of malocclusion or other obvious dental problems that hamper their confidence and social interaction (Dimberg et al., 2015). Psychological obstacles must be reduced to enable behavioral treatment, sedation dentistry, continuity of care, supportive communication, and patient trust in the dentists in order to maximize the use of dental care. (Hedman et al., 2013; Wu et al., 2017). Additionally, can improve the subject's quality of life (Militi et al., 2021).

3. Oral Diseases in Adolescents

(Fig.1), Oral health problems are prevalent during adolescence, such as dental caries and periodontal diseases (Fig.1), basically due to poor oral hygiene practices and a sugar-rich diet. This is a very critical period because oral healthcare habits formed throughout these years could have a high impact on dental health in the long term. Although at a higher level, it manifests itself with physical symptoms, a focus on preventive strategies is necessary for minimizing the different oral disorders. It urges people to promote proper information and regular dental appointments.

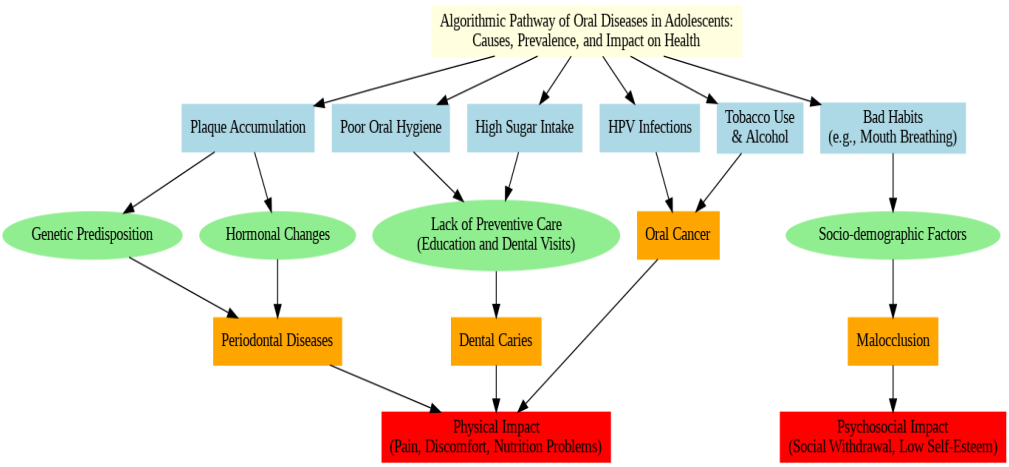

Figure 1: Oral diseases in adolescents

3.1 Dental Caries

Dental caries, out of all these dental problems, is the most prevalent worldwide health issue; untreated lesions in permanent teeth harm 2.3 billion individuals.
(James et al., 2018). It creates a major physical barrier that is characterized by pain, disturbed nutrition, and, most frequently, the resultant disorder of periodontal diseases, especially in developing adolescents (Dimberg et al., 2015). There are also psychological implications of dental caries in terms of its behavioural effects and self-esteem as a result of discomfort and aesthetic associated issues. These predispose the individual to social withdrawal and mental health difficulties(Antunes et al., 2020; Chimbinha et al., 2023). Consequently, dental care should be holistic as it takes care of the physical and psychological needs of the patient.

3.2 Periodontal Diseases

Although there is a significant prevalence of periodontal disease among adolescents, only 20 out of 193 countries report on the same statistics (Nazir et al., 2020). The main cause is the accumulation of dental plaque, which causes irritation of the gums, exacerbated by adolescent hormonal fluctuations and genetic predispositions(Saxén & Nevanlinna, 1984; Socransky et al., 1998; Studen-Pavlovich & Ranalli, 2006). These disorders have a large impact on the quality of life due to pain, functional limitations, and psychological distress (Fotedar et al., 2014; Habashneh et al., 2012). Pain is the primary reason for patients with periodontal diseases to visit dental clinics, whereas an asymptomatic nature normally characterizes the periodontal disease, which may lead to delays in seeking treatment and requires greater awareness and intervention (López et al., 2006).

3.3 Malocclusion

Malocclusion affects 56% of adolescents worldwide, with regional variations in its prevalence. It is a critical issue. (Lombardo et al., 2020). This syndrome's pathogenesis remains multifactorial, including breathing through the mouth, inadequate oral hygiene, and socio-demographic factors. (Mtaya et al., 2009; Souki et al., 2009). Malocclusion has a high effect on OHRQoL in teenagers, affecting emotional and social well-being, decreasing self-esteem, and heightening psychological discomfort (Dimberg et al., 2015). Since many adolescents face the physical and emotional repercussions of malocclusion, early intervention becomes increasingly important, demanding the need for properly built treatment strategies (ElNaghy & Hasanin, 2023).

3.4 Oral Cancer

Oral cancer rarely affects a teenager, yet it poses an alarmingly high risk due to lifestyle factors such as tobacco use, alcohol consumption, and poor oral care. (Rupel et al., 2020). Tobacco, alcohol, and harmful HPV (Human Papillomavirus) infections are the decisive factors in the development of OSCC in the mouth (Rosenquist et al., 2007). Future risk of oral cancer among teenagers may be expected to rise as many will be using tobacco products, such as e-cigarettes. In spite of these worries, there is a dearth of epidemiological data on oral cancer in adolescents, which makes it difficult to implement focused preventative strategies (Muwonge et al., 2008). The physical and psychosocial effects of oral cancer treatment, such as difficulties eating and mental anguish, highlight the importance of comprehensive care that addresses both recovery and long-term quality of life (Attaran et al., 2023; Beeken & Calman, 1994).

4. Public Health Interventions in Adolescent Oral Health

School-based programs, community water fluoridation, and legislation all enhance adolescent oral health, while developments like Teledentistry, minimally invasive dentistry, and mobile health apps broaden access and care. Future directions emphasize the integration of oral health into primary care, personalized treatment options, artificial intelligence in dentistry, and behavioral interventions for encouraging long-term oral hygiene(Fig. 2).

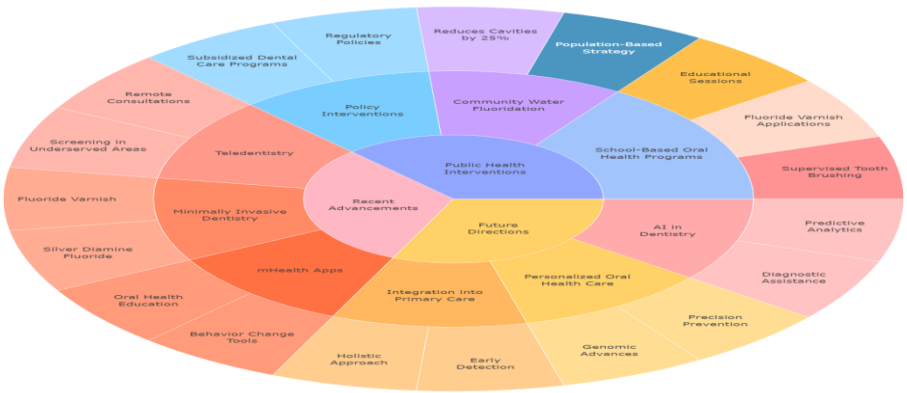

Figure 2: Public health interventions and emerging innovations in adolescent oral health

4.1 School-Based Oral Health Programs

Globally, schools have been regarded as an appropriate setting for efficiently imparting Oral Health Education (OHE), resulting in increases in oral cleanliness, knowledge, and oral health behaviors (Angelopoulou et al., 2015). Furthermore, when delivering preventive and curative services, school-based approaches are more cost-effective and efficient than community-based approaches(Gauba et al., 2013). These programs are typically delivered through supervised tooth brushing, fluoride varnish applications, and teaching sessions, which have been shown to improve oral hygiene and reduce dental caries among adolescents(Azarpazhooh & Main, 2008; Dadipoor et al., 2023; Marinho et al., 2013).

4.2 Community Water Fluoridation

Community water fluoridation is one of the low-cost population-based keys to reducing tooth decay and provides a basis for prevention rather than expensive treatment(Phipps, 2000). As with all public health interventions, community water fluoridation is equal in the prevention of dental caries; it has been shown by different studies that it reduces cavities by about 25% at a population level.(Zokaie & Pollick, 2022). Ensuring and increasing access to appropriately fluoridated water is an important strategy for reducing the prevalence of dental caries and decreasing both community and family financial burdens(Boehmer et al., 2023). Community water fluoridation has, however, remained controversial in those areas where individual autonomy concerns or a misunderstanding of possible health dangers from fluoride are raised(Oh et al., 2020). Still, the reality of the matter is that extensive research has established the safety and efficiency of fluoridation(Petersen & Lennon, 2004). The confirmation of equal benefit from this preventive measure is key to developing oral health and reducing disparities.

4.3 Policy Interventions

Policy interventions become very necessary to reduce existing inequalities in access to preventive and therapeutic care to achieve better oral health outcomes. According to Zokaie & Pollick, 2022 (Zokaie & Pollick, 2022), This is complemented by school-based oral health programs, which enhance oral health equity by promoting educational events and increasing access to care among school-aged children and their populations(Bramantoro et al., 2021). Subsidized dental care programs also assist minimize the financial barriers to care, boosting access for low-income and vulnerable individuals(Northridge et al., 2020). Quality and reasonable access are further supported by regulative measures that set infection control requirements and assist the integration of oral health into primary care(Prasad et al., 2019; Schmalz et al., 2022).

5. Current Advancements in Adolescent Oral Health

5.1 Teledentistry

For a long time, teledentistry has been touted as one sure way of improving access to dental care, especially in rural communities, through remote consultations and screenings. (MESQUITA et al., 2023). This approach reduces health disparities, allows greater access to professional advice, and shortens the duration of treatment without loss of quality, according to studies by Nayar et al., 2017(Nayar et al., 2017). Teledentistry links general dentists with specialists to ensure the early detection and treatment of disorders in oral health, especially oral cancer(Alabdullah & Daniel, 2018). It received positive reviews in areas like maxillofacial surgery but with challenges in areas like temporomandibular joint disorder (Al-Izzi et al., 2020; Wells et al., 2016). Teledentistry's reach has been expanded by advanced technology and media platforms, making it an important aspect of dynamic patient management strategies, especially during crises (Islam et al., 2022).

5.2 Minimally Invasive Dentistry

Minimally Invasive Dentistry (MID) will, therefore, aim to conserve dental tissues and restore comfort to the patient by providing preventive therapy (Featherstone & Doméjean, 2012). Fluoride varnish, silver diamine fluoride, resin sealants, and atraumatic restorative treatment are suitable for monitoring early carious lesions, especially in adolescents, as they are non-invasive and less expensive(Desai et al., 2021; Schmalz et al., 2022). However, these treatments are ineffective for big cavitated lesions due to dentin composition and bacterial penetration difficulties. Improving antibacterial characteristics and biostability of materials may increase the long-term efficacy of MID and lessen the need for surgical interventions (Desai et al., 2021).

5.3 Mobile Health (mHealth) Applications

The development of mHealth apps has gained attention, as they can improve oral health knowledge and health behavior, particularly concerning adolescents. Moreover, the features of the applications include didactic information coupled with interactive features, appointment reminders, and individualized recommendations for the practice of better oral hygiene(Kaczmarczyk et al., 2021; Tiffany et al., 2018). Although useful in many ways, issues around usability and installation are important, and user preference needs to be taken into consideration in the design of such apps. Detection of diseases through interactive and living aspects, and

availability to dental specialists, can help these tools offer more to oral health education and promotion in behavior change(Ab Mumin et al., 2022).

6. Future Directions

6.1 Integration of Oral Health into Primary Care

Integrating oral health into primary care has evolved as a critical strategy for offering long-term and efficient oral health treatments, encouraging early diagnosis of dental disorders, and improving overall health outcomes(Christian et al., 2023). (Harnagea et al., 2018)Harnagea et al. (2018) conducted scoping assessments and outlined several integration techniques that acted at multiple levels: organizational, professional, and patient, including theoretical frameworks and applied models, together with policy efforts. This type of integration is important in fighting common risk factors for oral and systemic disorders that involve nutrition and lifestyle choices; the approach provides more effective and holistic healthcare as compared to the other way around(Sheiham & Watt, 2000). These need to be done through better finance, increased wellbeing workforce, support from government, and public-private collaborations which offer both affordability and accessibility of care to everyone (Prasad et al., 2019).

6.2 Personalized Care for Oral Health

Recent breakthroughs in genetics, biotechnology, and data analytics have completely modified healthcare into one of precision medicine, acceptable by drugs adapted to a patient's genes, biology, and social aspects(Amato, 2023). The change also, therefore, applies to oral health and encourages the convergence of dental and systemic healthcare(Samaranayake, 2012). Translational research plays a huge role in learning how components causative of oral and systemic diseases interact by interrogating complex biological systems, including the genome and the microbiome(Patini, 2020). Today, personalized dental care is focused more on precision prevention and treatment by enabling early diagnosis more efficiently and effectively for better patient outcomes using breakthroughs in salivary diagnostics and nanotechnology(Khurshid et al., 2018; H. A. Mohammed et al., 2022). Genomic advancements advance the reaction to treatment and aid preventive approaches toward predictive and patient-specific therapies(Eng et al., 2012).

6.3 Artificial Intelligence (AI) in Dentistry

The use of AI in the field of dentistry has continuously expanded and, as a result, improved patient care and clinical workflow. This spans diagnostic assistance—the improvement of accuracy and speed in the detection of dental abnormalities through AI-powered tools—(Sivari et al., 2023); and treatment planning, where AI personalizes recommendations for procedures such as orthodontics and implants(Revilla-León et al., 2023); The other area is predictive analytics, which contributes to the tracking of patient-specific risks and realization of targeted preventive measures(Khanagar et al., 2022; Patil et al., 2023). Having the potential for improvement in diagnosis, treatment, and patient engagement, there is a need for the dental fraternity to reflect upon ethical and practical implications. Dentistry can create an intelligent future by embracing the potential of AI while maintaining the standard of care and privacy of patients (Dhingra, 2023).

6.4 Enhanced Behavioral Interventions

Motivational interviewing (MI), together with cognitive-behavioral approaches, can help programs aimed at adolescent oral health overcome some of the major psychological barriers to positive oral hygiene behavior.(Dimenäs et al., 2022; Wu et al., 2017). MI is a person-centered, directive method of increasing an individual's motivation to change, focusing on his reasons for changing within an atmosphere that is characterized by acceptance and compassion(Jönsson & Abrahamsson, 2020; Ramseier & Suvan, 2014).Further, MI empowers the individual due to the enhancement of his self-efficacy and health goal-setting during educational interventions. Therefore, the oral hygiene routines that these adolescents are involved in could be made more successful in terms of long-term maintenance(Carra et al., 2020; Kopp et al., 2017).

7. DISCUSSION

The need to further expand deep insight on the determinants that influence dental care utilization and the effectiveness of various interventions in enhancing oral health among adolescents gives some of the important challenges and opportunities. Therefore, the development level of adolescence becomes an opportune period to adopt oral health practices; most of these patterns extend up to the period of adulthood, which makes studying factors affecting growth in the field of oral health important.

Socioeconomic Disparities in Oral Health

Such potent associations thus underlie the appropriateness of such public health action in the face of oral health disparities. Among populations characterized by low SES are a persistent, higher prevalence and incidence rate of dental caries, periodontal disease, and other oral health-related problems associated with barriers, such as lack

of dental insurance and lack of access to dental care services. The most vulnerable are seen to be adolescents from low-income households, unlikely to have had a history of preventive dental care. They are found putting themselves at risk for untreated dental problems that will result in complex health complications in their later lives (Singh et al., 2019).

The existence of these disparities calls for complex strategies that can increase access to dental care for underserved populations. More blanket public insurance coverage, and health promotion in general—into which oral health could be folded—might offset some of the disparities evident in different socioeconomic groups vis-à-vis oral health. Besides, increasing the number of (FQHCs) and community-based health clinics would serve the needs of this group of adolescents from low-income areas about critical services in dentistry.(Northridge et al., 2020). It cannot be overemphasized that the role of public health policy in attenuating these disparities must be one of decision, as policy interventions become needed to assure access to equal care and promotion of oral health equity.

Cultural and Psychological Barriers to Care

In addition, cultural and psychological factors greatly influence the pattern of dental care utilization among adolescents. Cultural beliefs, language barriers, and poor health literacy may affect the nature of and frequency with which adolescents access or seek dental care, especially in disadvantaged neighborhoods. Low SES is also related to bad eating habits, poor health literacy regarding oral health, and greater exposure to health risk variables, such as tobacco use and sugar intake, which enhance oral health issues. (Bethesda, 2021).

Fear and anxiety about dentists, often subsequent to a past of unfavorable experience, are the second psychological barrier to seeking routine dental care in adolescence. In such cases, the appearance of dental phobia leads to the occurrence of ailments falling since individuals become hostile to dental intervention. To deal with these issues, supportive communication techniques, the use of behavioral interventions, working collaboratively, and appropriate sedation dentistry may further reduce the challenge and increase access to dental health care for patients with dental anxiety (Cianetti et al., 2017). Finally, cultural safety is one area of influence that can incorporate dental utilization among adolescents from diverse populations.

The Role of Public Health Interventions

The best settings for the promotion of adolescent oral health through public health interventions are school-based oral health programs and community water fluoridation. A school is the ideal setting where preventive care and education regarding oral health can be provided. These interventions will bring dental care within reach of many adolescents who otherwise would not have been able to access it. According to historical accounts, they made a commitment to reduce cavities and encourage oral hygiene, so establishing enduring dental health practices. (Angelopoulou et al., 2015; Dadipoor et al., 2023).

Community water fluoridation is another cornerstone of population-level public health efforts to reduce dental caries. Whereas fluoridation may encounter some resistant audiences, its benefits are underpinned by an exceptionally strong body of evidence of its safety and effectiveness as a preventive measure for dental caries. (Petersen & Lennon, 2004). As part of reducing oral health disparities, it is especially important in communities with limited access to care that all populations have equal access to optimally fluoridated water. (Zokaie & Pollick, 2022).

Recent Advancements in Dental Care

Developments in dental technology and care about to advance adolescent oral health. For instance, dental services are now easily accessible in underserved or inaccessible places because of telemedicine. One has had access to a model for consultation and review. This development reduces health inequities while encouraging the early detection of irregularities related to oral health. (MESQUITA et al., 2023)

It is a novel concept, as it describes an approach to dentistry under the theoretics of Minimally Invasive Dentistry (MID): the concept that has the potential to conserve the dental structure and tries to have patients-centered care preventive in nature. By employing fluoride varnish and silver diamine fluoride, restorative dentistry that is affordable, non-invasive, and painless can successfully treat carious teeth in adolescents. (Featherstone & Doméjean, 2012; Desai et al., 2021). These advancements highlight the importance of continuing to develop minimally invasive methods to expand their use and improve their success.

Recent developments in genomics and biotechnology have moved oral health programs from being broadly applicable to being somewhat customized. With the ability to now tailor dental care to each adolescent's unique genetic, biological, and social characteristics, it will be possible to better meet their individual needs (Amato, 2023). Personalized medicine, when combined with other innovations such as salivary diagnostics and nanotechnology, yields great promise in improving early detection coupled with successful treatment protocols for a variety of diseases, including oral cancer and periodontitis among others (Khurshid et al., 2018).

Currently, AI is becoming more widespread within the dental field, improving upon diagnostic accuracy, treatment planning, and forecasting analytics. AI-powered technologies in the dentistry industry may expand the

detection of dental abnormalities to provide better and more personalized care. (Revilla-León et al., 2023; Sivari et al., 2023). It is, however, very important to pace the development of artificial intelligence at the same rate of discussion involving ethical issues so that patient confidentiality might be preserved yet the optimum quality of care be bestowed.

Future Directions

Enhancing health care for adolescents necessitates the integration of additional emerging technologies, tailored care approaches, and public health initiatives. The integration of artificial intelligence, mobile health applications, and teledentistry can lead to better treatment outcomes, more accessibility, and increased patient participation in the dental industry.

Integrating oral health into primary care will provide a more comprehensive approach to treatment that targets common risk factors for systemic and oral illnesses. (Christian et al., 2023).

Behavioral interventions aimed at promoting oral health in adolescents should be based on motivational interviewing, and also include the following cognitive-behavioral strategies in order that psychological barriers not reduce their optimum oral health behaviors.

The optimum use of these techniques is in public health initiatives, which reduce inequities in the oral health outcomes of teenagers and enhance their quality of life. (Wu et al., 2017).

8. CONCLUSION

This thorough analysis highlights how crucial it is to pay attention to dental health in adolescence in order to maintain excellent health for the rest of one's life.

This period of adolescence becomes a very critical developmental phase to develop lifelong oral hygiene behavior, yet many adolescents and, in particular, those from disadvantaged socio-economic backgrounds face barriers to receiving dental care. It is because of socioeconomic factors and cultural and psychological barriers that there are health disparities concerning oral health conditions, setting up the worsening of caries, periodontal diseases, and malocclusion.

Adolescents' dental health has consistently improved thanks to public health measures. School-based initiatives and community water fluoridation are two examples of these interventions. Recent developments in minimally invasive dentistry, teledentistry, and mHealth applications all carry a significant potential to improve access to care and promote healthy oral hygiene behaviors among adolescent population. Person-centered care assumes new possibilities brought about by sciences that are as fast-developing as genomics and AI, opening new avenues for individual preventive and treatment strategies. Other strategies that may reduce disparities and improve oral health outcomes among adolescents are policies that improve access to care, provide integration of oral health into primary care, and decrease psychological barriers through behavioral interventions. Integrating new technologies with personalized care, coupled with public health policies, will better place adolescents from a very wide range to lead healthier lives in the coming years.

REFERENCES

1. Ab Mumin, N., Yusof, Z. Y. M., Marhazlinda, J., & Obaidellah, U. (2022). Adolescents' opinions on the use of a smartphone application as an oral health education tool: A qualitative study. DIGITAL HEALTH, 8, 205520762211141. https://doi.org/10.1177/20552076221114190
2. Akinkugbe, A. A. (2019). Cigarettes, E-cigarettes, and Adolescents' Oral Health: Findings from the Population Assessment of Tobacco and Health (PATH) Study. JDR Clinical & Translational Research, 4(3), 276–283. https://doi.org/10.1177/2380084418806870
3. Al-Izzi, T., Breeze, J., & Elledge, R. (2020). Following COVID-19 clinicians now overwhelmingly accept virtual clinics in Oral and Maxillofacial Surgery. British Journal of Oral and Maxillofacial Surgery, 58(10), e290–e295. https://doi.org/10.1016/j.bjoms.2020.07.039
4. Alabdullah, J. H., & Daniel, S. J. (2018). A Systematic Review on the Validity of Teledentistry. Telemedicine and E-Health, 24(8), 639–648. https://doi.org/10.1089/tmj.2017.0132
5. Albandar, J. M., & Tinoco, E. M. B. (2002). Global epidemiology of periodontal diseases in children and young persons. Periodontology 2000, 29(1), 153–176. https://doi.org/10.1034/j.1600-0757.2002.290108.x
6. Amato, A. (2023). Personalized Oral and Dental Care. Journal of Personalized Medicine, 13(1), 110. https://doi.org/10.3390/jpm13010110
7. Angelopoulou, M. V, Kavvadia, K., Taoufik, K., & Oulis, C. J. (2015). Comparative clinical study testing the effectiveness of school based oral health education using experiential learning or traditional lecturing in 10 year-old children. BMC Oral Health, 15(1), 51. https://doi.org/10.1186/s12903-015-0036-4
8. Antunes, L. A. A., Lemos, H. M., Milani, A. J., Guimarães, L. S., Küchler, E. C., & Antunes, L. S. (2020). Does traumatic dental injury impact oral health-related to quality of life of children and adolescents? Systematic review and meta-analysis. International Journal of Dental Hygiene, 18(2), 142–162. https://doi.org/10.1111/idh.12425

9. Attaran, N., Sharma, A., Morris, M., Dudubo, O., & Macdonald, M. E. (2023). What are the impacts of oral complications from cancer therapy on the quality of life of children? A protocol to update a scoping review. PLOS ONE, 18(11), e0290364. https://doi.org/10.1371/journal.pone.0290364
10. Azarpazhooh, A., & Main, P. A. (2008). Fluoride varnish in the prevention of dental caries in children and adolescents: a systematic review. Journal (Canadian Dental Association), 74(1), 73–79. https://doi.org/18298889
11. Baiju, R. (2017). Oral Health and Quality of Life: Current Concepts. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. https://doi.org/10.7860/JCDR/2017/25866.10110
12. Baker, S. R., Foster Page, L., Thomson, W. M., Broomhead, T., Bekes, K., Benson, P. E., Aguilar-Diaz, F., Do, L., Hirsch, C., Marshman, Z., McGrath, C., Mohamed, A., Robinson, P. G., Traebert, J., Turton, B., & Gibson, B. J. (2018). Structural Determinants and Children's Oral Health: A Cross-National Study. Journal of Dental Research, 97(10), 1129–1136. https://doi.org/10.1177/0022034518767401
13. Beeken, L., & Calman, F. (1994). A return to "normal eating" after curative treatment for oral cancer. What are the long-term prospects? European Journal of Cancer Part B: Oral Oncology, 30(6), 387–392. https://doi.org/10.1016/0964-1955(94)90017-5
14. Bethesda, M. (2021). Effect of Oral Health on the Community, Overall Well-Being, and the Economy. In Oral Health in America: Advances and Challenges (pp. 1–98). https://www.ncbi.nlm.nih.gov/books/NBK578297/
15. Boehmer, T. J., Lesaja, S., Espinoza, L., & Ladva, C. N. (2023). Community Water Fluoridation Levels To Promote Effectiveness and Safety in Oral Health — United States, 2016–2021. MMWR. Morbidity and Mortality Weekly Report, 72(22), 593–596. https://doi.org/10.15585/mmwr.mm7222a1
16. Bowen, S. (2015). The Impact of Language Barriers on Patient Safety and Quality of Care Final Report Prepared for the Société Santé en français. https://www.qualityhealth.org/wpsc/2017/10/13/impact-of-language-cultural-barriers-on-patient-safety-health-equity/
17. Bramantoro, T., Santoso, C. M. A., Hariyani, N., Setyowati, D., Zulfiana, A. A., Nor, N. A. M., Nagy, A., Pratamawari, D. N. P., & Irmalia, W. R. (2021). Effectiveness of the school-based oral health promotion programmes from preschool to high school: A systematic review. PLOS ONE, 16(8), e0256007. https://doi.org/10.1371/journal.pone.0256007
18. Carra, M. C., Detzen, L., Kitzmann, J., Woelber, J. P., Ramseier, C. A., & Bouchard, P. (2020). Promoting behavioural changes to improve oral hygiene in patients with periodontal diseases: A systematic review. Journal of Clinical Periodontology, 47(S22), 72–89. https://doi.org/10.1111/jcpe.13234
19. Chimbinha, Í. G. M., Ferreira, B. N. C., Miranda, G. P., & Guedes, R. S. (2023). Oral-health-related quality of life in adolescents: umbrella review. BMC Public Health, 23(1), 1603. https://doi.org/10.1186/s12889-023-16241-2
20. Christian, B., George, A., Veginadu, P., Villarosa, A., Makino, Y., Kim, W. J., Masood, M., Martin, R., Harada, Y., & Mijares-Majini, M. C. (2023). Strategies to integrate oral health into primary care: a systematic review. BMJ Open, 13(7), e070622. https://doi.org/10.1136/bmjopen-2022-070622
21. Cianetti, S., Lombardo, G., Lupatelli, E., Pagano, S., Abraha, I., Montedori, A., Caruso, S., Gatto, R., De Giorgio, S., & Salvato, R. (2017). Dental fear/anxiety among children and adolescents. A systematic review. European Journal of Paediatric Dentistry, 18(2), 121–130. https://doi.org/10.23804/ejpd.2017.18.02.07
22. Cruz, G. D., Chen, Y., Salazar, C. R., & Le Geros, R. Z. (2009). The Association of Immigration and Acculturation Attributes With Oral Health Among Immigrants in New York City. American Journal of Public Health, 99(S2), S474–S480. https://doi.org/10.2105/AJPH.2008.149799
23. Dadipoor, S., Akbarizadeh, F., Ghaffari, M., Alipour, A., & Safari-Moradabadi, A. (2023). Educational Intervention of Improve Student's Oral Health: A Systematic Review and Meta-Analysis School-Based. Iranian Journal of Public Health. https://doi.org/10.18502/ijph.v52i3.12133
24. de Lucena, E. H. G., da Silva, R. O., Barbosa, M. L., de Araújo, E. C. F., Pereira, A. C., & Cavalcanti, Y. W. (2021). Influence of socioeconomic status on oral disease burden: a population-based study. BMC Oral Health, 21(1), 608. https://doi.org/10.1186/s12903-021-01970-w
25. Desai, H., Stewart, C. A., & Finer, Y. (2021). Minimally Invasive Therapies for the Management of Dental Caries-A Literature Review. Dentistry Journal, 9(12). https://doi.org/10.3390/dj9120147
26. Dhingra, K. (2023). Artificial intelligence in dentistry: current state and future directions. The Bulletin of the Royal College of Surgeons of England, 105(8), 380–383. https://doi.org/10.1308/rcsbull.2023.132
27. Dimberg, L., Arnrup, K., & Bondemark, L. (2015). The impact of malocclusion on the quality of life among children and adolescents: a systematic review of quantitative studies. The European Journal of Orthodontics, 37(3), 238–247. https://doi.org/10.1093/ejo/cju046
28. Dimenäs, S. L., Östberg, A., Lundin, M., Lundgren, J., & Abrahamsson, K. H. (2022). Adolescents' experiences of a theory-based behavioural intervention for improved oral hygiene: A qualitative interview study. International Journal of Dental Hygiene, 20(4), 609–619. https://doi.org/10.1111/idh.12606

29. ElNaghy, R., & Hasanin, M. (2023). Impact of malocclusions on oral health-related quality of life among adolescents. Evidence-Based Dentistry, 24(3), 140–141. https://doi.org/10.1038/s41432-023-00927-y
30. Eng, G., Chen, A., Vess, T., & Ginsburg, G. (2012). Genome technologies and personalized dental medicine. Oral Diseases, 18(3), 223–235. https://doi.org/10.1111/j.1601-0825.2011.01876.x
31. Ervin, R. B., Kit, B. K., Carroll, M. D., & Ogden, C. L. (2012). Consumption of added sugar among U.S. children and adolescents, 2005-2008. NCHS Data Brief, 87, 1–8. https://doi.org/22617043
32. Featherstone, J. D. B., & Doméjean, S. (2012). Minimal intervention dentistry: part 1. From "compulsive" restorative dentistry to rational therapeutic strategies. British Dental Journal, 213(9), 441–445. https://doi.org/10.1038/sj.bdj.2012.1007
33. Fleary, S. A., Joseph, P., & Pappagianopoulos, J. E. (2018). Adolescent health literacy and health behaviors: A systematic review. Journal of Adolescence, 62(1), 116–127. https://doi.org/10.1016/j.adolescence.2017.11.010
34. Fotedar, S., Sharma, K. R., Fotedar, V., Bhardwaj, V., Chauhan, A., & Manchanda, K. (2014). Relationship between oral health status and oral health related quality of life in adults attending H.P Government Dental College, Shimla, Himachal Pradesh--India. Oral Health and Dental Management, 13(3), 661–665. http://www.ncbi.nlm.nih.gov/pubmed/25284532
35. Frech, A. (2012). Healthy behavior trajectories between adolescence and young adulthood. Advances in Life Course Research, 17(2), 59–68. https://doi.org/10.1016/j.alcr.2012.01.003
36. Gauba, A., Bal, I., Jain, A., & Mittal, H. (2013). School based oral health promotional intervention: Effect on knowledge, practices and clinical oral health related parameters. Contemporary Clinical Dentistry, 4(4), 493. https://doi.org/10.4103/0976-237X.123056
37. Habashneh, R. Al, Khader, Y. S., & Salameh, S. (2012). Use of the Arabic version of Oral Health Impact Profile-14 to evaluate the impact of periodontal disease on oral health-related quality of life among Jordanian adults. Journal of Oral Science, 54(1), 113–120. https://doi.org/10.2334/josnusd.54.113
38. Harnagea, H., Lamothe, L., Couturier, Y., Esfandiari, S., Voyer, R., Charbonneau, A., & Emami, E. (2018). From theoretical concepts to policies and applied programmes: the landscape of integration of oral health in primary care. BMC Oral Health, 18(1), 23. https://doi.org/10.1186/s12903-018-0484-8
39. Hedman, E., Gabre, P., Birkhed, D., & Lepp, M. (2013). Adolescents' experiences of a two-year oral health intervention programme in two <scp>S</scp> wedish secondary schools. International Journal of Dental Hygiene, 11(4), 244–252. https://doi.org/10.1111/idh.12035
40. Høiseth, M., & Jasbi, A. (2024). Adolescents' views on oral health care and promotion in Norway: everyday practices, recommendations, and future visions. Frontiers in Oral Health, 5. https://doi.org/10.3389/froh.2024.1290652
41. Islam, M. R. R., Islam, R., Ferdous, S., Watanabe, C., Yamauti, M., Alam, M. K., & Sano, H. (2022). Teledentistry as an Effective Tool for the Communication Improvement between Dentists and Patients: An Overview. Healthcare, 10(8), 1586. https://doi.org/10.3390/healthcare10081586
42. James, S. L., Abate, D., Abate, K. H., Abay, S. M., Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abdelalim, A., Abdollahpour, I., Abdulkader, R. S., Abebe, Z., Abera, S. F., Abil, O. Z., Abraha, H. N., Abu-Raddad, L. J., Abu-Rmeileh, N. M. E., Accrombessi, M. M. K., … Murray, C. J. L. (2018). Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet, 392(10159), 1789–1858. https://doi.org/10.1016/S0140-6736(18)32279-7
43. Janakiram, C., Antony, B., & Joseph, J. (2018). Association of Undernutrition and Early Childhood Dental Caries. Indian Pediatrics, 55(8), 683–685. http://www.ncbi.nlm.nih.gov/pubmed/30218516
44. Jönsson, B., & Abrahamsson, K. H. (2020). Overcoming behavioral obstacles to prevent periodontal disease: Behavioral change techniques and self-performed periodontal infection control. Periodontology 2000, 84(1), 134–144. https://doi.org/10.1111/prd.12334
45. Kaczmarczyk, K. H., Gray-Burrows, K. A., Vinall-Collier, K., & Day, P. F. (2021). Oral health promotion apps: an assessment of message and behaviour change potential. International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care, 33(1). https://doi.org/10.1093/intqhc/mzaa112
46. Kaur, P. (2017). Impact of Dental Disorders and its Influence on Self Esteem Levels among Adolescents. Journal Of Clinical And Diagnostic Research. https://doi.org/10.7860/JCDR/2017/23362.9515
47. Khanagar, S. B., Alfouzan, K., Awawdeh, M., Alkadi, L., Albalawi, F., & Alfadley, A. (2022). Application and Performance of Artificial Intelligence Technology in Detection, Diagnosis and Prediction of Dental Caries (DC)—A Systematic Review. Diagnostics, 12(5), 1083. https://doi.org/10.3390/diagnostics12051083
48. Khurshid, Z., Zafar, M. S., Khan, R. S., Najeeb, S., Slowey, P. D., & Rehman, I. U. (2018). Role of Salivary Biomarkers in Oral Cancer Detection (pp. 23–70). https://doi.org/10.1016/bs.acc.2018.05.002

49. Kopp, S. L., Ramseier, C. A., Ratka-Krüger, P., & Woelber, J. P. (2017). Motivational Interviewing As an Adjunct to Periodontal Therapy—A Systematic Review. Frontiers in Psychology, 8. https://doi.org/10.3389/fpsyg.2017.00279
50. Lawal, F. B., Fagbule, O. F., Akinloye, S. J., Lawal, T. A., & Oke, G. A. (2022). Impact of oral hygiene habits on oral health-related quality of life of in-school adolescents in Ibadan, Nigeria. Frontiers in Oral Health, 3. https://doi.org/10.3389/froh.2022.979674
51. Levin, L., Proter, N. E., & Levin, S. (2007). Dental visits and personality traits among young adults. Quintessence International (Berlin, Germany : 1985), 38(7), e379-83. http://www.ncbi.nlm.nih.gov/pubmed/17694200
52. Lombardo, G., Vena, F., Negri, P., Pagano, S., Barilotti, C., Paglia, L., Colombo, S., Orso, M., & Cianetti, S. (2020). Worldwide prevalence of malocclusion in the different stages of dentition: A systematic review and meta-analysis. European Journal of Paediatric Dentistry, 21(2), 115–122. https://doi.org/10.23804/ejpd.2020.21.02.05
53. López, R., Fernández, O., & Baelum, V. (2006). Social gradients in periodontal diseases among adolescents. Community Dentistry and Oral Epidemiology, 34(3), 184–196. https://doi.org/10.1111/j.1600-0528.2006.00271.x
54. Marinho, V. C., Worthington, H. V, Walsh, T., & Clarkson, J. E. (2013). Fluoride varnishes for preventing dental caries in children and adolescents. Cochrane Database of Systematic Reviews, 2014(2). https://doi.org/10.1002/14651858.CD002279.pub2
55. Mariño, R., Enticott, J., Browning, C., Elsamman, M., Etzion, R., Ferooz, M., Fujihara, R., Hancock, H., He, J., & Kendig, H. (2020). Self-assessed impact of oral health on the psychological well-being and depressive symptoms of older adults living in Melbourne. Journal of Public Health Dentistry, 80(3), 177–185. https://doi.org/10.1111/jphd.12363
56. MESQUITA, M. N. de, MACIEL, J. A. C., & SILVA, A. R. de C. da. (2023). Teleodontology as a tool for adolescent oral health care. RGO - Revista Gaúcha de Odontologia, 71. https://doi.org/10.1590/1981-86372023004120220073
57. Militi, A., Sicari, F., Portelli, M., Merlo, E. M., Terranova, A., Frisone, F., Nucera, R., Alibrandi, A., & Settineri, S. (2021). Psychological and Social Effects of Oral Health and Dental Aesthetic in Adolescence and Early Adulthood: An Observational Study. International Journal of Environmental Research and Public Health, 18(17), 9022. https://doi.org/10.3390/ijerph18179022
58. Minervini, G., Franco, R., Marrapodi, M. M., Di Blasio, M., Ronsivalle, V., & Cicciù, M. (2023). Children oral health and parents education status: a cross sectional study. BMC Oral Health, 23(1), 787. https://doi.org/10.1186/s12903-023-03424-x
59. Mohammed, H. A., Abdulkareem, A. A., Zardawi, F. M., & Gul, S. S. (2022). Determination of the Accuracy of Salivary Biomarkers for Periodontal Diagnosis. Diagnostics, 12(10), 2485. https://doi.org/10.3390/diagnostics12102485
60. Mohammed, R. H. A., & El Seed, D. A. G. (2024). Gingival Health and Periodontal Diseases during Puberty in Females Students in Maal High School in Omdurman, Sudan (2021 – 2022). International Journal of Clinical Science and Medical Research, 04(02). https://doi.org/10.55677/IJCSMR/V4I2-07/2024
61. Mtaya, M., Brudvik, P., & Astrom, A. N. (2009). Prevalence of malocclusion and its relationship with socio-demographic factors, dental caries, and oral hygiene in 12- to 14-year-old Tanzanian schoolchildren. The European Journal of Orthodontics, 31(5), 467–476. https://doi.org/10.1093/ejo/cjn125
62. Muwonge, R., Ramadas, K., Sankila, R., Thara, S., Thomas, G., Vinoda, J., & Sankaranarayanan, R. (2008). Role of tobacco smoking, chewing and alcohol drinking in the risk of oral cancer in Trivandrum, India: A nested case-control design using incident cancer cases. Oral Oncology, 44(5), 446–454. https://doi.org/10.1016/j.oraloncology.2007.06.002
63. Nayar, P., McFarland, K. K., Chandak, A., & Gupta, N. (2017). Readiness for Teledentistry: Validation of a Tool for Oral Health Professionals. Journal of Medical Systems, 41(1), 4. https://doi.org/10.1007/s10916-016-0654-7
64. Nazir, M., Al-Ansari, A., Al-Khalifa, K., Alhareky, M., Gaffar, B., & Almas, K. (2020). Global Prevalence of Periodontal Disease and Lack of Its Surveillance. The Scientific World Journal, 2020, 1–8. https://doi.org/10.1155/2020/2146160
65. Northridge, M. E., Kumar, A., & Kaur, R. (2020). Disparities in Access to Oral Health Care. Annual Review of Public Health, 41(1), 513–535. https://doi.org/10.1146/annurev-publhealth-040119-094318
66. Oh, H. J., Kim, C. H., & Jeon, J. G. (2020). Public Sense of Water Fluoridation as Reflected on Twitter 2009–2017. Journal of Dental Research, 99(1), 11–17. https://doi.org/10.1177/0022034519885610
67. Patil, S., Joda, T., Soffe, B., Awan, K. H., Fageeh, H. N., Tovani-Palone, M. R., & Licari, F. W. (2023). Efficacy of artificial intelligence in the detection of periodontal bone loss and classification of periodontal diseases. The Journal of the American Dental Association, 154(9), 795-804.e1. https://doi.org/10.1016/j.adaj.2023.05.010

68. Patini, R. (2020). Personalized Dentistry: Approaching a New Way for Diagnosis and Treatment of Oral Diseases. Journal of Personalized Medicine, 10(2), 35. https://doi.org/10.3390/jpm10020035
69. Petersen, P. E., & Kwan, S. (2011). Equity, social determinants and public health programmes - the case of oral health. Community Dentistry and Oral Epidemiology, 39(6), 481–487. https://doi.org/10.1111/j.1600-0528.2011.00623.x
70. Petersen, P. E., & Lennon, M. A. (2004). Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach. Community Dentistry and Oral Epidemiology, 32(5), 319–321. https://doi.org/10.1111/j.1600-0528.2004.00175.x
71. Phipps, K. R. (2000). Community water fluoridation, bone mineral density, and fractures: prospective study of effects in older women. BMJ, 321(7265), 860–864. https://doi.org/10.1136/bmj.321.7265.860
72. Prasad, M., Manjunath, C., Murthy, A. K., Sampath, A., Jaiswal, S., & Mohapatra, A. (2019). Integration of oral health into primary health care: A systematic review. Journal of Family Medicine and Primary Care, 8(6), 1838–1845. https://doi.org/10.4103/jfmpc.jfmpc_286_19
73. Purohit, B. M., Singh, A., Barbi, W., & Ahmad, S. (2024). Cultural factors and family influences on adolescent oral health: qualitative research in a socially disadvantaged population. International Journal of Paediatric Dentistry. https://doi.org/10.1111/ipd.13170
74. Ramseier, C. A. ., & Suvan, J. E. . (2014). Health behavior change in the dental practice. In Health Behavior Change in the Dental Practice. Wiley-Blackwell. https://doi.org/10.1002/9781118786802
75. Revilla-León, M., Gómez-Polo, M., Vyas, S., Barmak, B. A., Galluci, G. O., Att, W., & Krishnamurthy, V. R. (2023). Artificial intelligence applications in implant dentistry: A systematic review. The Journal of Prosthetic Dentistry, 129(2), 293–300. https://doi.org/10.1016/j.prosdent.2021.05.008
76. Rosenquist, K., Wennerberg, J., Annertz, K., Schildt, E.-B., Göran Hansson, B., Bladström, A., & Andersson, G. (2007). Recurrence in patients with oral and oropharyngeal squamous cell carcinoma: human papillomavirus and other risk factors. Acta Oto-Laryngologica, 127(9), 980–987. https://doi.org/10.1080/00016480601110162
77. Rupel, K., Ottaviani, G., Gobbo, M., Poropat, A., Zoi, V., Zacchigna, S., Di Lenarda, R., & Biasotto, M. (2020). Campaign to Increase Awareness of Oral Cancer Risk Factors Among Preadolescents. Journal of Cancer Education, 35(3), 616–620. https://doi.org/10.1007/s13187-019-01504-7
78. Salawu, M. M., & Omitoye, R. (2019). An Assessment Of Dental Care Practices Among Undergraduate Students Of Adeleke University, Ede, Osun State, Nigeria. Annals of Ibadan Postgraduate Medicine, 17(1), 24–29. http://www.ncbi.nlm.nih.gov/pubmed/31768153
79. Samaranayake, L. (2012). Dentistry in an era of personalized medicine. Journal of Investigative and Clinical Dentistry, 3(3), 161–162. https://doi.org/10.1111/j.2041-1626.2012.00161.x
80. Sanadhya, Y. K., Thakkar, J. P., Divakar, D. D., Pareek, S., Rathore, K., Yousuf, A., Ganta, S., Sobti, G., Maniar, R., Asawa, K., Tak, M., & Kamate, S. (2014). Effectiveness of oral health education on knowledge, attitude, practices and oral hygiene status among 12–15-year-old schoolchildren of fishermen of Kutch district, Gujarat, India. International Maritime Health, 65(3), 99–105. https://doi.org/10.5603/IMH.2014.0022
81. Saxén, L., & Nevanlinna, H. R. (1984). Autosomal recessive inheritance of juvenile periodontitis: test of a hypothesis. Clinical Genetics, 25(4), 332–335. https://doi.org/10.1111/j.1399-0004.1984.tb01999.x
82. Schmalz, G., Jakubovics, N., & Schwendicke, F. (2022). Normative Approaches for Oral Health: Standards, Specifications, and Guidelines. Journal of Dental Research, 101(5), 489–494. https://doi.org/10.1177/00220345211049695
83. Sheiham, A., & Watt, R. G. (2000). The Common Risk Factor Approach: a rational basis for promoting oral health. Community Dentistry and Oral Epidemiology, 28(6), 399–406. https://doi.org/10.1034/j.1600-0528.2000.028006399.x
84. Shomuyiwa, D. O., & Bridge, G. (2023). Oral health of adolescents in West Africa: prioritizing its social determinants. Global Health Research and Policy, 8(1), 28. https://doi.org/10.1186/s41256-023-00313-2
85. Silk, H., & Kwok, A. (2017). Addressing Adolescent Oral Health: A Review. Pediatrics In Review, 38(2), 61–68. https://doi.org/10.1542/pir.2016-0134
86. Singh, A., Peres, M. A., & Watt, R. G. (2019). The Relationship between Income and Oral Health: A Critical Review. Journal of Dental Research, 98(8), 853–860. https://doi.org/10.1177/0022034519849557
87. Sivari, E., Senirkentli, G. B., Bostanci, E., Guzel, M. S., Acici, K., & Asuroglu, T. (2023). Deep Learning in Diagnosis of Dental Anomalies and Diseases: A Systematic Review. Diagnostics, 13(15), 2512. https://doi.org/10.3390/diagnostics13152512
88. Socransky, S. S., Haffajee, A. D., Cugini, M. A., Smith, C., & Kent, R. L. (1998). Microbial complexes in subgingival plaque. Journal of Clinical Periodontology, 25(2), 134–144. https://doi.org/10.1111/j.1600-051X.1998.tb02419.x
89. Souki, B. Q., Pimenta, G. B., Souki, M. Q., Franco, L. P., Becker, H. M. G., & Pinto, J. A. (2009). Prevalence of malocclusion among mouth breathing children: Do expectations meet reality? International

Journal of Pediatric Otorhinolaryngology, 73(5), 767–773. https://doi.org/10.1016/j.ijporl.2009.02.006
90. Studen-Pavlovich, D., & Ranalli, D. N. (2006). Periodontal and Soft Tissue Prevention Strategies for the Adolescent Dental Patient. Dental Clinics of North America, 50(1), 51–67. https://doi.org/10.1016/j.cden.2005.11.001
91. Tiffany, B., Blasi, P., Catz, S. L., & McClure, J. B. (2018). Mobile Apps for Oral Health Promotion: Content Review and Heuristic Usability Analysis. JMIR MHealth and UHealth, 6(9), e11432. https://doi.org/10.2196/11432
92. Tseveenjav, B., Pesonen, P., & Virtanen, J. I. (2015). Use of snus, its association with smoking and alcohol consumption, and related attitudes among adolescents: the Finnish National School Health Promotion Study. Tobacco Induced Diseases, 13(1), 34. https://doi.org/10.1186/s12971-015-0058-3
93. Wang, X., Chen, H., Hou, R., Yang, T., Liu, J., Li, J., Shi, X., Zhao, B., & Liu, J. (2023). Effect of dietary patterns on dental caries among 12–15 years-old adolescents: a cross-sectional survey. BMC Oral Health, 23(1), 1–12. https://doi.org/10.1186/s12903-023-03566-y
94. Wells, J. P., Roked, Z., Moore, S. C., & Sivarajasingam, V. (2016). Telephone review after minor oral surgery. British Journal of Oral and Maxillofacial Surgery, 54(5), 526–530. https://doi.org/10.1016/j.bjoms.2016.02.016
95. Wu, L., Gao, X., Lo, E. C. M., Ho, S. M. Y., McGrath, C., & Wong, M. C. M. (2017). Motivational Interviewing to Promote Oral Health in Adolescents. Journal of Adolescent Health, 61(3), 378–384. https://doi.org/10.1016/j.jadohealth.2017.03.010
96. Yamamoto-Kuramoto, K., Kusama, T., Kiuchi, S., Kondo, K., Osaka, K., Takeuchi, K., & Aida, J. (2023). Lower socio-economic status in adolescence is associated with poor oral health at an older age: Mediation by social and behavioural factors. Gerodontology, 40(4), 509–517. https://doi.org/10.1111/ger.12688
97. Yar, A., Unar, J., Khalid Khan, A., Khalid, A., Irshad, F., Tahir, H., & Lodhi, K. (2024). Assessing the effectiveness of community-based oral health education programs in promoting dental hygiene practices. Bioanalysis, 16(1), 199–207.
98. Zokaie, T., & Pollick, H. (2022). Community water fluoridation and the integrity of equitable public health infrastructure. Journal of Public Health Dentistry, 82(3), 358–361. https://doi.org/10.1111/jphd.12480