ORAL HEALTH BEHAVIOR CHANGE FRAMEWORK IN PRESCHOOLERS: SYSTEMATIC REVIEW

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Abstract

BACKGROUND: Pre-school children have difficulty maintaining oral health. Studies show that preschoolers' dental and oral health depends on the attitudes and behavior of their parents towards dental and oral health. This systematic review aims to identify and analyze the framework through the Health Belief Model (HBM) approach and the Theory of Planned Behavior (TPB) for behavioral changes to maintain oral health in pre-school children.

METHOD: This systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement. The literature search was carried out on the ScienceDirect, Google Scholar, Proquest, Pubmed, and Wiley Online Library databases, with a publication period between 2010 and 2021.

RESULTS: All studies (n = 10) were conducted on preschooler oral-health and focused on parents' involvement. Five studies used theory of planned behavior framework, and five studies remaining used the health belief model. All studies confirmed a prominent means in preschoolers oral-health rely on the knowledge, attitude, practice, and beliefs of parents.

CONCLUSIONS: Both the Health Belief Model and the Theory of Planned Behavior can help improve behavior change in pre-school children in maintaining oral health.

KEYWORDS: **Health Belief Model, Theory of Planned Behavior, Oral Health, Pre-school**

Introduction

The resolution of the World Health Assembly in 2000 was in sync with World Health Organization (WHO's) priorities on the Global Oral Health Programme, consisting of techniques, approaches for preventing dental disease, and promoting health [1,2]. It is an urgent need for public health against the threat of non-communicable diseases and the formulation of strategies for disease prevention and control using a practical approach [3,4]. Empowering behavior change is better than simply informing individuals, communities, and populations. Individuals are obliged to take greater responsibility for health care and maintenance and adopt healthy behaviors [4].

Regarding the factors of healthy behavior, people are still not aware that oral and dental health behavior is only 2.8% in the five-year age group [5]. Oral and dental health behavior dramatically influences the occurrence of dental disease, where children aged five years have the highest incidence of dental disease, 93% [6]. Therefore, improving oral and dental health behavior is highly recommended to prevent dental and oral diseases in children [7].

Oral health is defined as "free from chronic oral and facial pain, oral and throat cancer, thrush, congenital disabilities such as cleft lip and palate, periodontal (gum) disease, tooth decay, and tooth loss, and other diseases and disorders [8]. It affects the oral cavity. The impact of oral health on general health and quality of life is significant because some common infections are caused by the direct effect of untreated oral health problems [9].

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Poor oral health has a substantial impact on many aspects of general health. It is associated with social and environmental behavioral factors that can contribute to poor nutrition, missed work and school hours, pain and suffering, and increased health care costs [10].

Poor oral health can lead to infectious diseases and other degenerative diseases. Therefore, an effective method is needed to improve dental and oral health [11]. In high-income countries, oral health disease is a significant public health problem and is a growing concern in low- and middle-income countries (LMIC) [12]. Therefore, the World Health Organization (WHO) has adopted a strategy of prevention and promotion of oral health needs and has been working to increase awareness of oral health worldwide as an essential component of public health and quality of life in the Global Oral Health Programme [13]. Dental health education can be delivered to a broad group of people through dentistry in schools, workplaces, daycare centers, and nursing homes [14]. Health education for parents is essential because of their role in the care of their children [15].

Preschool children have difficulty in maintaining oral health. Various interventions have been designed and evaluated. However, the effectiveness of the intervention depends on the continuity and intensity of the meeting or session [16]. To support oral health promotion methods, experts seek to explore the use of various health education media and health promotion intervention models for preschool children [17]. Therefore, the acceleration of the learning process is influenced by game-based interventions by increasing the willingness to maintain the required oral health. These findings have led to the development of oral health promotion models for preschool children and intervention tools [18].

Studies show that preschoolers' dental and oral health depends on the attitudes and behavior of their parents towards dental and oral health. In particular, children are more likely to have better dental health behaviors and outcomes if their mothers have positive attitudes toward oral health [19–21].

This systematic review aims to identify and analyze the framework through the Health Belief Model (HBM) approach and the Theory of Planned Behavior (TPB) for behavioral changes to maintain oral health in pre-school children. This study examines articles that have been published in the period 2015 to 2021.

Methods

Review Protocol

This systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement. Through this study, the authors try to develop a framework for behavioral change in oral health in pre-school children based on the results of previously published studies.

Searching strategies

Relevant articles were searched and collected using Sciencedirect, Google Scholar, Proquest, Pubmed, and Wiley Online Library, with a publication period between 2015 to 2021. The author adjusted the search keywords according to the Mesh terms for health studies. The keywords used vary, depending on the search engine used. In general, keywords focus on the 'Health Belief Model' OR 'Theory of Planned Behavior' OR 'Intervention Model' OR 'Parental' OR 'Behavior' OR 'Behavioral change' OR 'Behavioral improvement' OR empower* AND 'Oral Health' OR 'Oral Hygiene' AND 'Child' OR 'Children' OR 'Preschooler.'

Inclusion and Exclusion Criteria

Inclusion criteria consist of intervention studies, programs, training, or educational strategies to support changes in children's behavior in maintaining oral health. It also includes analyzing the effectiveness of the intervention by measuring changes in children's knowledge, attitudes, perceptions, or practices in maintaining oral health, focusing on the parent, the child, or both. The search strategy focuses on databases and publications in English and Indonesian. Articles were excluded or not reviewed if they only discussed the prevalence of oral health disorders and did not refer to intervention strategies or health promotion.

Data extraction and analysis

Titles and abstracts are screened on each database. Screening for duplicate articles is carried out using the Mendeley application. Substantive information is extracted from each study into a Microsoft Word table.

The author determined the selection of papers after being reviewed from 10 full-text articles that adjusted to the inclusion and exclusion criteria. Data extraction was carried out with care. The interpretations are presented in the table by taking the critical parts of the article.

Study quality

Overall articles were assessed using the National Institutes of Health **(**NIH) study quality assessment tool for observational cohort and cross-sectional studies and intervention studies using the National Institutes of Health (NIH) quality assessment of controlled intervention studies. A developed scoring sheet conducts to assess the research methodology and adherence to the scoring criteria for each article that met the inclusion criteria of this study. Articles with scores <30% of the standards were classified as "poor" scores between 30 and 70% were classified as "moderate" and scores >70% were classified as "good" study quality. The articles taken are classified as "moderate" and "good."

Results

The search returned 11,504 articles. after removing the duplicated articles, 3,041 articles remained, removing 8,463 pieces after screening titles and abstracts. The remaining 26 papers were reviewed and checked for eligibility, so 16 articles were excluded. The final results were as many as ten articles that met the inclusion criteria.

Table 1. Characteristics of studies that match the inclusion criteria

Author, Title, Year	Country	Sample	Outcome	Framework	Evaluation Methods	Result
Soltani et al, 2018. Determinants of Oral Health Behavior among Preschool Children: Application of the Theory of Planned Behavior [22]	Iran	833 mother-child pairs	Oral Health Behavior	Theory of Planned Behavior	Questionnaire: the child's tooth brushing frequency, the frequency of child's tooth brushing assisted by parent.	There is positive relationship between all TPB structures and children's oral health behavior.
Adiatman et al., 2017. The Correlation between Mothers' Behaviors of Maintaining Their Children's Oral Hygiene and Early Childhood Caries (Based on the Theory of Planned Behavior) [23]	Indonesia	295 pairs of mothers and children	the relation between mothers' dental and oral health behaviors and Early Childhood Caries (ECC) in children.	Theory of Planned Behavior	Questionnaire Interview, and intra-oral examination of the children	There was no correlation between mothers' behaviors of maintaining their children's oral hygiene and ECC.
Clarke & Ridley, 2018. Parental Attitudes and Beliefs About Preschooler Preventive Oral Health Behaviors: Implications for Health Promotion [24]	United States	192 parents/ guardians of Black, preschool children (ages 3–5)	Parental attitudes, beliefs, and behaviors about caries preventive behaviors among their Black preschool children.	Theory of Planned Behavior	The oral health questionnaire contained 114 questions, and included The International Collaborative Study on Child Dental Health Questionnaire to Parents (CDHQ) containing 100 questions [19], and The Child Nutrition Questionnaire (CNQ) containing 14 questions.	Parental attitudes and beliefs, including intentions, about children's oral health were associated with oral health behaviors.

Author, Title, Year	Country	Sample	Outcome	Framework	Evaluation Methods	Result
Gharlipour et al., 2016. Factors Affecting Oral-Dental Health in Children in the Viewpoints of Mothers Referred to the Health Centers in Qom City: Using the Health Belief Model [25]	Iran	300 mothers who had health records for their children and referred to the Qom health centers	Mothers' behavior, child behavior	Health Belief Model	Questionnaire related to the Health Belief Model	There was a positive and significant relationship between the mothers' behavior towards oral-dental health with perceived benefits and self-efficacy.
Hiratsuka et al., 2019. Oral health beliefs and oral hygiene behaviours among parents of urban Alaska Native children [26]	USA	100 Parents/caregiver of children 71 months	Tooth-brushing frequency	Health Belief Model	The Oral Health Belief Questionnaire contains 18 items, 9 of which were used in the composite survey, which measure dimensions of the health belief model grouped into 5 oral health belief scales	Parental tooth-brush-ing had a strong positive association with the belief that oral health is as important as physical health.
Hossein, B.M.M, et al., 2015. Evaluation of oral hygiene care of under 4 years old children by their mothers based on the Health Belief Model [27]	Iran	200 mothers with children under 4years	Oral health care status of children under 4 by their mother	Health Belief model	Questionnaire with 42 questions about 8 constructs of HBM (knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barrier, self - efficacy, cues to action and preventive behavior)	There is significant relationship with the oral and dental health behaviors of children by their mothers.
Wilson et al., 2018. Validity of Measures Assessing Oral Health Beliefs of American Indian Parents [28]	USA	1016 parent-child dyads	Measurement of EHBM constructs in relation to the influence of parents' beliefs on the oral health outcomes of their children.	Health Belief Model	Basic Research Factors Questionnaire (BRFQ)	Questionnaire items assessing the EHBM theoretical constructs are reliable and valid as measures of key parental beliefs influencing children's oral-health outcomes in an AI population

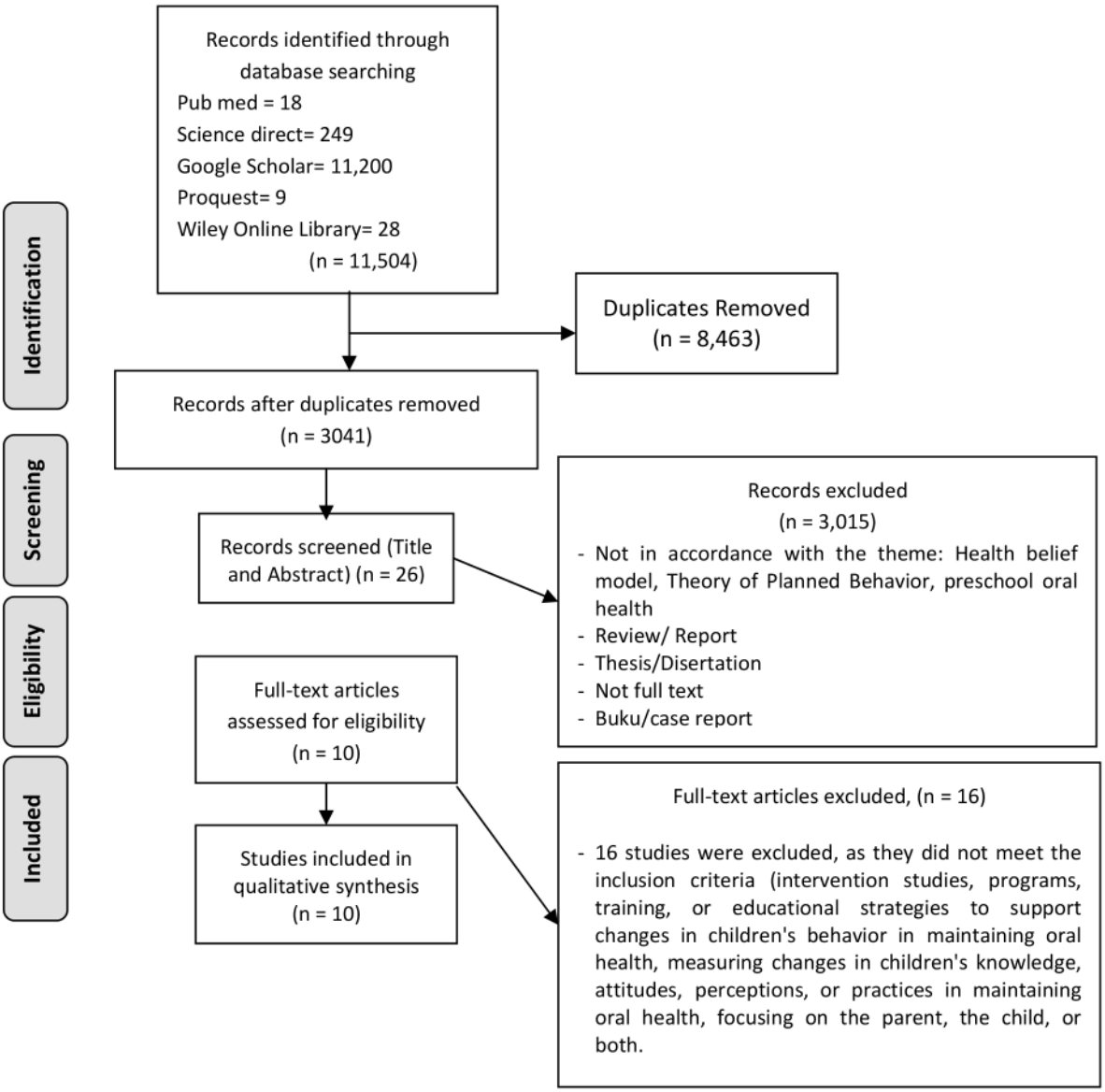
Author, Title, Year	Country	Sample	Outcome	Framework	Evaluation Methods	Result
Wilson et al., 2016. Validation and Impact of Caregivers' Oral Health Knowledge and Behavior on Children's Oral Health Status [29]	USA	992 American Indian/ Alaska Native caregivers with a child aged three to five years	oral health knowledge and behavior	Health Belief Model	The Basic Research Factors Questionnaire (BRFQ)	Caregiver oral health knowledge was significantly associated with education, income, oral health behavior, and all but one of the oral health attitude measures.
Elyasi et al., 2020. Modeling the Theory of Planned Behaviour to predict adherence to preventive dental visits in preschool children [30]	Canada	370 participants	dental attendance behavior in preschoolers	Theory of Planned Behavior	24-item validated questionnaire based on Azjen's Theory of Planned Behaviour (TPB) constructs adopted to examine parental attitudes (8 items), subjective norms (10 items), PBC (5 items), and intention (1 item) towards their preschoolers' dental attendance	Parent's SOC significantly predicted TPB components and dental attendance.
Makvandi et al., 2015. Evaluation of an Oral Health Intervention among Mothers of Young Children: A Clustered Randomized Trial [31]	Iran	90 mothers of 1-2 year old children	Mothers behavior of teeth cleaning of children aged 1-2 years	Theory of Planned Behavior	Questionnaire and interview	TPB intervention among mothers of 1-2 years old children may be effective in improve the cleaning of children's teeth and related cognitions.

Study Characteristics

Most of the literature included is quantitative with a cross-sectional approach [22–27,30], and randomized trial [29,31], with quality assessment scores for ten studies that met the criteria. Inclusion ranges from moderate to good. A total of 4,388 participants were sampled across the studies included in this review. Included articles were published from 2015 to 2020 and were conducted in 4 countries located in the USA (n = 4), Iran (n = 4), Canada (n = 1), and Indonesia (n = 1). Oral health behavior was the most common outcome in the included studies found in five studies [22,23,25,28,29]. Parental attitudes, beliefs, and behaviors [24], toothbrushing frequency [26], dental attendance [30], parents belief [28], and mother behavior [31] as other outcomes. In general, based on the framework of the studies included in this study, it consists of two theories, namely the Health Belief Model used in 5 studies [25–29], and five studies using the Theory of Planned Behavior model [22–24,30,31].

Health Belief Model Framework for Changes in Children's Oral Health

The use of the Health Belief Model (HBM) framework in the application of the study is mainly related to the respondent's behavioral assessment instrument based on question items related to the dimensions of the HBM model.



Gharlipour and his team conducted several questions arranged based on dimensions in the Health Belief Model (HBM), ranging from awareness of the health status of children's teeth and mouth with the example of the question "What are the signs of dental caries?", perceptions of vulnerability to the possibility of suffering from dental and oral diseases sample question "In my opinion, tooth decay happens more in old age and my child will not suffer tooth decay." of my child.", the perceived benefits for dental and oral health by brushing and flossing with the example of the question "I think, if my child brushes his teeth at least two times a day, can prevent tooth decay.", perceived barriers for oral health such as flossing and brushing teeth with the example of the question "In my opinion, bleeding from gums causes that my child escapes from brushing.", perceived self-efficacy for oral-dental health such as flossing and brushing with the example question "I am sure my child can properly floss his/her teeth" [25].

Hiratsuka, in his study, used The Oral Health Belief Questionnaire instrument that measured the dimensions of the Health Belief Model (HBM), including perceived seriousness, the benefit of preventive practices, benefits of plaque control, the efficacy of dentists, and perceived importance [26]. While in the study conducted by Moghadam and colleagues involved eight items from HBM, including knowledge,

perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, cues to action, and preventive behavior [27].

In two different years, Wilson carried out research that focused on children's dental health using the HBM approach. In 2016, Wilson and colleagues used sixteen items to measure four key constructs of the Health Belief Model (HBM). These fundamental constructions include perceived vulnerability (carers' perception that their children are prone to cavities), seriousness (the degree to which caregivers believe oral health problems are serious), benefits, and barriers to engaging in recommended oral health behaviors [29]. Whereas his 2018 study used the Extended HBM (EHBM), sixteen items measured four primary constructs of the main Health Belief Model (HBM): perceived vulnerability, perceived severity, perceived benefit, and perceived inhibition [28].

The Theory of Planned Behavior Framework in Efforts to Change Children's Oral Health

A total of five studies included in this literature review used the Theory of Planned Behavior (TPB) approach to looking at the behavior of maintaining oral health by parents and children themselves. Based on the TPB concept, that intentions determine a person's behavior. This intention is reinforced by the individual's attitude towards behavior, subjective norms, and perceived behavioral control.

In their study on the determination of oral health behavior in children, Soltani and colleagues used Theory of Planned Behavior based questions that discussed maternal attitudes, subjective norms, perceived behavioral control, and intentions towards children's dental and oral health behavior [22]. Meanwhile, Adiatman and his team developed a TPB-based questionnaire focusing on children's oral and dental hygiene habits [23]. Clarke and Ridley used the Theory of Planned Behavior (TPB) to analyze attitudes, beliefs, parenting efficacy, and intention items related to caries prevention behavior. Theory of Planned Behavior (TPB) asserts a relationship between individual views, attitudes, intentions, perceived control over behavior, and actual possession. Some of the questions use the Theory of Planned Behavior (TPB) approach. Those questions samples include "I don't know how to brush my child's teeth properly," "if we brush our child's teeth twice a day, we can prevent our child getting tooth decay in the future," "I can control my child getting tooth decay," and "preventing tooth decay is the dentist responsibility" [24].

Elyasi and his team adopted Theory of Planned Behavior (TPB) to prepare their research instrument, which aims to examine parental attitudes, subjective norms, Perceived Behavioral Control (PBC), and intentions towards the presence of preschool children in dental examinations [30]. The intervention study conducted by Makvandi and colleagues used a questionnaire focusing on TPB-based questions covering attitudes, perceived behavioral control, intentions, knowledge, children's teeth cleaning, and demographic questions. Theory of Planned Behavior (TPB) of cognition (i.e., attitudes, perceived behavioral control, and) intentions) was measured indirectly (i.e., belief-based) [31].

DISCUSSION

This systematic study focuses on developing a framework for behavioral change to maintain oral health in preschool children through an in-depth review of published and peer-reviewed literature. The theme of the literature is the implementation of the Health Belief Model approach and the Theory of Planned Behavior. Overall, the articles included in this study and have met the inclusion criteria are ten articles from several countries globally.

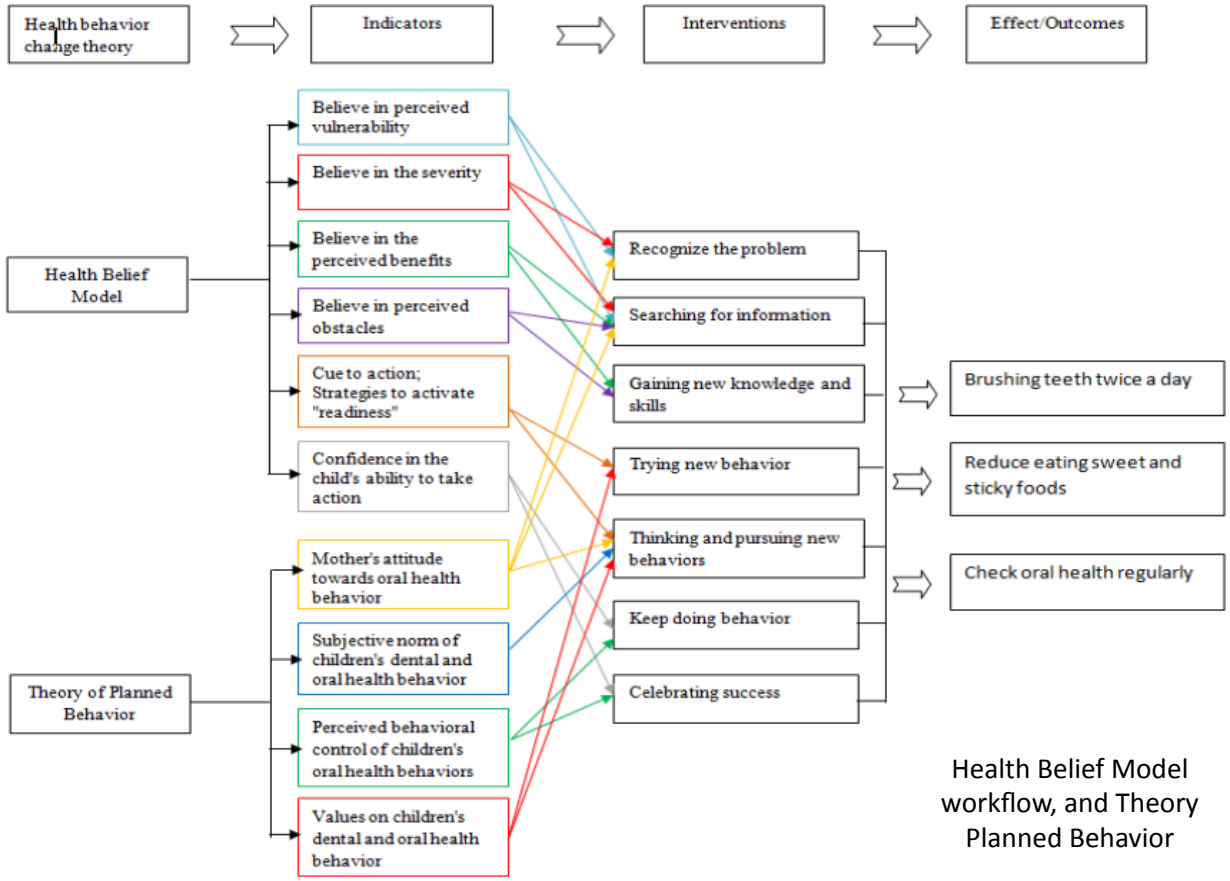
There are five articles in each of the approaches used for the Health Belief Model (HBM) and Theory Planned Behavior (TPB). Overall, the instrument's preparation utilizing this model in the ten articles included is identical. In the Health Belief Model (HBM), all articles compose questions based on the guidelines for HBM, even though the questions or statements that are compiled or developed are not the same in format. Still, the dimensions of the items displayed represent the primary form of the HBM. The questions or statements compiled in each article generally include awareness of the dental and oral health status of children, perceptions of vulnerability to the possibility of suffering from dental and oral diseases, perceived severity of worsening dental and oral health problems, perceived benefits for dental and oral health by brushing and flossing, perceived barriers to oral-dental health such as flossing and brushing

teeth, perceived self-efficacy for oral-dental health such as flossing and brushing teeth [25]. These questions or statements are briefly included in the HBM dimension, as other researchers implement the same approach (HBM). These dimensions know perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, cues to action, and preventive behavior [27].

The HBM is one of the essential models that shows the relationship between health beliefs and behavior and is based on the assumption that preventive action is a person's belief in health [32]. Health Belief Model (HBM) is used for various health problems, including cervical cancer, osteoporosis, diabetes treatment, dental health, dental plaque control. This model focuses on motivation, past experiences, and a general focus on fluctuations in beliefs and can describe long-term and short-term health behaviors [33],[34].

The study that uses the Theory of Planned Behavior approach, as a whole, compiles question or statement items that focus on attitudes towards prevention, change control, external control, desire to brush children's teeth, desire to control children's sugar consumption, parental efficacy to touch children's teeth [24]. TPB is used to analyze attitudes, beliefs, parental effectiveness, and desired items related to caries prevention behavior. The TPB theory states that there is a relationship between individual views, attitudes, intentions, perceived control over behavior, and actual control over behavior. The theory assumes that people are involved in rational and cognitive-based decision-making processes. In this Clarke & Ridley study, control beliefs (external control and opportunity control), normative beliefs (perceptions of the seriousness of decay), attitudes towards behavior (prevention attitudes), intentions (importance and intention to brush children's teeth and interests and preferences to control snack sugar).

Based on the results of the study of the relevant literature, it can be described a framework that represents the pattern of implementation or implementation of the HBM and TPB approaches as follows:



Health Belief Model workflow, and Theory Planned Behavior

Some of the limitations mentioned include the accessibility of relevant articles in the database, which the author cannot do, besides the use of language, which the author limits to articles in English or Indonesian only. The number of pieces included in this study did not meet the requirements for a meta-analysis.

CONCLUSION

Both the Health Belief Model and the Theory of Planned Behavior can help improve behavior change in preschool children in maintaining oral health. Through HBM, parents can find support to set the best example for their children performing oral health care. Also, using the Theory of Planned Behavior approach increases parents' attitudes and beliefs, including intentions, about children's oral health and can ultimately improve oral health behavior.

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