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Application of the Health Belief Model in Oral Health Promotion and Preventive Dentistry: A Narrative Review

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ABSTRACT

Oral diseases are among the most widespread non-communicable diseases globally, affecting around 3.5 billion people and their health, quality of life, and economic productivity. Despite being preventable, their incidence continues to increase because preventive oral health practices are not sufficiently adopted or maintained. Understanding factors influencing health-related behaviours is crucial for promoting oral health and preventive dentistry. The Health Belief Model (HBM), developed in the 1950s by social psychologists with the United States Public Health Service, is a widely used behavioural theory for explaining and predicting preventive health behaviours. It proposes that perceived disease risk, seriousness, benefits, barriers, cues to action, and self-confidence shape health decisions. For over seventy years, the HBM has been used in health promotion, including vaccination, chronic disease prevention, medication adherence, tobacco cessation, and oral health promotion. In dentistry, interventions improved oral hygiene and the use of preventive services. This narrative review outlines the model's development, components, applications, strengths, weaknesses, and future integration with digital health technologies to improve oral health outcomes.

Keywords: Oral Health; Mouth Diseases; Preventive Dentistry; Health Belief Model; Health Promotion

1. INTRODUCTION

Oral health is an aspect of health and well-being, supporting eating, speaking, communication, and interactions. Oral diseases can harm nutrition, self-esteem, education, work productivity, and quality of life. According to the World Health Organisation (WHO), nearly 3.5 billion people suffer from oral diseases [(1).] However, behavioural change remains a challenge in preventive dentistry, as knowledge, beliefs, motivation, experiences, and environmental influences shape behaviours.

Behavioural Science is essential in public health dentistry because it provides frameworks for understanding and predicting health-related behaviour. Health behaviour theories help identify behavioural determinants, design evidence-based interventions, and evaluate health promotion programmes. Theory-driven interventions are more successful than programmes based only on information dissemination because they address mechanisms underlying behavioural change [(4,5)]. Consequently, these theories are essential for planning oral health education, preventive interventions, and community-based health promotion. Among them, HBM remains one of the oldest and most researched frameworks in preventive healthcare. Developed in the early 1950s by Godfrey Hochbaum, Stephen Kegeles, and Irwin Rosenstock at the United States Public Health Service [(6,7)], it was designed to explain why individuals missed free tuberculosis screenings. The investigators proposed that preventive health behaviour is influenced by perceived susceptibility, seriousness, benefits, and barriers [(8,9)].

The model was later expanded to include ' cue to action' and 'self-efficacy' [(10–12)], improving its ability to explain behaviours requiring effort, including oral hygiene. The HBM is applied in health promotion and dentistry [(4,5).] It has guided interventions to improve hygiene, fluoride use, dietary practices, dental attendance, orthodontic compliance, periodontal maintenance, and tobacco cessation. HBM-based educational interventions improve oral health knowledge, beliefs, self-efficacy, perceived barriers, and preventive behaviours across age groups [(13–18).] However, the model gives less attention to broader determinants such as social support, culture, healthcare accessibility, economic conditions, and environmental factors [(4,5)]. Because behaviour is influenced by interacting determinants beyond individual beliefs, many researchers recommend integrating the HBM with complementary behavioural theories. Nevertheless, its simplicity, foundation, and empirical support keep it influential in preventive medicine and oral health promotion. This narrative review examines the model's evolution, foundations, oral health applications, strengths, limitations, and integration with digital health technologies to improve outcomes and evidence-based preventive dental practice.

2. HISTORICAL EVOLUTION OF THE HEALTH BELIEF MODEL

The HBM is real science, aiding interventions that address misconceptions, fears, and barriers to healthy behaviour. It is an early framework for understanding preventive health behaviour. Developed in the 1950s after the U.S. Public Health Service observed low participation in free tuberculosis (TB) screening despite easy access [6,7], it led social psychologists, including Godfrey Hochbaum, Stephen Kegeles, and Irwin Rosenstock, to examine psychological factors shaping health decisions. Their research showed that healthcare use depends not only on service availability but also on beliefs, perceptions, and attitudes toward disease and prevention. The HBM proposed four perceptions driving preventive action: perceived susceptibility, severity, benefits, and barriers. People are more likely to act if they feel at risk, believe interventions reduce that risk, and see benefits outweighing barriers.

These ideas remain central to the HBM today. The model was later applied to immunizations, hypertension screening, cervical cancer screening, family planning, medication adherence, and other preventive actions [8,9], establishing it as a foundational theory in health education and behavioural science. In the 1980s, Rosenstock, Strecher, and Becker added cues to action—internal or external triggers of preventive behaviour[10]. Internal cues include symptoms; external cues include advice from healthcare professionals, educational campaigns, family encouragement, and reminder systems. Later research showed that cognitive perceptions alone could not fully explain health behaviours requiring sustained effort or long-term lifestyle change. A key advance was the inclusion of self-efficacy, introduced by Bandura within Social Cognitive Theory [11,12]. Self-efficacy is an individual's confidence in performing a behaviour despite obstacles. Its inclusion strengthened the model because many preventive behaviours, including smoking cessation, dietary changes, physical activity, and oral hygiene maintenance, require sustained effort rather than a single decision. Higher self-efficacy is associated with greater persistence and motivation to sustain healthy behaviours. Over seventy years, the Health Belief Model has evolved into a widely used model in medicine, public health, psychology, and dentistry, supporting interventions that address misconceptions, fears, and barriers to healthy behaviours and improve health outcomes [4,5].

The original HBM suggested that preventive actions are primarily driven by four cognitive perceptions: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers [8,9]. People are more likely to act if they feel at risk for a serious illness, believe that recommended interventions can reduce that risk, and perceive the benefits as outweighing the barriers. These concepts formed the basis of one of the earliest cognitive models of health-related behaviour and remain central to the HBM. During the 1960s and 1970s, the model was applied to various health behaviours beyond TB screening, including immunisations, hypertension screening, cervical cancer screening, family planning, medication adherence, and other preventive measures[8,9]. Its broad application helped establish the HBM as a key theory in health education and behavioural science, guiding interventions to address misconceptions, fears, and barriers to healthy behaviours.

Later research indicated that cognitive perceptions alone could not fully explain all health behaviours, especially those requiring ongoing effort or lifestyle changes. Consequently, the model was refined in the 1980s when Rosenstock, Strecher, and Becker added the concept of cues to action–internal or external triggers that prompt preventive behaviour[10]. Internal cues include symptoms like pain or discomfort, while external cues encompass healthcare provider advice, media messages, family support, and reminder systems.

3. THEORETICAL FOUNDATIONS OF THE HEALTH BELIEF MODEL

The Health Belief Model is primarily based on **value-expectancy theory**. This psychological framework proposes that human behaviour is influenced by two fundamental considerations: the value an individual places on a particular outcome and the expectation that a specific action will successfully achieve that outcome [8,9]. In other words, individuals are more likely to engage in behaviours that they believe will produce desirable results and avoid behaviours perceived as ineffective or unnecessary. Applied to healthcare, this theory suggests that preventive actions are undertaken when individuals value good health and believe that the recommended behaviour will effectively reduce disease risk.

The theoretical basis of the HBM also reflects principles proposed by Kurt Lewin, whose field theory emphasised that the interaction between personal motivation and environmental influences determines behaviour. Building on these concepts, Rosenstock proposed that preventive health behaviour depends largely on an individual's subjective perception of disease risk rather than objective clinical risk. Thus, two individuals with similar clinical characteristics may exhibit completely different health behaviours because they perceive susceptibility and severity differently. This emphasis on subjective perception distinguishes the HBM from purely biomedical models of disease prevention.

Another important theoretical influence on the HBM is social cognitive theory, particularly through the incorporation of self-efficacy [10–12]. While the original model focused primarily on perceived threats and expected outcomes, the addition of self-efficacy recognized that individuals must also believe that they possess the skills and confidence necessary to perform the recommended behaviour successfully. This addition improved the model's ability to explain complex behavioursthat require sustained effort, such as maintaining oral hygiene, adhering to periodontal maintenance programmes, quitting tobacco use, and following long-term preventive healthcare recommendations.

The HBM is also consistent with broader cognitive theories of decision-making, which propose that individuals actively evaluate the advantages and disadvantages of different behavioural options before making health-related decisions. Within this framework, people are not viewed as passive recipients of health information but as rational decision-makers who interpret health messages based on their previous experiences, beliefs, cultural values, perceived risks, and anticipated outcomes [4,5]. Consequently, health promotion programs based on the HBM aim to modify these perceptions through education, counselling, behavioural reinforcement, and supportive environmental interventions.

Although several newer behavioural theories have emerged over the past four decades, including the theory of planned behaviour, the transtheoretical model, and the COM-B framework, the health belief model continues to be one of the most widely used theoretical frameworks because of its simplicity, practical applicability, and extensive empirical support [4,5]. Its constructs have been validated across numerous health conditions and population groups, making it particularly valuable for designing evidence-based interventions in oral health promotion and preventive dentistry.

4. Core Constructs Of The Health Belief Model

The HBM posits that health-related behaviour is determined by individuals' perceptions and beliefs about disease prevention and health promotion. Initially, the model comprised four constructs—perceived susceptibility, perceived severity, perceived benefits, and perceived barriers—explaining preventive health behaviours[8,9]. Dumitrescu AL. et al later added cues to action and self-efficacy to explain behavioural changes [12]. These six constructs guide decision-making and are applied in oral health promotion and disease prevention research [4,5].

Perceived Susceptibility

Perceived susceptibility is an individual's subjective belief about the likelihood of developing a disease or condition [8,9]. This construct emphasizes personal rather than objective clinical risk perception, which influences preventive behavior. Individuals who feel vulnerable are more motivated to adopt preventive measures than those at low risk. Perceived susceptibility motivates hygiene and healthier behaviours. People who believe poor toothbrushing and frequent sugar consumption increase the risk of dental caries are more likely to brush regularly, use fluoridated toothpaste, and reduce sugary intake. Educational interventions strengthen perceived susceptibility by informing patients about risk factors and oral conditions [13–16].

Perceived Severity

Perceived severity is the belief in a disease's seriousness and consequences [8,9]. People are likely to adopt preventive behaviours when they understand these risks, but severity alone is insufficient without also perceiving susceptibility. In dentistry, it shapes awareness of the consequences of untreated oral disease. Studies show that enhancing perceived severity improves hygiene behaviour and utilisation of preventive services[14,16].

Perceived Benefits

Perceived benefits are beliefs that behaviours reduce risk or improve outcomes [8,9]. In preventive dentistry, they include beliefs that tooth brushing prevents dental caries and that tobacco cessation lowers oral cancer and periodontal disease risk. Studies report that strengthening perceived benefits improves oral hygiene and dental attendance [13–16].

Perceived Barriers

Among HBM constructs, perceived barriers predict health behaviour because they influence willingness to undertake preventive action [8,9].They reflect an individual's assessment of obstacles to recommended behaviour. In dentistry, barriers include anxiety, fear of pain, treatment costs, limited time, inadequate access, transportation difficulties, misconceptions about oral diseases, and low oral health literacy. Oral health promotion programmes, therefore, focus on education and reducing barriers through communication, counselling, affordable services, and supportive healthcare environments [13–17].

Cues to Action

Recognizing that favourable health beliefs do not always lead to behavioural change, Rosenstock and colleagues introduced cues to action, internal or external events that stimulate preventive health behaviours[10]. Internal cues include symptoms such as toothache, gingival bleeding, tooth sensitivity, oral ulcers, and halitosis that motivate dental care. External cues include advice from dentists and physicians, school oral health programs, community campaigns, family encouragement, media messages, appointment reminders, and educational materials. Digital technologies have increased the importance of cues to action, as mobile reminders, smartphone applications, tele-dentistry, and electronic recall systems now reinforce preventive oral healthcare and improve adherence [18].

Self-Efficacy

Self-efficacy, added to the Health Belief Model following Bandura's theory, is confidence in performing health behaviour despite obstacles [10–12]. Unlike perceived benefits, it reflects capability. In oral health, it influences brushing, flossing, dietary change, tobacco cessation, dental attendance, and treatment adherence. Educational interventions improve self-efficacy through skill training and feedback. Stronger self-efficacy improves sustained oral hygiene behaviour and long-term preventive dental care adherence [11–18].

5. APPLICATIONS OF THE HEALTH BELIEF MODEL IN ORAL HEALTH PROMOTION AND PREVENTIVE DENTISTRY

The HBM is widely used in oral health promotion because prevention and control of oral diseases depend on individual behaviours. Unlike acute conditions, dental caries, periodontal diseases, oral cancer, dental erosion, and other oral conditions are linked to lifestyle practices, making behavioural modification essential in dentistry [1–5]. The HBM explains beliefs and perceptions influencing oral health decisions and supports behaviour-change interventions. It has been applied in school and community programs, tobacco cessation counselling, periodontal maintenance, orthodontic care, and preventive dental services [13–18], including oral hygiene promotion among children and adolescents. Several studies show that HBM-based educational programmes improve oral health behaviours more than conventional education. Sanaeinasab et al. found that schoolchildren receiving an HBM-based intervention improved oral health knowledge, toothbrushing frequency, self-efficacy, and plaque control compared with routine education [15]. Reviews likewise conclude that theory-based programmes are more effective than traditional approaches because they target behavioural determinants, not only knowledge. These findings support the use of behavioural theories in oral health programmes and the improvement of pregnant women's oral health by addressing misconceptions, emphasising preventive care, and reducing perceived barriers through counselling and reassurance [16].

6. STRENGTHS AND LIMITATIONS OF THE HEALTH BELIEF MODEL

For over seventy years, HBM has remained a key framework in health promotion and disease prevention. Its clarity allows professionals, educators, and researchers to apply it across various settings. The HBM's six constructs provide a structure for identifying cognitive factors that shape health behaviour and for designing interventions that address barriers to change. Unlike many behavioural theories, the HBM translates into practical educational approaches, making it useful for oral health initiatives, school health education, tobacco cessation, and preventive dentistry. The model is flexible across populations and health issues, explaining behaviours related to oral hygiene, dental visits, vaccination, diabetes management, cancer screening, and medication compliance. It has informed interventions for children, pregnant women, older adults, and people with chronic illnesses. Despite these advantages, the Health Belief Model has limitations. It emphasises individual cognitive perceptions and presumes choices result from a rational assessment of risks and benefits. However, health behaviour is also shaped by emotional, social, cultural, environmental, and economic influences that the HBM does not sufficiently address. Thus, cognitive-only interventions may not achieve behavioural change without considering social determinants. Another drawback is its limited ability to predict habitual behaviours. Health habits may bypass conscious evaluation, and the HBM's predictive ability varies across studies and populations.

7. FUTURE PERSPECTIVES

Behavioural science continues to evolve with advances in healthcare technology, creating opportunities to expand the Health Belief Model in oral health promotion. Digital technologies, including mobile health applications, tele-dentistry, electronic health records, and artificial intelligence (AI)-based decision-support systems, have transformed the delivery of preventive oral healthcare. These innovations can strengthen HBM constructs through personalised education, behavioural reinforcement, reminders, and real-time feedback, improving engagement and adherence to recommendations[18]. AI and machine learning may enhance HBM-based interventions by identifying behavioural risk profiles and delivering

customised messages based on patients' beliefs, oral health status, and patterns. Smartphone applications can monitor tooth-brushing frequency, dietary habits, and appointment attendance, serving as cues to action and improving self-efficacy through reinforcement. Future research should integrate the HBM with broader behavioural and socioecological frameworks, and longitudinal studies and randomised controlled trials should evaluate long-term effectiveness across populations and settings. Greater emphasis should be placed on addressing oral health inequalities through community-based and primary healthcare programmes, particularly in low- and middle-income countries where oral disease burdens remain high [1,2].

CONCLUSION

The Health Belief Model remains an influential theory in health promotion and preventive healthcare. Since its introduction over seven decades ago, it has explained cognitive factors affecting preventive health behaviours and guided evidence-based education programmes. In dentistry, the HBM has promoted oral hygiene, preventive dental service use, tobacco cessation, periodontal maintenance, and adherence to oral healthcare recommendations among diverse groups [13–18]. The six constructs—perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy—help explain preventive oral health behaviours. However, oral health practices are also shaped by social, cultural, economic, and environmental determinants. Integrating the HBM with complementary theories and digital health technologies may improve effectiveness, long-term outcomes [10–12]and access.

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