

REVIEW ARTICLE

Association of Parental Knowledge, Attitude, and Practice of Oral Health With Early Childhood Caries Among Preschool Children: A Systematic Review

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ABSTRACT

Early childhood caries (ECC) is a serious public health problem in both developing and developed countries. Given that children mainly depend on their parents for their day-to-day activities, it is important to investigate the extent of parental influence on the oral health of their children. The objective of this study is to review the association of parental knowledge, attitude, and practice of oral health with ECC among preschool children. PubMed, Medline, and Google scholar were used to search for related articles published within the past 10 years. All of the studies that investigated parental oral health practice have shown association with the development of dental caries. However, there were discrepancies in the outcome of studies that examined the association of parental knowledge and attitude with ECC. More investigations on parental knowledge and attitude are needed to clarify their association with ECC.

Keywords: Parental knowledge, Parental attitude, Parental practice, Oral health, Early childhood caries

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INTRODUCTION

Children first learn the principles of oral hygiene from their family. During the first three years of children's life, parents play the most important role to ensure their oral health (1) by instilling the habit of tooth brushing (2). Even though the status of oral health has significantly improved among preschool children in developed countries, dental caries still exists and it affects quite a number of children around the world (3). Studies have shown that oral and dental problems including tooth decay, trauma, and injury to the teeth are high among preschool children (4–7). In addition, these problems affect children from low-SES households more than children from higher SES groups due to their lack of access to the necessary health facilities (8,9). Children with poor oral health are also more likely to experience low quality of life, stunting, weight loss, poor self-esteem, and poor academic performance (10).

Early childhood caries (ECC) can be defined as caries incident in children less than 6 years of age in the form of either decayed, missing or filled tooth surfaces in any of their deciduous tooth (11). It is a serious public health problem in both developed and developing countries

(12). However, caries prevalence among preschool children varies greatly in different countries. A review of ECC prevalence in different regions of the world showed that the figures can range from 16% to 89% (13). Additionally, the median prevalence was highest in the Middle East region (76%, IQR: 72.5%, 82.5%) followed by Asia (48.3%, IQR: 32%, 52%), and it was observed to be the least (20.7% - 24.9%) in developed countries (13).

To date, the majority of studies and reviews on children oral hygiene mainly focused on the sociodemographic, socioeconomic, education and/or oral health practice of the parents or caregivers (14,15). In reality, these factors do not necessarily equate to the awareness and positive attitude of the parents with regard to the oral health of their children. Instead the oral health of children is affected by their parent's dental knowledge, attitudes, and perception (16). Likewise, parent's oral health behavior and lifestyle are also linked to the oral health of their children (16). Parental influence therefore is of utmost importance among the preschool children given their inability to fully grasp the concept of oral hygiene and the lack of mastery in using the toothbrush. However, this area of study is not well understood, and to date, clearly undervalued.

The main purpose of this review is to identify studies that investigated the association between parental knowledge, attitude and practice of oral health with

ECC within the last 10 years.

MATERIALS AND METHODS

Literature search was conducted using electronic databases such as PubMed, Medline, and Google Scholar where only articles from the last 10 years were considered. Keywords used for this review were related to the oral health of children (i.e. Dental Caries/ Dental Decay / dental caries / dental AND caries, AND early childhood caries Preschool/ child /children /Preschool Child / Preschool Children) AND to the parental knowledge, attitude and practice (parent/parental attitude, parent/parental perspective, parent/ parental knowledge, parent/parental beliefs, parent/parental practice, maternal, parental, caregiver, parental Risk Factor AND Oral Health Knowledge, Attitudes, Practice/ Oral Health Knowledge, Attitudes, Practice/knowledge/ attitude/ attitudes/ behavior/ behaviors). Studies were also identified through reference-list checking of other reviews on relatable topics (e.g. children’s oral health, ECC).

Study selection

The articles selected in this review were based on the inclusion criteria that included studies i) conducted among preschool children (2-6 years old), ii) had parents (mother or father) or caregivers involvement iii) published in English, iv) published from 2010 up to 2019, v) available in full-text, and vi) included the association of ECC prevalence with the caregiver’s knowledge, attitude and practice of the oral health (at least one association).

Systematic searching was conducted and documented using a Reference Manager application (i.e. Mendeley) by the first author. The first author was also responsible for screening the title, abstract and full text articles against the inclusion and exclusion criteria. Articles included in the review were then reviewed and verified once again by the other authors.

Search Outcome

The systematic searching and screening were reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (17). Figure 1 illustrates the flow diagram for the study selection. The search from the PubMed, Medline and Google Scholar database yielded a total of 123 studies and seven were added through manual searching in reference lists of relevant articles, totaling up to 130 studies. Of these, 71 studies were duplicates and excluded during the title screening process. During screening of the abstracts, 35 more articles were excluded for failing to meet one or more inclusion criteria. A total of 24 studies met our eligibility criteria, however only 12 were included in the review. The other 12 articles were not included due to the absence of ECC data (e.g. prevalence, incidence, and gender ratio) in the reports.

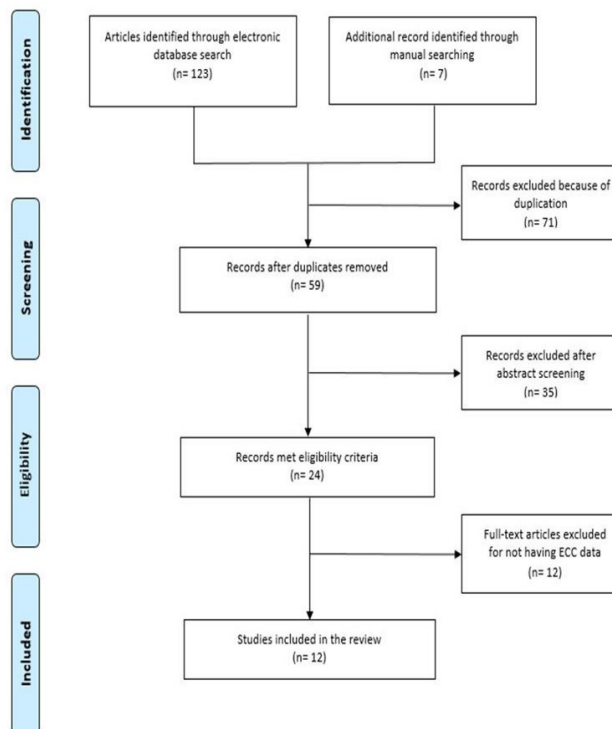


Figure 1: Flow diagram of selection process

Data extraction and methodological quality assessment

The extracted studies were summarized into i) authors, ii) publication year, iii) study objectives, iv) study setting and participant, v) study instruments and vi) outcome variables (Table I). Additionally, information on knowledge, attitude, and practice of parents in relation to their children dental health is presented on Table II. The ECC diagnosis or the DMFT caries index was determined in accordance with the WHO guidelines and the International Caries Detection and Assessment System (ICDAS). Moreover, the methodological quality for the studies was assessed and appraised using an instrument adapted from previous systematic reviews (18,19). Table III outlined the results of this assessment.

RESULTS

Characteristics of the included study

Most of the studies included in this review were conducted in the Asian continent where two (n=2) were from China (20,21), two (n =2) were from India (1,22), and one (n=1) was from Japan (23). Two (n=2) studies were from Europe (24,25) while one study each from Africa (26) and United States (27). The rest of the studies (n=3) were from the middle eastern region such as Iran, Egypt, and Qatar (15,28,29).

The total number of respondents who participated in the studies included in the review were 5364 parent-child pairs with the number of participants per study range from 100 (30) to 862 (25). Most of the studies selected (n=9) followed cross-sectional study design and two studies used case-control study design (1,22) while one

Table I: Characteristics of included studies

-Author citations -Country -Study design -Sample size	Study objectives	Setting and participants	Study instruments, tools, and investigations	Outcome variables
-Wigen & Wang (2010) -Norway -Cross-sectional -523 children -523 parents	To assess the caries status of 5-year-olds in a low caries area, and study associations between dental caries and parent-related factors	5-year-olds	-Clinical and radiographic oral examination -Questionnaire	Parents' dental behaviors and attitude prevalence of Enamel and dentine caries
-Agarwal et al. (2011) -India -Case-control -150 children -150 mother	To identify the association between maternal risk factors and early childhood caries among	primary schools of 3- to 5-year-old	-Questionnaire -Mothers and children dental examination	Maternal oral health practice
-Bozorgmehr et al. (2013) -Iran -Cross-sectional -222 children -222 parents	To evaluate the relationship between oral health behavior of parents and oral health status and behavior of their children	5 years old	-Questionnaire -Dental examination	Oral health behaviors of children and their parents
-Hamila (2014) -Egypt -Cross-sectional -560 children -560 mothers	To assess prevalence of dental caries and identify some of risk factors among a sample of 1- 3.5 years old	Maternal and child health care and vaccination centers 1-3.5	-Questionnaire -Intraoral examinations	Prevalence of ECC, dmft maternal attitude and
-Jibieke Wulaerhan et al. (2014) -China -Cross-sectional -670 children -670 parents	To gain a greater epidemiological understanding of the associations between ECC prevalence and relevant socioeconomic, behavioral, and parental conditions	-pre-school-based 3 to 5 years old	-Questionnaire -dmft" index to assess dental caries	Dental caries prevalence parent- or caregiver-reported feeding and oral health- related habits, parental dental knowledge
-Sun et al. (2014) -China -Cross-sectional -392 children -392 parents/grandparents	To analyze factors associated with the susceptibility of early childhood caries (ECC)	-Kindergartens -2-6 years	-Questionnaire -Dental examination	prevalence of deciduous caries Oral health knowledge/attitudes
-Folayan et al. (2015) -Nigeria -Cross-sectional -497 children -497 parents	To determine the prevalence and ECC risk indicators in a suburban population	-Household survey -6 months to 71 months old	-Questionnaire -Dental examination	Maternal knowledge ECC prevalence
-Dabawala et al. (2017) -India -Case-control -422 children -422 parents	To study the type of parenting style and oral health practices as risk factors among children with ECC	-kindergarten schools -3 and 5 years of age	-Questionnaire -Examine the child for the presence of dental caries	oral health practices such as oral hygiene methods, feeding habits, daily sugar intake
-Tusek et al. (2017) -Serbia -Cross-sectional -862 children -862 parents	To determine its prevalence in preschoolers and to define the risk factors that affect the prevalence of this disease	-13- 71 months	-Questionnaire -Dental examination	Dental caries prevalence Parent knowledge and practice
-Alkhtib & Morawala (2018) -Qatar -Cross-sectional -315 children -315 mothers	To assess the knowledge, attitude, and related practices of mothers of preschool children about oral health in Qatar	-Government kindergarten -3-4 years	-Questionnaire -Dental examination	- dmft caries index - mothers' oral health knowledge and practices
-Tiwari et al. (2018) -USA -Cross-sectional -100 children -100 mothers	To describe maternal psychosocial, behavioral, and acculturation factors associated with early childhood caries in	-Dental Center at Children's Hospital Colorado < 6years old	-Questionnaire -oral examination to measure decayed, missing, filled, surfaces	Maternal Knowledge Health belief model of the oral health
-Nishide et al. (2018) -Japan -Retrospective cohort -566 children -566 mothers	To identify protective and risk factors associated with ECC	-Community health center -18month and 3years old	-Oral examinations -Questionnaire	Dental caries parental oral health habits

Table II: Scope of included studies

Author citations	Prevalence ECC	ECC by gender	Knowledge	Attitude	Practice	Factors associated with ECC
Wigen & Wang (2010)	34%	x	x	√	√	- Poor practice and dentine caries (d3-5mft > 0) (OR= 2.2, 95% CI= 1.0-4.6, p= 0.04) - Poor attitude and dentine caries (d3-5mft > 0) (OR= 2.8, 95% CI= 1.1-6.9, p= 0.03)
Agarwal et al. (2011)	x	M>F (36%)	x	x	√	- Poor practice of toothbrush and ECC (p=0.038)
Bozorgmehr et al. (2013)	54.5% plaque index	x	x	x	√	- Parental oral health behaviors and children plaque Index/gingival index (p> 0.05)
Hamila (2014)	69.6%	M >F	x	x	√	- Mothers oral hygiene practice and ECC (p<0.001)
Jibieke Wulaerhan et al. (2014)	74.2%	M>F	√	x	x	- Greater general oral health knowledge was protective for ECC (OR= 0.740, 95% CI= 0.606-0.902, p= 0.003)
Sun et al. (2014)	66.33%	x	√	√	x	- Poor oral health knowledge and attitudes with development of ECC (OR =9.959, 95% CI= 5.540-17.903, p<0.001)
Folayan et al. (2015)	6.6 %	M<F (66.7%)	√	x	x	- Mothers with good knowledge of oral health were less likely to have ECC (PR: -0.06; 95% CI= -0.11-0.008; p= 0.02)
Dabawala et al. (2017)	x	x	x	x	√	- Practice of visiting dentist only when a problem was perceived and ECC (pain: OR= 3.009, 95% CI: 6.54 1.67-25.73, p= 0.007; cavities: OR= 7.405, 95% CI: 7.09 1.73-29.07, p= 0.007)
Tusek et al. (2017)	46.64%	M>F (47.56%)	√	x	√	- Parents health information level and ECC (OR= 217.57, 95% CI: 84.457 -560.50, p< 0.001) - Parents oral status and ECC (OR= 3.09, 95% CI: 1.652-5.788, p< 0.001)
Alkhtib & Morawala (2018)	89%	M>F (49%)	√	x	√	- dmft and mothers' oral health knowledge and practices (NS, p> 0.05)
Tiwari et al. (2018)	66%	F (11.24) >M (10.13)	√	√	√	- Oral health behavior (p= 0.0126) - Oral health knowledge (NS, p> 0.05) - Oral health attitude (NS, p> 0.05)
Nishide et al. (2018)	30.6%	M=F	x	x	√	- Parental oral practice (OR=1.84, 95% CI: 1.09-3.12, p< 0.05)

Table III: Methodological quality appraisal

Author citations	Q1	Q2	Q3	Q4	Q5	Q6	%	Total
(Wigen & Wang, 2010)	1	0	0	1	1	2	62%	Satisfactory
(Agarwal et al., 2011)	0	0	1	1	1	1	50%	Satisfactory
(Bozorgmehr et al., 2013)	1	0	1	1	1	1	62%	Satisfactory
(Hamila, 2014)	1	0	1	1	1	2	75%	Good
(Jibieke Wulaerhan et al., 2014)	1	1	1	1	1	1	75%	Good
(Sun et al., 2014)	1	0	1	1	1	2	75%	Good
(Folayan et al., 2015)	1	0	1	1	1	1	62%	Satisfactory
(Dabawala et al., 2017)	0	1	1	1	1	1	62%	Satisfactory
(Tusek et al., 2017)	1	0	1	1	1	2	75%	Good
(Alkhtib & Morawala, 2018)	1	1	1	1	1	2	87.5%	Good
(Tiwari et al., 2018)	1	1	1	1	1	3	100%	Good
(Nishide et al., 2018)	0	0	0	0	1	1	25%	Poor

other employed retrospective cohort study (23). Most studies were conducted in kindergarten/ preschool setting except for three studies which were done at a maternal/child care and vaccination center, a dental center, and a community health center.

Prevalence and gender ratio of ECC

Majority of the studies selected have identified and stated the prevalence of ECC among the study population except Agarwal et al. (22) and Dabawala et al. (1) (Table II). The highest prevalence of ECC was 89% from a study in Qatar (29) and the country with the lowest reported prevalence is Nigeria (6.6%) (26). Several studies showed the prevalence was higher among males (1,20,25,28,29) but one study found the prevalence was equal among male and female (23). However, two studies reported that female has higher prevalence of ECC than its male counterpart (26,30).

Parents knowledge, attitude and practice of oral health

The summary of parental KAP effects on children oral health is illustrated in table II. The reviewed studies were either covering one (1,15,20,22,23,26), two (24,25,28,29,31,32), or all three of the KAP variables (30). Six studies (n=6) investigated the association of caregiver's knowledge of oral health with ECC (20,21,25,26,29,30). Two studies showed that there were no significant association between the caregiver's knowledge and the oral health status of their children (29,30). Nonetheless, two studies reported that greater oral health knowledge was protective against ECC development (PR= -0.06, (26); OR=0.740, (20) while two others showed that poor oral health knowledge was predictor of development of ECC (OR= 9.959) (21); OR=217.57 (25).

Three studies (n=3) examined the association of attitude of the parents with the oral health status of their children (21,24,30). Of these, one study found that the attitude of parents was not significantly associated or was not a predictor of dental caries development (30). Wigen & Wang (24) on the other hand reported that poor parental attitude was a predictor of dentine caries (OR =2.8, 95% CI =1.1-6.9, p= 0.03) while Sun et al. (21) found that the combined score of parental oral health knowledge and attitude was significantly related to ECC (OR =9.959, 95% CI =5.540-17.903, p< 0.001).

Nine studies (n=9) analyzed the relationship of parents' oral practice with their children oral health status. Out of these nine articles, only two (15,29) showed no significant association (p> 0.05) while the rest showed significant findings. Nishide et al. (23), Wigen & Wang (24), and Tusek et al. (25) all reported that parental poor oral practice were significant predictors of dentine caries in their kids with odds ranging from 1.84 to 3.09 (OR= 1.84, 95% CI: 1.09-3.12; OR= 2.2, 95% CI= 1.0-4.6; OR= 3.09, 95% CI: 1.65-5.79 respectively). This was supported by three other studies which found that poor

parental toothbrushing practice was associated with ECC (22,28,30). ECC was also more likely to occur if reasons for dental visit practice were only when pain (OR= 3.009, 95% CI: 1.67-25.73, p= 0.007) and cavities were perceived (OR=7.405, 95% CI: 1.73-29.07, p= 0.007) compared to regular check-up visitations (1).

Methodological Quality Appraisal

The quality assessment of the articles included in this review is summarized in Table III. Of the 12 studies reviewed, most used random sampling technique except for three (n=3) which used purposive sampling (23) or the sampling method was not clearly stated (1,31). Only four (n=4) studies mentioned the response rate (1,20,29,30). Most of the studies (n=10) mentioned that their instruments (questionnaire and dental examination procedures) were either validated and tested for reliability or adapted from articles that did (1,15,20-22,25,26,28-30), except in two studies where these information were not mentioned clearly (23,24). All the studies used primary data with the exception of Nishide et al. (23) which used national dental record.

Based on the scoring of the methodological appraisal in Table III, half of the studies (n=6) showed "good" result (20,21,25,28-30), while five studies (n=5) were categorized as "satisfactory" (1,15,22,24,26). Only one was categorized as "poor" (23).

DISCUSSION

Our review summarized previously published studies that investigated parental knowledge and/or attitude and/or practice and its association with the prevalence of ECC. The findings of this review demonstrated that parental oral health knowledge, attitudes and practices were associated with ECC among children. However, few studies showed otherwise.

The prevalence of ECC differs in different countries globally. Several studies stated that the prevalence of ECC is lower in developed countries (33) while the prevalence can reach 70% in developing countries (11). However, among the disadvantaged families in developed countries, ECC prevalence can be as high as those in the underdeveloped nations as shown in this review. A study by Tiwari et al. (30), found that the prevalence of ECC among the less privileged Latinos and immigrant children in US has reached 66%. On the contrary, the lowest prevalence in this review was recorded from a household survey done in the developing nation of Nigeria (26). Nevertheless, the population sampled in the study was predominantly middle to high income earners (71.5%). The review also noted that the prevalence of ECC in the middle eastern countries ranged from 54.5% to 89%, which was concurrent with other study in this region (34).

Children younger than 6 years generally spend much

of their time with their parents and caregivers and this is the critical period where they develop their oral hygiene routine. These routines that they picked up from their parents, either good or bad, will determine their general well-being and oral habits (35,36). Understandably, parents with higher levels of oral health knowledge had children with lower risk of caries (37,38). Studies in this review however have shown inconsistencies with respect to the association between parental knowledge and development of ECC. Only four studies showed significant results out of the six that investigated the association (20,21,25,26). In terms of attitude, our findings showed that two out of five articles in the review found no association with ECC. This was contrary to the previous systematic reviews which found significant association for the two relationships (i.e. parental knowledge with ECC, parental attitude with ECC) in all the studies included (16,27,39). Nonetheless, all the studies that investigated the association between parental oral health behavior or practice in this review have shown significant association with the oral health status of their children.

The relationship between parental oral health knowledge, attitudes, and behavior with ECC is not as straightforward as it seems (40). It is generally accepted by many that parents who are well informed about oral health will usually have positive attitude towards the matter, leading them to abide to the recommended oral health behaviors while modelling this practice to their children for them to follow. However, this is not always the case as demonstrated in this review. Underlying psychosocial constructs of the parents and children such as oral health locus of control, sense of coherence, self-confidence or self-efficacy might have influenced the oral health specific behaviors on both sides that led to the non-significant associations. A study conducted with Qatari parents described some of these underlying factors where it was suggested that seeking dental care for children is challenging to them (i.e. low self-efficacy) even when they know the importance of such visit. This is partly due to the lack of access to a child-friendly dentist in the public health system in the country (29). Another study also pointed out the fact that some parents felt that it was the responsibilities of dentists, physicians, and the schools to teach oral hygiene to children, validating an external oral health locus of control (30).

Additionally, the parent-child unidirectional relationship assumed in these studies is not as simple as it seems. Even though parents may directly influence children's behavior and shape the child's environment, there is a possibility that this interplay can be flipped when children started to control their parents' parenting approaches. This is especially true when parents had to deal with "difficult" children who have been shown to have greater risk of dental caries (41). In this situation, parents often seek to calm, reward, and motivate these children with treats or beverages that are high in sugar

that may not necessarily reflect the parents' knowledge or attitude towards oral health, rather these responses are natural reaction to their child's needs (16). Discrepancies could also stem from the multitude of instruments or questionnaires used to measure the key variables in the reviewed studies, where several had failed to document either the validity (e.g. Cronbach's alpha) or reliability (*r* scores). Test validity and reliability are two technical properties that indicate the quality and usefulness of any questionnaires and give assurance that what they are measuring is what we intend them to measure. Thus, findings derived from information gathered using untested tools may lead to the wrong conclusion.

The strength of this review was that it included studies with various sociocultural and socioeconomic levels of preschool children. Evidently, early childhood caries is a public health burden that affects children in all nations and this review was able to represent the extent of its prevalence in the represented countries of selected regions. Secondly, the study focused specifically on the parental risk factors for ECC development therefore the prevalence patterns can be seen clearly in relation to the KAP of parents. Putting prevention as the main focus, in order to decrease the risk factors for ECC development, it is essential to establish partnerships with the children's family members so they can be informed and educated with the issues at hand (33). There were also some limitations to this review. First, this review only used PubMed and Google scholar databases to search for published studies that fit our criteria. A few related articles that are published in other databases could have been left out and not included in this study. Moreover, in this review, only English articles were included thus some similar works published in other languages might have been excluded. Finally, most of the articles included in this review used observational study design, specifically cross-sectional and this type of design does not proof causality as only a glimpse of factors associated with caries were investigated (42). Hence, determining the pathways between parental factors (i.e. knowledge, attitude and practice) with childhood caries development through longitudinal and prospective multifactorial studies are called for moving forward. Additionally, there is a need to use qualitative studies to capture the holistic and in-depth picture of the parents understanding in regard to their children's oral health.

CONCLUSION

Oral problems are serious conditions that have severe consequences for individuals. It is important to note that knowing the predicting factors of oral health among children can help in planning interventions that are more effective in promoting oral health. Our study showed some discrepancies in the outcome, but arguably parental oral health behavior and practice are associated with the development of dental caries among preschool-aged children. Nonetheless, more

investigations are needed to accurately examine the association between parental knowledge, attitude and behavior with their children's oral health status and to identify what can be done to prevent ECC.

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