

The Role of Dental Hygienists in Promoting Oral and Dental Health within the Framework of Multidisciplinary Health Care and Modern Digital Technologies

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ABSTRACT

Dental hygienists play a vital role in maintaining oral health by providing preventive and educational care, early diagnosis and treatment. Their duties include cleaning teeth, removing plaque and tartar, applying fluoride and protective pastes, and promoting health awareness among patients about best oral care practices. With recent technological advances, the use of digital tools such as digital X-rays, intraoral scanning and 3D printing enhances the efficiency of diagnosing oral diseases and personalizing treatment. This technology contributes to accelerating treatment, reducing pain and improving oral health care outcomes. Moreover, oral hygienists are an essential part of the multidisciplinary medical team, working hand in hand with specialist physicians to ensure comprehensive patient care. This study aims to explore the role of oral hygienists in preventing oral diseases using the latest technological tools and to clarify the impact of this on improving oral health outcomes.

Keywords: dental hygienists, Dental Technology, health care, AI, Patient Care

Introduction:

Dental hygienists play a pivotal role in promoting and maintaining oral health, which includes keeping the mouth, teeth, and gums clean and healthy to prevent disease [1]. The roles and responsibilities of dental hygienists are not limited to cleaning teeth, but the roles and responsibilities extend much further [2]. Early detection of oral health problems, prevention of oral diseases, and patient education are among the most

important duties and responsibilities of dental hygienists. This makes dental hygienists the cornerstone of maintaining oral and dental health [3,4].

Globally, the importance of oral health and its impact on overall health has been recognized. Therefore, the goal of a dental hygienist is to prevent and manage oral diseases [5]. Dental hygienists' duties include diagnosing oral health, early detection of caries and gum disease, removing plaque and tartar, applying fluoride and sealants, taking x-rays, and educating patients on effective oral hygiene practices [4,6]. In addition, dental hygienists focus on preventive care, with the goal of reducing the risk of common oral diseases such as tooth decay, gum disease, and bad breath [7].

Patient education is one of the most important responsibilities of dental hygienists. They provide guidance on proper brushing and flossing techniques, nutritional advice, and lifestyle choices that promote good oral health, and provide personalized advice and preventive interventions [8,9]. A proactive approach to oral health helps reduce the need for more invasive procedures, which contributes to improved patient outcomes and lower healthcare costs [5].

In addition, dental hygienists play an active role within the multidisciplinary medical team to ensure that patients receive comprehensive care, addressing oral and systemic health needs. As healthcare becomes increasingly multidisciplinary and patient-centered, the role of dental professionals is increasingly important, especially in early detection, preventive care, and management of oral and dental diseases [10].

The importance of dental hygienists

Oral health problems are widespread among communities around the world and pose a major challenge to healthcare systems [5]. Therefore, the importance and role of oral health professionals in promoting and maintaining oral health through a proactive approach to preventive care, early diagnosis and community education on the importance of maintaining oral health is increasing [11].

Dental hygienists play an important role in the multidisciplinary medical team, as they are the link between the patient and the specialized dentist [12]. Dental hygienists also collaborate with dental assistants, provide preventive consultations, and conduct regular check-ups to detect health problems such as tooth decay, gum disease and oral infections [12,13]. This enhances their role in diagnosis, treatment planning and overall healthcare management.

Dental hygienists' care is not limited to treatment appointments only, but also includes a counselling and preventive role that contributes significantly to improving oral health in the long term and reducing the need for expensive therapeutic interventions [14].

The Role of Dental Hygienists in Dental Care

Dental hygienists play a multifaceted role within the dental care team, making a significant contribution to patient care and oral health. Their work is characterized by a collaborative approach, as they work closely with dentists to develop treatment plans and educate patient's about proper oral care.

Preventive Dental Care

The roles of dental hygienists include cleaning teeth to remove plaque and tartar buildup that is difficult to remove traditionally with a brush or floss. It helps prevent cavities, gum disease, and periodontal disease. In addition, dental hygienists apply fluoride treatments that strengthen teeth and protect against cavities, and cavity preventers that aim to protect teeth from erosion and decay [15].

Assessment of Oral Health

Dental hygienists conduct comprehensive examinations and assessments of the mouth and teeth to detect any early oral and dental health problems, such as detecting cavities or gingivitis, using many modern tools and techniques such as X-rays and taking dental impressions to help accurately diagnose and treat medical conditions [16].

Assisting in Dental Treatments

Dental hygienists support dentists who specialize in dental interventions and treatment procedures by preparing the equipment and tools used in treatment to ensure the patient's comfort [17]. In addition, some qualified dental hygienists can perform local anesthesia procedures to help manage pain. Their role in this context is a great support to dentists to ensure that procedures run smoothly and comfortably for the patient [16,17].

Infection Control and Management

Maintaining a healthy and safe environment is an essential part of the duties of dental hygienists, as dental hygienists work to continuously sterilize the tools and equipment used in diagnostic and therapeutic procedures according to approved health procedures and protocols, which prevents the transmission of diseases and infections between patients and doctors [18].

Patient Education

One of the important roles of dental hygienists is to guide and educate patients on oral health care methods and provide precise instructions on how to brush and floss properly. They also provide nutritional advice on foods that affect oral health, in addition to providing advice on smoking cessation, which is an important step in preventing oral and body diseases [16,17].

Community Health Promotion

Dental hygienists participate in community outreach programs such as educational campaigns in schools, health centers, and mobile dental clinics to increase awareness of the importance of dental and oral care and prevention of dental diseases, which enhances the overall health of the community [17]. In addition, they participate in research projects related to dental health and develop strategies and plans that promote overall oral health.

Dental Hygienists' Collaboration

Dental hygienists are an essential part of the multidisciplinary dental team. Each professional in a modern dental practice performs tasks that promote oral health. Dental hygienists therefore play a key role in the collaboration between general dentistry and specialty practices, through a team-based approach that ensures comprehensive care is provided that meets the needs of each patient [19]. For example, dental hygienists perform initial examinations and cleanings, identifying potential problems that may require intervention by a dentist. They then communicate with dentists and share their observations to develop personalized treatment plans that suit each individual case [20]. Dental hygienists are also trained to treat conditions in the gum tissue and supporting bone, so there are strong partnerships and relationships with dental hygienists who have the expertise to provide a first line of defense against the development of infection, and work with dentists to identify patients who need specialized treatment [19,20].

Technology and Digital Technologies in Dentistry

Technological advancements and modern digital technologies have led to rapid developments in dentistry and innovative approaches to patient care. This has revolutionized dental practices, especially in the field of dental hygiene. Making treatments more efficient, effective and comfortable for patients.

Laser Dentistry

Laser technology is becoming increasingly popular in dental procedures. Lasers can be used for a variety of treatments, including cavity detection, tooth decay removal, gum reshaping, and teeth whitening. The benefits of laser dentistry include reduced pain, faster healing times, and minimal need for anesthesia, making procedures less invasive and more comfortable for patients [21].

Smart Toothbrush

Smart toothbrushes equipped with sensors and Bluetooth connectivity help patients improve their oral hygiene. These toothbrushes provide real-time feedback on brushing techniques, track brushing habits, and even offer personalized advice for better oral care. Incorporating smart technology into daily routines encourages improved dental hygiene and preventive care [22].

3D Printing

3D printing is revolutionizing the way dental appliances and fillings are created. This technology allows for the precise manufacturing of crowns, bridges, dentures, and even orthodontic appliances. 3D printing reduces production costs and time, offers customized solutions that fit patients perfectly, and improves treatment outcomes [23].

Intraoral Scanners

Intraoral scanners have become a staple in modern dental practices. These devices capture highly detailed digital impressions of a patient's mouth, eliminating the need for traditional molds. Intraoral scanners improve the accuracy of dental restorations

and alignment and enhance the patient experience by providing a more comfortable and faster process [24].

Computer-aided design and computer-aided manufacturing (CAD/CAM)

Computer-aided design and computer-aided manufacturing (CAD/CAM) technology is transforming dental practices. This technology allows dentists to design and manufacture precise dental restorations, such as crowns, bridges, and veneers, in a single visit. Digital impressions and 3D printing capabilities enhance accuracy and reduce turnaround time, providing patients with faster and more comfortable treatments [25].

Teledentistry

Teledentistry is expanding access to dental care, especially in remote and underserved areas. Through virtual consultations, patients can receive professional advice, diagnosis, and follow-up care without having to visit the clinic in person [26]. This trend is expected to grow, providing greater convenience and flexibility for both patients and dental practitioners.

Artificial Intelligence (AI)

Artificial intelligence is making its mark in dentistry by enhancing the accuracy of diagnosis and treatment planning. AI-powered software can analyze dental images and patient data to identify problems like cavities, gum disease, and oral cancers earlier than traditional methods [27]. AI also helps develop personalized treatment plans, ensuring patients receive the most effective care based on their unique needs.

The role of technology and digital technologies in enhancing the dental hygienists

Accurate diagnosis and treatment

- **Digital X-rays:** provide accurate and immediate images to diagnose dental and tissue problems, reducing exposure to radiation and shortening treatment time.
- **Digital impressions:** Instead of annoying traditional impressions, intraoral scanning devices allow accurate impressions to be obtained without the need for repeated visits, which increases patient comfort.

Technologies that help in designing dentures

- **3D printing:** allows for the creation of accurate models of teeth and the design of restorations such as crowns and bridges quickly and at a lower cost, which enhances efficiency.

Improving care and treatment planning:

- **Facial scanning devices:** Systems such as the Vectra system provide 3D images of the patient's face and mouth, which helps in developing accurate treatment plans and customizing procedures to suit the facial structure.

Training and education:

Introducing modern technology in educating and training patients and raising their awareness of healthy practices to maintain oral and dental health through various means of communication, telemedicine and robotics

Increasing the effectiveness of procedures and reducing pain:

Using lasers in procedures reduces surgical interventions, which reduces pain and bleeding and speeds up the healing process.

Universal access to care:

Technology has made care easier and more convenient for patients, especially in underserved areas, contributing to improved public health.

Conclusion:

Dental hygienists play a pivotal role in maintaining and promoting oral health through early diagnosis, preventive measures, and patient education about oral health. Advances in technology in dentistry have revolutionized how oral diseases are diagnosed and treated, improving outcomes and reducing the need for costly surgical interventions. In the future, the integration of dental hygienists with digital technologies such as artificial intelligence and 3D printing is expected to become increasingly important, enabling more personalized and effective care. Through this ongoing collaboration with the multidisciplinary medical team, dental hygienists promote oral health and the community at large, reducing the burden of oral diseases on the health system.

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