

Short Communication

Bridging the Gap: Analyzing the Discrepancy Between Theoretical Knowledge and Clinical Implementation in Modern Caries Management in Existing Dental Education

Asaad Javaid Mirza^{1*}, Irshad Afzal², Saadia Saad³

¹Department of Operative Dentistry, Faculty of Dentistry, Baqai Medical University, Pakistan

²Department of Biological and Materials Sci and Prosthodontics, School of Dentistry, University of Michigan, USA

³Department of Oral Biology, Faculty of Dentistry, Baqai Medical University, Pakistan

Correspondence author: Asaad Javaid Mirza, MDS, Department of Operative Dentistry, Faculty of Dentistry, Baqai Medical University, Pakistan;
E-mail: asaadjmirza@baqai.edu.pk

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Abstract

Traditionally, caries has been addressed through surgical means, where the dentist utilizes rotary and hand instruments to eliminate the affected tooth tissue, creating a cavity that is subsequently filled with biomaterials for restoration purposes. This approach stems from the understanding of caries as an irreversible condition involving the destruction of hard tissues. However, recent evidence reveals caries to be a dynamic ailment characterized by alternating phases of demineralization and remineralization of hard tooth tissues. Contrary to the earlier perception, caries is now recognized as a dynamic disease with a fluctuating balance between factors that protect and promote tooth remineralization, as well as factors that contribute to tooth demineralization. Identified as caries risk factors and indicators, these pathological elements prompt a shift in perspective among cariologists towards managing caries through a medical model.

In this medical model, caries is viewed as a multifactorial infectious disease caused by acidogenic bacteria present in the oral cavity. The recommended approach involves preventive strategies such as evaluating patients' caries risk, regulating bacterial levels in saliva, employing various therapeutic agents, remineralizing incipient carious lesions and ultimately restoring cavitated lesions. These strategies not only emphasize prevention but also align with the principles of Minimal Intervention Dentistry (MID).

Dental students studying in various dental institutions receive theoretical education on existing preventive caries management; however, the practical application of this knowledge is insufficient and requires emphasis through integration into the curriculum.

Keywords: Minimal Intervention Dentistry; Modern Caries Management; Undergraduate Dental Curriculum

Introduction

Dental caries stands out as one of the most prevalent health concerns affecting humanity. This condition arises from the interaction between acid-producing and acid-resistant oral bacteria in combination with dietary sugars and carbohydrates. These bacteria generate acid that erodes the protective enamel of teeth, leading to the development of cavities. Historically, caries treatment has followed a 'surgical model,' in which dentists would surgically remove the decayed tissue and replace it with dental biomaterials. This approach primarily focused on addressing cavities rather than treating caries as a disease. Unfortunately, this approach has demonstrated numerous drawbacks, such as its inability to treat caries comprehensively, incapacity to detect early-stage caries and unnecessary removal of natural tooth structure [1].

The surgical model not only compromises tooth strength but also places a tooth on a recurring cycle of restoration, resulting in the gradual loss of the tooth structure. Placing a small filling in a tooth requires repair or replacement at some point after its placement and repeated patching of a tooth makes the restoration larger each time until there is no more tooth substance left to restore; this is known as the 'restorative cycle'. Many studies have mentioned that the placement of a restoration as the primary means to control caries has been regarded as inaccurate and ineffective, as it does not effectively arrest the progression of the caries process [2-4]. In general, existing programs in dental education focus more on restorative cycle than treating the caries as a disease [5].

Recent consensus statements from cariology experts worldwide have made it clear that the traditional model, as advocated by GV Black, is now considered outdated. The current recommendation is to avoid intervention in inactive carious lesions, while the active lesions that are easily accessible to cleaning should be treated with non-invasive methods. Only cavitated lesions that cannot be effectively cleaned require restorative treatment to restore the form, function and esthetics of the affected tooth [6]. Profound research in caries etiology and pathogenicity, induction of newly formulated restorative materials and contemporary technology in dental profession has proposed a 'medical model' to replace the existing surgical concept. This new model forms a valuable foundation for comprehending the biological mechanisms essential for dental decay and devising more effective strategies for prevention and treatment. In contrast to previous approach of addressing only the symptoms, the medical model seeks to tackle the fundamental causes of the decay process to avoid its recurrence and advancement. In the medical model dental caries is managed as a dynamic disease process caused by multiple factors consisting of genetics, diet and habits of oral hygiene maintenance [7]. Instead of managing the consequences of caries, this philosophy emphasizes early clinical interference with a focus on attempting to remineralize the non-cavitated caries before it reaches the cavitation stage. In this fresh perspective, dental caries is viewed as a disease that can be both prevented and treated through various clinical and preventive interventions. In accordance with the medical model, contemporary caries management strategies encompass a combination of preventative and therapeutic approaches. The initial step is to conduct a risk assessment to gauge the patient's susceptibility to developing dental caries. This assessment includes evaluation of the dietary choices, at home oral care practices, as well as their medical history and previous dental history.

The timely caries diagnosis is of paramount importance in order to minimize the need for extensive interventions and to delay restorative cycle of the carious teeth. The failure to catch caries in its early phase results in its progression, eventually leading to the development of cavities and an increased burden of the disease. Therefore, it is imperative for a dentist to prioritize the early and accurate detection of incipient lesions [8].

Visual examination and X-rays are fundamental tools for identifying caries, but they have limitations in assessing the progression of carious lesions and exhibit a relatively low sensitivity rate in detecting early-stage caries. As a response to these limitations, there is a growing reliance on modern diagnostic tools rooted in technology. These modern paraphernalia include laser fluorescence, fibreoptic transillumination, electrical conductance and quantitative light-induced fluorescence, which are employed to detect early non-cavitated carious lesions.

Prevention, from the patient's perspective, is the cornerstone of effective caries management. This entails educating patients on adopting proper oral hygiene practices like regular brushing and flossing, as well as reducing their risk factors for tooth decay by making dietary adjustments and incorporating fluoride into their daily oral care routine. Fluoride can be applied through toothpaste, mouth rinses and gum products.

In the event of caries detection, a minimal intervention approach is recommended. This approach employs preventive and non-invasive techniques, such as the application of fluoride varnish. It either stops or reverses caries process. For minor cavities, resin infiltration or sealants may be employed. In certain cases, silver diamine fluoride, may be used to arrest the caries and prevent its further progression. Chlorhexidine is recommended as mouth wash to reduce the count of acidogenic bacteria, which in turn diminish ability of Streptococci and Lactobacilli to promote tooth decay. Providing suitable dietary guidance for necessary alterations is also crucial to prevent further occurrences of dental decay. A diet having low sugar and carbohydrate content, is strongly recommended to reduce the risk of developing caries [9]. Instead, individuals are encouraged to consume a diet containing fruits, vegetables, nuts, eggs and fish as these choices promote good oral health.

Post-treatment monitoring by a dentist plays a vital role in the new philosophy as he/she actively supervises the patient's progress through regular dental follow-up schedule and assesses current caries status.

Multiple research studies have demonstrated the wide-ranging benefits of the non-invasive and conservative approach, which may seem apparent to many dental clinicians. However, the implementation of these preventive and less invasive principles into routine clinical dentistry has not been universally embraced for various reasons. The existing 'drilling filling' model generates more revenue than the new model which is more preventive and less operative. Accepting and implementing the new approach therefore leads to resistance from most of the dental clinicians [6].

One more reason for resisting implementation of this philosophy is patient's attitude and expectations. They expect a restorative or an operative procedure from the dentist as a remedy for their dental ailment and are unaware and uncertain about outcome efficacy of new philosophy of caries management.

In the United States, educators in the field of dentistry incorporated preventive caries management into the core curriculum for undergraduate students. This integration mandated that clinical students adopt a risk-based model for caries management, departing from the conventional surgical approach. Consequently, over a span of around two decades, those students who underwent training in preventive methods began applying them in their clinical practice [10]. This shift is leading to a gradual replacement of the traditional surgical intervention approach with preventive strategies for caries treatment but current curriculum employed in education and training programs fail to prepare graduates to adopt new philosophy in their practices and therefore, they resist the change in caries management. Theoretically, dental graduates are well versed with the new philosophy but for caries treatment they prefer old philosophy of drilling and filling. Findings of study as project of master's thesis also emphasizes the need of educational interventions to improve the knowledge about caries management by risk assessment [11]. A latest study finds that dental students lack training in implementing the new caries management approach highlighting the need for extensive improvement in clinical training [12].

The new philosophy for managing caries signifies a shift of a paradigm in clinical dentistry towards a comprehensive and preventative method to manage Oro-dental health but its implementation by dentists encounters ongoing resistance, as outlined in the aforementioned factors. Surmounting these obstacles and cultivating a deeper appreciation for the non-invasive, results-oriented approach of this model is pivotal for advancing contemporary dental care and advocating sustained oral well-being. To bridge the divide between established practices and innovative caries management, it is essential for all stakeholders, encompassing dental practitioners, educators and researchers, to collaborate and work collectively towards this common goal [13].

Conflict of Interest

The authors have no conflict of interest to declare.

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