**Aims and Objectives:** Predicting caries risk in children can be done by identifying caries risk factors. It is an important measure which contributes to best understanding of the cariogenic profile of the patient. Identification could be done by clinical examination and answering the questionnaire. We arrange the study to verify the questionnaire validation for predicting caries risk in children.

**Materials and Methods:** The study was conducted on 62 pairs of mothers and their children, aged between 3 and 5 years. The questionnaire consists of 10 questions concerning mothers’ attitude and knowledge about oral health. The reliability and validity test is based on Cronbach’s alpha and correlation coefficient value.

**Results:** All question are reliable (Cronbach’s alpha = 0.873) and valid (Corrected item-total item correlation >0.4).

**Conclusions:** Five questionnaires of mother’s attitude about oral health and five questionnaires of mother’s knowledge about oral health are reliable and valid for predicting caries risk in children.

**Keywords:** Children, mother’s attitude, mother’s knowledge, predicting caries risk, validated questionnaire

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**INTRODUCTION**

Dental caries is an important global health problem. In general, its prevalence is still high, particularly in children. It is the most common infectious disease of childhood. The disease is 5 times more common than asthma and 7 times more common than hay fever or allergic rhinitis in children. In developing country such as Indonesia, approximately 60% of student population have dental caries. Based on the survey in 2010 of the Ministry of Health of The Republic of Indonesia, 89% of under 12-year-old population have dental caries.[1-3]

Children’s quality of life can be affected by severe caries because of pain and discomfort which can lead to disfigurement, acute and chronic infections, and altered eating and sleeping, as well as risk of hospitalization, high treatment costs, and loss of school days with the consequent diminished ability to learn.[4]

Dental caries is a disease with multifactorial etiology. There are four major factors of interaction: the host (saliva and susceptible tooth), microflora; cariogenic bacteria (plaque), substrate; fermentable carbohydrates (dietary), and time. There are many factors which do not seen in clinical examination but contribute to the dental caries incidence. Those things are considered as dental caries risk factor. The risk factors are an indirect cause and play an important role in the incidence of disease, significantly associated with disease progression.[5-7] These factors are determined from interviews with parents and children from clinical assessment, such as socioeconomic, attitudes, knowledge, and behavior about oral health.[7,8]
In pathological conditions, risk factors can explain the treatment of imbalance after clinical onset of disease. Therefore, it is important to have an accurate epidemiological examination tools to predict the risk of caries in children. The questionnaire is the best method for this purpose. Some questionnaires have been validated in various parts of the world, but social and cultural differences need development and validation more specific questionnaires for use in different populations. Questions about caries risk in children give a sign of symptoms of decay or they have a tendency to caries. Mother’s level of knowledge about oral health will affect children and their families. Many studies suggest that there is a positive relationship between the children’s caries incidence with mother. Mother is a good predictor of caries risk in children. Maternal factors (i.e., mother’s age, education, occupation, behavior, knowledge, and attitudes) have correlation with oral health of their children. Dental caries is a preventable disease. Therefore, caries risk assessment is an important tool to help dentist to understand cariogenic profile of the patient. There is no single test that can predict individual caries susceptibility accurately. This risk can be evaluated by analyzing the integration of several factors. Many attempts are made to predict the incidence of dental caries. Specific information about the systematic caries risk assessment will assist the dentist in performing proper protocols and prevention. Based on the concern above, the questionnaire was made, to get information about maternal risk factors which play an important role in the caries incidence of their children.

**Materials and Methods**

**Ethical Consideration**

The Human Ethical Research Committee of the Dentistry Faculty, Indonesia University, approved the study protocol, and written informed consent was obtained from each patient at the beginning of the study (protocol no. 07980915/2015).

**Selection of Participant**

The study was conducted in Sekolah pendidikan anak usia dini RW 10, Kelapa Gading, North Jakarta, Indonesia. The population consists of 62 pairs of mother and children, aged between 3 and 5 years ($r = 0.4; \alpha = 5\%; \beta = 10\%; n = 62$). The inclusion criteria were as follows: children aged between 3 and 5 years, boys or girls, and mother as primary caregiver.

**Designing, Preparation, and Interview with the Subject**

Questionnaire of maternal attitude and knowledge for predicting children’s caries risk partially was designed referring to the Likert Scale, which is an instrument most commonly used in research of the opinions, beliefs, and attitudes. Respondents were asked to specify their level of agreement about the statement. Statement items have been selected from the literature and the relevant study, about maternal risk factor. There is no problem in terms of scoring. Score 5 is given for the highest level of participants which is the most at risk of caries. The most important thing is consistency in the scoring of direction attitude shown. The statement was made in such a way so that cannot cause any response tendency. The questionnaire of maternal attitude and knowledge for predicting children’s caries risk consists of five questions concerning mothers’ attitude about oral health and five questions concerning mother’s knowledge about oral health. The participants were asked to answer the questionnaire, assisted by researcher. The interview will take about 10 min.

**Reliability and Validity Test**

Statistical analyzed was carried out for the study. The reliability and validity test is based on Cronbach’s alpha and correlation coefficient. Cronbach’s alpha >0.7 required for a scale that is considered already established or stable. Parameter of validation (corrected item-total item correlation) is the correlation between an item with the total items corrected and the item in question is not included in the study. Researcher determines a minimal value of the validation, correlation coefficient >0.4.

**Results**

A final validation and reliability study using a sample of 62 pairs of mother and children was conducted to establish whether the questionnaire provides reliable and valid measures of predicting caries risk in children. All questions for predicting caries risk in children were developed and validated using standard and measurement procedures.

The study provides validating questionnaire of maternal attitude and knowledge for predicting caries risk in children. The question about mother’s attitude and knowledge consists of: brushing teeth after meals item (question 1.1 and 2.3), caries restoration item (question 1.2), extraction of radix or unrestorable teeth item (question 1.3), the importance of primary teeth (1.4), cariogenic food item (question 2.1 and 2.4), plaque removal (question 2.2), and periodical checking item (question 1.5 and 2.5). The results are presented in Tables 1 and 2.

The reliability of the obtain questionnaire was estimated using Cronbach’s alpha which yielded a value of 0.873. Questionnaire is reliable when the responder’s answer is
### Table 1: Questionnaire mothers’ attitude about oral health and analyze result of reliability and validity test

| Question                                                                 | Alternative answer | Corrected item-total correlation | Cronbach’s alpha |
|-------------------------------------------------------------------------|--------------------|----------------------------------|------------------|
| 1.1 What is your opinion about brushing teeth after meals?              |                    | 0.771*                           | 0.873**          |
| 1.2 What is your opinion about dental caries filling?                   |                    | 0.735*                           |                  |
| 1.3 What is your opinion about tooth extraction on unrestorable caries or radix? |                    | 0.725*                           |                  |
| 1.4 What is your opinion that the primary teeth are important, which will be replaced by permanent teeth? |                    | 0.612*                           |                  |
| 1.5 What is your opinion about periodical checking to the dentist?      |                    | 0.543*                           |                  |

*Correlation coefficient ($r$>0.4), **Cronbach’s alpha ($\alpha$>0.7)

### Table 2: Questionnaire mothers’ knowledge about oral health and analyze result of reliability and validity test

| Question                                                                 | Alternative answer | Corrected item-total correlation | Cronbach’s alpha |
|-------------------------------------------------------------------------|--------------------|----------------------------------|------------------|
| 2.1 What kind of food can cause dental caries?                          |                    | 0.489*                           | 0.873**          |
| A. Salty foods                                                          |                    |                                  |                  |
| B. Hot foods                                                            |                    |                                  |                  |
| C. Sour foods                                                           |                    |                                  |                  |
| D. Tough foods                                                          |                    |                                  |                  |
| E. Sweetened and sticky foods                                           |                    |                                  |                  |
| 2.2 Dental plaque can be removed by                                     |                    | 0.446*                           |                  |
| A. No opinion                                                           |                    |                                  |                  |
| B. Diminish                                                             |                    |                                  |                  |
| C. Toothpick                                                            |                    |                                  |                  |
| D. Gargling                                                            |                    |                                  |                  |
| E. Brushing the teeth                                                   |                    |                                  |                  |
| 2.3 The proper time to brush your teeth is                              |                    | 0.441*                           |                  |
| A. Only if necessary                                                    |                    |                                  |                  |
| B. Taking bath in the morning                                           |                    |                                  |                  |
| C. After breakfast                                                      |                    |                                  |                  |
| D. Every time taking bath                                               |                    |                                  |                  |
| E. After breakfast and before sleeping                                  |                    |                                  |                  |
| 2.4 Snacks which can’t cause dental caries                              |                    | 0.570*                           |                  |
| A. Candy                                                                |                    |                                  |                  |
| B. Ice cream                                                            |                    |                                  |                  |
| C. Fried snacks                                                         |                    |                                  |                  |
| D. Bread                                                                |                    |                                  |                  |
| E. Fruits                                                               |                    |                                  |                  |
| 2.5 Periodical checking to the dentist, there should be                 |                    | 0.640*                           |                  |
| A. Once a year                                                          |                    |                                  |                  |
| B. If there are any complaints                                          |                    |                                  |                  |
| C. Every 8-10 months                                                    |                    |                                  |                  |
| D. Every 6-8 months                                                     |                    |                                  |                  |
| E. Every 3-6 months                                                     |                    |                                  |                  |

*Correlation coefficient ($r$>0.4), **Cronbach’s alpha ($\alpha$>0.7)
constantly. It shows and ensures that the questionnaire provides consistent measure of caries risk prediction. The evidence of validity was obtained through consideration of corrected item-total item correlation coefficient for each item. The value of corrected item-total item correlation exceeded 0.4 for all question. Questionnaire is valid when it could use to measure something. Based on the result, it can be said that five questions concerning mothers’ attitude about oral health [Table 1] and five questions concerning mother’s knowledge about oral health [Table 2] are valid and reliable.

**Discussion**

The parents, especially mother, is the main figure for children. She has an important role in the children’s character building, including oral health. Mother is the primary role model for children, their attitude and knowledge toward oral health. Many studies mention about the positive correlation between attitudes and knowledge of mother and children’s oral health status. The study conducted by Sajadi et al. states that there was no significant relationship between the child’s quality of life relating to oral health and father’s level of education, compare with mother’s level of education.[18]

Dental caries is generally known as a most common infectious disease in children. Caries risk is defined as the probability of an individual developing at least a number of caries lesions during a specific period. Caries risk assessment is a part of primary prevention strategy and an important step in decision-making and treatment planning while early detection is a part of secondary prevention.[16,19,20]

There are many important factors in the incidence of dental caries, but the main one is the etiologic factor. Caries risk assessment is a very complex issue because of its multifactorial etiology and its interaction between risk factors. Caries risk assessment can be done based on clinical examination and other factors which are not seen on clinical examination but contribute to dental caries. Questionnaire is the instrument of choice to obtain information about individual caries risk factors that are not found on clinical examination.[20] The outcome of the study is a validated questionnaire package which can assist clinicians to predict children’s caries risk, by assessing mother’s knowledge and attitude through interviews. This questionnaire can be used as a guidance that will help a dentist to diagnose the patient’s cariogenic profile. Question items are conducted based on literature review which is considered contribute to dental caries. The requirements of questionnaire have also been fulfilled that are relevant to the purpose and hypothesis; easy to ask; easy to answer; data could be processed.

Untreated caries in children will cause many things such as pain, the possibility of infection, impairment of daily activity, psychomotor problems, and growth disturbances. Some effort can be taken to reduce the risk of caries such as brushing teeth 2 times a day, especially after meals. For most young children, toothbrush prophylaxis is efficient to remove plaque. The advantages of brushing teeth are the mechanical removal of plaque and teeth exposure with fluoridated toothpaste. Regarding to research by Damle et al., oral health education and toothbrushing instruction are effective in improving the status of oral health in school children.[8,21-23]

Decayed teeth require treatment to eliminate infection and restore tooth function. The teeth restoration will re-establish the anatomy and preserve tooth structure, restore tooth function such as masticatory, phonetic, esthetic, and space-maintainer function in dental arch, and to provide good oral hygiene. Similar with study by Subramaniam et al. (2016), restoring carious teeth will repair significantly children’s occlusal bite forces.[4,7,24]

According to Kay and Blinkhorn, the reason for tooth extraction is generally divided into several categories: caries, orthodontic, exfoliation, periodontal disease, general health, economy, prolonged retention, patient request, and other reasons. Unrestorable dental caries is the main consideration of tooth extraction. This is in accordance with the study by Alsheneifi and Hughes (2001) who investigated the reasons of primary teeth extraction in children aged 3–5 years in the US and found that 53% of primary teeth extraction was due to caries. Focal infection theory mention that systemic disease can be caused by microorganisms from the dental infection in origin.[25-27]

Deciduous teeth have many functions such as esthetics, mastication, phonetic, and normal development of occlusion in the permanent dentition. Early loss of deciduous teeth can lead to malocclusion. Parents, especially mothers, are the primary caregiver of children and as the decision maker for the children. They must have enough knowledge about the primary teeth, which is its role in children’s confidence building. Based on recent journal searches, research on parental attitudes and knowledge about oral health of their children, especially of primary teeth, is actively conducted in India. Research by Vittoba Setty and Srinivasan in Bengaluru, India, shows that 39% of parents who care and understand about primary teeth in children. In addition, studies by Sultan et al. in Kashmir, India, show that there are about 32.6% of parents who understand the importance of primary teeth.[28-30] The parents suggest that primary teeth are temporary and unimportant because it will be replaced by permanent teeth. The role of professionals
is required to provide comprehensive information to the parents.

The American Academy of Pediatric Dentistry caries management protocols for children aged 3–5 years mention that children who have high risk of caries should be performed periodically checking to the dentist every 3 months. Children at moderate risk are 6 months’ periodic checking, and low-risk children are 12 months. In other side, Jain et al. reported that even though mothers mostly agree about regular dental visit, very few of them apply this visit. It may be caused by perception of fear, expensive cost’s treatment, and lack of their motivation and willingness. Kamil et al. in their study conveyed the low concerns of mothers about the visit of the child to the dentist, whereas Oredugba et al. stated that the emphasis of maternal health promotion cannot be overestimated because most of their decisions relating to children’s oral health remain based on the knowledge they have. Some conditions such as knowledge and sociocultural background may affect mother’s beliefs and attitudes. These beliefs and attitudes are something modifiable and sometimes different between individuals of the same background.

Attention to public health in recent decades underscores the need for increased understanding of how social, cultural, and environmental factors may affect caries risk in children. Several recent studies, many stated about the importance of meaningful relationships between sociocultural factors.

Sucrose is regarded as the main factor in dental caries. Sugar food product such as cakes, dessert, candy, soft drinks, jam, and dried fruits contains added sucrose. Dietary containing sugar will diffuse into plaque and is fermented into lactic acid and other acids or can be stored as intracellular polysaccharides by bacteria. This will result in a decrease of pH and create suitable environment for aciduric and acidogenic bacteria. This in line with the Vipelholm’s study describes the association between the types of sugar with caries increment. The low incidence of caries is found in the participant with almost sugar-free diet. The frequency of sugar intake affects the progression of caries. The sticky sugar consumption between meals will cause highest caries progression.

It is well known that the mechanical removal of plaque is essential to prevent oral diseases such as dental caries, gingivitis, and periodontitis. Although many methods of toothbrushes are known today, the mechanical removal of plaque by manual toothbrush remains the primary maintenance of good oral health in mostly human population.

There is no single test that can analyze all caries risk factors and can accurately predict the susceptibility of an individual to caries. Predicted risk of dental caries can be evaluated by analyzing and integrating several risk factors. Therefore, this research questionnaire should be combined with clinical examination, for example, caries experience examination, white spot lesion examination, plaque index, plaque pH, and so on.

Educational programs and knowledge of parents, especially mothers, about dental and oral health can be considered as a routine and continuous program to do. Knowledge, attitude, and behavior of good mother are expected to bring positive influence to children’s oral health. In current health-care practice, assessment and management of caries risk is recognized as an important component in providing appropriate dental care for infants, children, and adolescents. Therefore, an accurate assessment of caries risk in patients can guide clinicians and health-care facilities to give more attention of their resources to high-risk patients. It is performed as an efficiency in identifying active caries patients or potentially high. The identification is important for the management of individually tailored patients.

**Conclusions**

A questionnaire validation is a mechanism to verify the validity and reliability for each variable research. Based on the result of the study, it can be concluded that five questionnaires of mother’s attitude about oral health and five questionnaires of mother’s knowledge about oral health are valid and reliable for predicting caries risk in children.

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Nil.

**Conflicts of Interest**

There are no conflicts of interest.

**References**

1. Kemparaj U, Chavan S, Shetty NL. Caries risk assessment among school children in Davangere city using cariogram. Int J Prev Med 2014;5:664-71.
2. Saravanan M, Lokesh S, Polepalle T. Prevalence, severity and associated factors of dental caries in 3-6 year old children – A cross sectional study. Int J Dent Sci Res 2014;2:5-11.
3. Direktorat Kesehatan Gigi. Kementerian Kesehatan Republik Indonesia. Pedoman Pelayanan Kesehatan Gigi Dan Mulut Sehat; 2010. Available from: http://www.depkes.go.id/. [Last accessed on 2016 Jun 09].
4. Colak H, Dülgergil CT, Dalli M, Hamidi MM. Early childhood caries update: A review of causes, diagnoses, and treatments. J Nat Sci Biol Med 2013;4:29-38.
5. Basavaraj P, Khuller N, Khuller RI. Caries risk assessment and control. J Oral Health Community Dent 2011;5:58-63.
6. Bahar A. Paradigma Baru Pencegahan Karies Gigi. Jakarta:
Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia; 2011. p. 59-74.
7. Premkumar S. Manual of Pediatric Dentistry. 1st ed. New Delhi: Jaypee Brothers Medical Publishers; 2014. p. 171-220.
8. Ramos-Gomez F, Crystal YO, Ng MW, Tinanoff N, Featherstone JD. Caries risk assessment, prevention, and management in pediatric dental care. Gen Dent 2010;58:505-17.
9. Hurlbut M. CAMBRA: Best practices in dental caries management. Academy of Dental Therapeutics and Stomatology, Chesterland: Peer Review Publications; 2011.
10. Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: A systematic review of the literature. Community Dent Health 2004;21 1 Suppl:71-85.
11. Hirooka LB, Mestriner-Junior W, Mestriner S. Dental caries in mother-child pairs from Xingu. Braz J Oral Sci 2014;13:43-6.
12. Nourijelyani K, Yekaninejad MS, Mohammad K, Rahimi Foroushani A, Pakpour A. The influence of mothers' lifestyle and health behavior on their children: An exploration for oral health. Iran Red Crescent Med J 2014;16:e16051.
13. Moinaz SA, Fadel CB, Lolli LF. Social aspects of dental caries in the context mother-child pair. J Appl Oral Sci 2014;22:73-8.
14. Tickle M, Milsom KM, Humphris GM, Blinkhorn AS. Parental attitudes to the care of the carious primary dentition. Br Dent J 2003;195:451-5.
15. Cabral RN, Hilgert LA, Faber J, Leal SC. Caries risk assessment in schoolchildren – A form based on carioogram software. J Appl Oral Sci 2014;22:397-402.
16. Tamaki Y, Nomura Y, Katsumura S, Okada A, Yamada H, Tsuge S, et al. Construction of a dental caries prediction model by data mining. J Oral Sci 2009;51:61-8.
17. Dahlan MS. Statistik Untuk Kedokteran Dan Kesehatan Seri 1 Edisi Ke-6. Jakarta: Penerbit Epidemiologi Indonesia; 2015. p. 241-3.
18. Sajadi FS, Pishbin L, Azhari SH. Impact of oral and dental health on children's and parents' quality of life based on early childhood oral health impact scale (ECOHIS) index. Int J Dent Sci Res 2015;3:28-31.
19. Vanobbergen J, De Visschere L, Daems M, Ceuppens A, Van Emelen J. Sociodemographic determinants for oral health risk profiles. Int J Dent 2010;2010:938936.
20. Zukanovic A. Caries risk assessment models in caries prediction. Acta Med Acad 2013;42:198-208.
21. Sheiham A. Dental caries affects body weight, growth and quality of life in pre-school children. Br Dent J 2006;201:625-6.
22. Mishu MP, Hobdell M, Khan MH, Hubbard RM, Sabbath W. Relationship between untreated dental caries and weight and height of 6- to 12-year-old primary school children in Bangladesh. Int J Dent 2013;2013:629675.
23. Damle SG, Patil A, Jain S, Damle D, Chopal N. Effectiveness of supervised toothbrushing and oral health education in improving oral hygiene status and practices of urban and rural school children: A comparative study. J Int Soc Prev Community Dent 2014;4:175-81.
24. Subramaniam P, Girish Babu KL, Ifzah. Effect of restoring carious teeth on occlusal bite force in children. J Clin Pediatr Dent 2016;40:297-300.
25. Mukhopadhyay S, Roy P. Extraction of primary teeth in children: An observational study. J Cranio Maxillar Dis 2015;4:57-61.
26. Alsheneifi T, Hughes CV. Reasons for dental extractions in children. Pediatr Dent 2001;23:109-12.
27. Olsen I, van Winkelhoff AJ. Acute focal infections of dental origin. Periodontol 2000 2014;65:178-89.
28. Vittoba Setty J, Srinivasan I. Knowledge and awareness of primary teeth and their importance among parents in Bengaluru City, India. Int J Clin Pediatr Dent 2016;9:56-61.
29. American Academy of Pediatric Dentistry. Guideline on caries-risk assessment and management for infants, children, and adolescents. Clin Pract Guidel 2014;37:132-9.
30. Sultan S, Ain TS, Gowhar O. Awareness of mothers regarding oral health of their children in Kashmir, India. Int J Contemp Res Med 2016;3:2169-71.
31. Jain R, Oswal KO, Chitguppi R. Knowledge, attitude and practices of mothers toward their children’s oral health: A questionnaire survey among subpopulation in Mumbai (India). J Dent Res Sci Dev 2014;1:40-5.
32. Kamil MA, El-Ameen NM, Madkhaly SH, et al. Knowledge and attitude of Saudi mothers towards health of primary teeth. J Dent Oral Hyg 2015;7:107-12.
33. Oredugba F, Agbaje M, Ayedun O, et al. Assessment of mother’s oral health knowledge: Towards oral health promotion for infant and children. J Sci Res Health 2014;6:908-15.
34. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, et al. Influences on children's oral health: A conceptual model. Pediatrics 2007;120:e510-20.
35. Axelsson P. Diagnosis and Risk Prediction of Dental Caries. Illinois: Quintessence Publishing Co.; 2000. p. 44-5.
36. Van Loveren C, Lingström P. Diet and dental caries. In: Axelsson P, editor. Diagnosis and Risk Prediction of Dental Caries. Illinois: Quintessence Publishing Co.; 2000. p. 44-5.