ORIGINAL ARTICLE

Knowledge, Attitude, And Practice On Early Childhood Caries Among Medical Nurses At A Teaching Hospital In Kuala Lumpur: A Cross-Sectional Study

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ABSTRACT

Introduction: Promoting oral health among hospitalised children using medical nurses is both beneficial and cost-effective. Good level of knowledge, attitude, and practice (KAP) is essential to promote caries prevention and reduce the incidence of early childhood caries (ECC). Thus, we conducted this study to assess the KAP of medical nurses at our hospital on ECC. **Materials and methods:** A total of 158 medical nurses from a teaching hospital in Kuala Lumpur were selected using the simple randomised sampling. A validated self-administered questionnaire was distributed, consisting of ten questions each on KAP related to ECC. Data were analysed using Statistical Package for the Social Sciences (SPSS) software version 29. **Results:** Of the participants, 89% were female, with a mean age of 37 years (±4.93). 97% had tertiary education and over ten years of work experience. While nurses demonstrated good knowledge of caries risk factors, their attitudes and practices regarding prevention were lacking. Only 32% and 45% recognised the effects of vertical caries transmission and prolonged bottle/breastfeeding, respectively while 84% of them introduced semi-solid food to their child after 6 months. Additionally, 72% and 63% failed to recognise issues with toothpaste ingestion and the proper amount of toothpaste for children. Spearman's correlation test found no significant correlation between the nurses' knowledge and sociodemographic factors ($p > 0.05$). **Conclusion:** While medical nurses possess good knowledge about ECC, they struggle to translate this into consistent attitudes and practices. Training focused on oral health care is necessary to address this gap.

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INTRODUCTION

Dental caries is a dynamic multifactorial disease, driven by the interaction between the bacterial biofilm and sugary diet, resulting in the cyclic demineralisation and remineralisation of the dental hard tissue (1). Early Childhood Caries (ECC) on the other hand is characterised by the presence of at least one decayed, missing, or filled tooth surface secondary to a carious process in the primary teeth of children aged six or younger (1). Though reversible at early stages (2), ECC remains a significant global health issue, with over 600 million affected children, many of whom do not receive adequate dental treatment (3).

In Malaysia, dental caries prevalence has decreased over the past 47 years, especially following the fluoride revolution in dentistry. Among 12-year-olds, the prevalence dropped from 78.4% in 1970 to 33.3% in 2017 (4), while for 6-year-olds, it declined from 95.4% in 1970 to 71.3% in 2015 (5). Despite these reductions, disparities still exist between developed and third-world countries (6) and between urban and rural areas (7). For example, a study in Kelantan among school children aged 7 to 9 years old revealed a high prevalence of dental caries for both primary (93%) and permanent (51%) teeth (8), exceeding the national survey conducted in 2015.

ECC significantly impacts children's quality of life and

imposes a burden on families and society. Left untreated, it can lead to further health complications (9), highlighting the importance of timely intervention. Nevertheless, treating ECC in young children is often challenging. Due to their young age and/or the complexity of the treatment needed, often these dental treatments need to be carried out under sedation or general anaesthesia, which increases the treatment costs (10) and time commitments for families (11). Thus, prevention of ECC has been identified as the best strategy in dealing with the rising trends of this disease in children.

Among various approaches to prevent dental disease, oral health education is the most cost-effective method (12). Oral health education, particularly for parents of preschool children, plays a vital role in reducing caries rates (13). School-based dental programs have also shown positive results in improving children's oral health knowledge and behaviour (14). However, children with chronic conditions like leukaemia, thalassemia, or congenital heart defects, who spend significant time in hospitals, often lack access to preventive dental care. The presence of dental caries in these groups of children will impact their general health greatly and increase their morbidity while delivering dental treatment is often complicated by their existing medical condition. Nicopoulos et al. (15) reported that nearly half of the hospitalised children had unmet oral health needs. This highlights the need for tailored oral health programs in hospital wards to address these children's unique needs. Medical nurses, especially those working with paediatric patients, can play a crucial role in promoting oral health in the ward, which in turn provides a cost-effective solution. To achieve this, adequate knowledge on oral hygiene care, dental caries and cariogenic food is essential. However, studies show that medical personnel, including paediatricians (16), often have limited knowledge of early caries detection and prevention (17,18,19). This gap in knowledge underscores the importance of equipping medical nurses with the necessary training to support ECC prevention effectively.

This study aims to assess the knowledge, attitudes, and practices of medical nurses regarding early childhood caries in our teaching hospital to enhance their ability to promote oral health among hospitalised children.

MATERIALS AND METHODS

Study Type and Design

This is an observational, cross-sectional study conducted at a teaching hospital in Kuala Lumpur, Malaysia among the medical nurses of both genders. The study was carried out from 1st April 2023 until 29th February 2024. The study was approved by the institution's ethical committee (JEP-2023-753). The inclusion criteria were medical nurses who work at the hospital and have at least one fit and healthy child aged below 6 years old. Any nurses who have child/children with medical illnesses/special needs where their oral hygiene practice might be different/challenging as compared to normal child was excluded from the study. Since the questionnaire assess the oral health care practise of the medical nurses on their child, including those children with special needs or with medical problem may give different response.

The minimal sample size needed in the study was based on a calculation by the Raosoft sample size calculator, using the following formula:

$$n = \frac{Z^2(p)(1-p)}{d^2}$$

where, n= sample size, Z= Z -score (corresponding to level of confidence or confidence interval), p= population proportion and d= precision (corresponding to the effect size or margin of error). Based on a 95% confidence level, the Z-score was set at 1.96 while the d-value was set at 0.05 representing the 5% margin of error. Assuming the population proportion of 10% and the expected response rate of 50%, the sample size calculated yields 158 medical nurses.

The list of medical nurses, identified through their staff numbers was obtained from the Department of Nursing Services of the hospital. The list was entered into Windows Microsoft Excel. Using Microsoft Excel, a random list of medical nurses using the simple randomised sampling was generated based on the calculated sample size. The list of selected medical nurses was given to the Department of Nursing Services, where they helped us in approaching the potential participants and asked for their participation in the study. Upon acceptance, the selected participants were given a set of questionnaires and were asked to return it to the department within 3 working days.

The questionnaire used consists of two sections. The first section of the questionnaire included demographic information such as gender, age, department, level of education, household income and number and age of children. The second part of the questionnaire consisted of a self-administered thirty-item close-ended questionnaire both in English and Bahasa Malaysia developed and validated previously by Mani et al. (20). The self-administered questionnaire consisted of ten items each assessing the participant's knowledge, attitude and practice on early childhood caries and children's oral health care. The knowledge component consists of questions on dental caries, diet, tooth eruption and oral hygiene care of the child, where the participants need to answer either true, false or don't know based on their knowledge on the subject of interest. Each correct answers were given 1 point, while no points were given for wrong and 'not sure' answers. The level of knowledge was then categorised as low (0

to 4 correct answers), moderate (5 to 7 correct answers) and high (8 to 10 correct answers).

The questions of the attitude component measure the participant's belief and commitment to the prevention of ECC, which includes the issues of vertical bacterial transmission, dietary and bottle/breastfeeding habits and oral health care of the child. This component utilises a 5-point Likert scale response assessing the participant's agreement (strongly agree, agree, don't know, disagree and strongly disagree) on the questionnaires given. In addition, the practise component utilises a 4-point Likert scale response with regards to the frequency (always, frequent, sometimes and never) of the participants brushing and examining their child's teeth, exposing their child to cariogenic and non-cariogenic diet and their effort on updating their knowledge on dental health. This component assesses the preventive oral health care practice of the participants against ECC (20).

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) software, version 29.0 for Windows (IBM; SPSS Inc., Chicago, IL., USA) was used to enter and analyse the data. The demographic data and the data from the Likert scale were calculated and reported in terms of frequency and percentages. Bivariate analysis using Spearman's correlation test was used to determine whether the background of the participants had any association with their level of knowledge, with $p < 0.05$ being regarded as statistically significant.

RESULT

Demographic data

The questionnaires were distributed to 158 nurses, with a 100% response rate. The demographic characteristics of the medical nurses involved in the study are presented in Table I. 89% of the respondents were female, with a mean age of 37 (±4.93) years old. Majority (97%) of them had graduated from the tertiary education centre, with 88% of the respondents being a diploma holder. 92% of the respondents reported a household income of more than RM 3,000 per month, and have been in the service at an average of 13.35 (±5.82) years. With regards to their child, the nurses reported having at least 1 child aged 6 years or below, with a mean of 1.38 (±0.61).

Table I: Demographic data of the medical nurses

Demographics	Frequency (n)	Percentage (%)
Gender		
Male	17	10.8
Female	141	89.2
Educational background		
SPM	4	2.5
STPM	0	0
Certificate	0	0
Diploma	139	88
Degree	15	9.5
Income		
RM3k and below	13	8.2
RM3k-9k	125	79.1
RM10k	20	12.7
Demographics	Mean (±SD)*	
Age	37 (±4.93)	
Period of service	13.35 (±5.82)	
Children aged below 6 years old	1.38 (±0.61)	

Knowledge of the medical nurses on ECC

Table II depicts the knowledge of the respondents regarding ECC based on the ten questions of the knowledge domain in the questionnaire. Despite the majority of the respondents (90.5%) knowing the timing of the first eruption of primary teeth, only half of them (50.6%) have the knowledge of the completion of primary teeth eruption in children. About 43.7% of the respondents acknowledged the potential of dental caries occurring in children below the age of 2. More than 90% of the respondents knew the type of food that can cause dental caries, the importance of maintaining good oral hygiene even before the tooth erupts and the preventive role of fluoride in dental caries prevention. However, only 70.9% of the respondents knew the right timing for the usage of fluoridated toothpaste in children. Most respondents (85.4%) knew when to start weaning off their child from the bottle, while more than half of them (53.2%) thought that filling is necessary for primary teeth. The knowledge level of the participants was favourable, with 62.7% of them having good and solid foundational knowledge of ECC, while only 35.4% and 1.9% of them had moderate and low levels of knowledge on ECC respectively.

The attitude of the medical nurses toward ECC-related factors

Table III summarises the attitude of the medical nurses on the ECC-related factors, represented by ten questions from the attitude domain in the questionnaire. Only 31.6% of the respondents agree that vertical transmission of bacteria can lead to dental caries. Regarding the first visit to the dentist, 62.7% and 27.2% of the respondents agree that the child should go for a dental visit at 1 and 3 years after tooth eruption respectively, while 79.8% of them agree the importance of a dental visit before the age of 2 years old. All respondents agree that a balanced diet is essential for the growth of the teeth, and 93.7% of them agree with the detrimental effects of pacifier usage on teeth development. With regards to bottle/breastfeeding, 69.7% and 44.9% of the respondents agree that nighttime feeding and prolonged bottle/breastfeeding can cause dental caries respectively. 93% of the respondents agree that brushing of teeth should

Table II: The knowledge of the medical nurses on EEC.

Knowledge section	Answer	Frequency (n)	Percentage (%)
1 Caries can affect infants below 2 years old	Yes	69	43.7
	No	78	49.4
	Don't Know	11	7
2 When does the first baby tooth appear in the child's mouth? Between ages	6 – 9 months	143	90.5
	By the age of 1.5 years	13	8.2
	Don't know	2	1.3
3 Your child will have a complete set of 20 milk teeth by the age of:	2-3 years	80	50.6
	4-5 years	64	40.5
	Don't know	14	8.9
4 The main types of food that can cause tooth decay are	Sugary and starchy food	158	100
	Fruits and vegetables	0	0
	Don't know	0	0
5 Weaning from a baby bottle to a sipping cup should be planned when the child is :	2.5 years	21	13.3
	1 year	135	85.4
	Don't know	2	1.3
6 Cleaning your baby's mouth after each feeding should begin even before teeth erupt.	Yes	149	94.3
	No	6	3.8
	Don't know	3	1.9
7 Brushing your baby's teeth is important for oral health.	Yes	158	100
	No	0	0
	Don't know	0	0
8 Fluoride in toothpaste is important for preventing tooth decay.	Yes	144	91.1
	No	10	6.3
	Don't know	4	2.5
9 You should start using toothpaste with fluoride for cleaning your child's teeth:	When they can spit properly	112	70.9
	When the first tooth erupt	38	24.1
	Don't know	8	5.1
10 It is not necessary to do fillings in the baby's teeth	Yes	84	53.2
	No	61	38.6
	Don't know	13	8.2
Level of knowledge	Good	99	62.7
	Moderate	56	35.4
	Low	3	1.9

Table III: The attitude of the medical nurses on ECC-related factors

Attitude section	Answer	Frequency (n)	Percentage (%)
1 Do you think tooth decay is caused by bacteria that are transmitted from mother to child by sharing feeding utensils (eg: spoon)?	Strongly agree	9	5.7
	Agree	41	25.9
	Don't Know	13	8.2
	Disagree	80	50.6
	Strongly disagree	15	9.5
2 When do you think you should take your baby for a dental checkup after the teeth erupt?	After 1 year	99	62.7
	After 3 years	43	27.2
	Don't know	9	5.7
	When experiencing pain	7	4.4

CONTINUE

Table III: The attitude of the medical nurses on ECC-related factors (CONT.)

Attitude section	Answer	Frequency (n)	Percentage (%)
3 Do you think balanced diet (rice, vegetables, fish, milk and meat) is essential for the healthy growth of your baby's teeth?	Strongly agree	100	63.7
	Agree	57	36.3
	Don't Know	0	0
	Disagree	0	0
	Strongly disagree	0	0
4 Do you think feeding before bed time and night time bottle/breastfeeding can cause tooth decay?	Strongly agree	32	20.3
	Agree	78	49.4
	Don't Know	17	10.8
	Disagree	29	18.4
	Strongly disagree	2	1.3
5 Do you think frequent and prolonged breast/ bottle feeding can cause tooth decay?	Strongly agree	21	13.3
	Agree	50	31.6
	Don't Know	18	11.4
	Disagree	68	43
	Strongly disagree	1	0.6
6 Do you think you need to brush your child's teeth as soon as they erupt?.	Strongly agree	47	29.7
	Agree	100	63.3
	Don't Know	3	1.9
	Disagree	8	5.1
	Strongly disagree	0	0
7 Do you think the child should brush his/her teeth himself/herself?	Strongly agree	17	10.8
	Agree	83	52.5
	Don't Know	8	5.1
	Disagree	48	30.4
	Strongly disagree	2	1.3
8 Do you think swallowing of toothpaste while brushing may cause any health problems to your child's teeth?	Strongly agree	3	1.9
	Agree	26	16.5
	Don't Know	53	33.5
	Disagree	72	45.6
	Strongly disagree	4	2.5
9 Do you think it is important for your child to visit the dentist before 2 years of age	Strongly agree	33	20.9
	Agree	93	58.9
	Don't Know	13	8.2
	Disagree	19	12
	Strongly disagree	0	0
10 Do you think prolonged use of a pacifier can affect the normal development of a child's	Strongly agree	54	34.2
	Agree	94	59.5
	Don't Know	4	2.5
	Disagree	5	3.2
	Strongly disagree	1	0.6

start as soon as the tooth erupts, but only 31.7% of them agree that the toothbrushing activity should be supervised instead of letting the child brush by him/herself. Interestingly, most of the respondents (81.6%) either disagree or are not sure about the detrimental effects of swallowing toothpaste by their child.

The practice of medical nurses in the prevention of ECC-related behaviours

Table IV shows the practice of the medical nurses on the prevention of ECC-related behaviours. About 36.1% of the respondents started giving semi-solid foods to their child at the age between 6 to 12 months old, while only 8.9% of the respondents either always or frequently bit the foods into small pieces before feeding them to their child. 27.8% and 48.7% of the respondents always and frequently examine their child's mouth respectively. With regards to the usage of sweetened food and beverages, 81% of the respondents admit that they sometimes buy sweetened food for their child, but never give sweetened drinks in a bottle (69.6%) or give a pacifier dipped in sweetener (96.8%) to their child. 91.2% of the respondents always and frequently give their children plain water after each meal. In terms of oral hygiene practice, the majority of the respondents (94.9%) always and frequently brush their child's teeth, but only 34.9% of them use the right amount of toothpaste. About 88.6% of the respondents always and frequently take the initiative to update their oral health knowledge.

Table IV: The practice of the medical nurses on the prevention of ECC-related behaviours

Practice section	Answer	Frequency (n)	Percentage (%)
1 Do you bite the food into small pieces before giving it to your child?	Always	5	3.2
	Frequent	9	5.7
	Sometimes	58	36.7
	Never	86	54.4
2 How often do you do mouth examinations on your baby?	Always	44	27.8
	Frequent	77	48.7
	Sometimes	35	22.2
	Never	2	1.3
3 How often do you buy sweetened food for your child?	Always	8	5.1
	Frequent	15	9.5
	Sometimes	128	81
	Never	7	4.4
4 How often did you give sweetened liquid/ juice to baby in bottle?	Always	3	1.9
	Frequent	3	1.9
	Sometimes	42	26.6
	Never	110	69.6
5 How often did you give plain water after each feed?	Always	54	34.2
	Frequent	90	57
	Sometimes	9	5.7
	Never	5	3.2
6 When did you start semi solid food for your child?	6 months	23	14.6
	1 year	34	21.5
	1 years	91	57.6
	2 years	10	6.3
7 Do you brush your baby's teeth?	Always	55	34.8
	Frequent	95	60.1
	Sometimes	7	4.4
	Never	1	0.6
8 How much toothpaste do you use to brush your child's teeth?	Smear	38	24.1
	Pea size	17	10.8
	Full brush length	100	63.3
	Not at all	3	1.9
9 Do you use a pacifier dipped into sweet liquid for your child?	Always	2	1.3
	Frequent	1	0.6
	Sometimes	2	1.3
	Never	153	96.8
10 Do you take the effort to improve your dental health knowledge?	Always	46	29.1
	Frequent	94	59.5
	Sometimes	16	10.1
	Never	2	1.3

The association between demographic background and level of knowledge

The demographic background of the participants did not have any correlation with the level of their knowledge on ECC, as depicted in Table V. The Spearman's correlation test showed no significant difference between the level of knowledge and the age, gender, monthly income, educational background, number of children and their working experience, with p-value > 0.05.

Table V: Association between demographic background and knowledge level

Spearman's rho correlation test

		Age	Gender	Education	Working experience	Monthly income	Number of child
Knowledge level	Correlation coefficient	0.07	0.062	0.085	0.042	0.073	0.08
	Sig. (2-tailed)	0.355	0.42	0.291	0.603	0.364	0.282

*Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION

Dental caries are highly preventable. Oral health education and literacy play an integral part in the prevention of dental caries. Low literacy and knowledge for example are often associated with problems in utilising preventive healthcare services, poor adherence to medical and dental advice, poor self-management skills and poor oral health outcomes (21). Thus, it is of paramount importance for medical nurses to equip themselves with adequate oral health knowledge and literacy before any ward-based preventive dental program can be implemented. Their current knowledge, attitude and practice on the EEC should be assessed as well to identify areas of deficient and unhealthy practice that can be addressed promptly.

The nurses in this study were mostly female. This is

common in the nursing profession, which is dominated by females globally (22). The mean age of the nurses in this study was 37 (±4.93) years and all of them have at least 1 child aged below 6 years old. This shows that all of them have experience in managing their own child's oral health. In addition, the mean period of service of the participating nurses is 13.35 (±5.82) years. Nurses with over a decade of service are likely to have extensive experience in paediatric healthcare. They may have cared for numerous children affected by ECC, witnessing its prevalence, severity, associated complications and how the disease impacts the child's oral health and overall well-being over time. Their valuable experience in healthcare service gives an added advantage in establishing a ward-based oral health preventive program since these nurses may have refined their skills in patient education and advocacy, empowering parents and caregivers with the knowledge and resources needed to maintain good oral health practices in children. Further, their involvement is crucial for developing comprehensive strategies that encompass clinical care, community engagement, advocacy, and policy reform to promote optimal oral health outcomes for children.

Overall, the knowledge of the medical nurses in the present study on EEC was good. Their level of knowledge was not influenced by their demographic background. There was no statistically significant correlation found between those demographic data and their knowledge level. Despite that, these results should be interpreted with caution. The majority of the nurses were of the same gender, had similar levels of education and were from the M40 income earners group. They were recruited as the hospital staff from the feeder nursing diploma program offered by the university. This explains the age and length of service of the participants that lie within a similar range, with low standard deviation for both parameters. Due to the lack of data heterogenicity, the demographic background has little influence or effect, explaining the non-significant correlation of these parameters on their level of knowledge.

However, other studies have reported an inverse relationship between the level of knowledge on dental caries with the educational background (23,24) and socio-economic status (24,25), reflecting the influence of both parameters in the knowledge level of parents on dental caries. Interestingly, gender difference also has been found to have effects on oral health knowledge. Lipsky et al. (26) concluded that women have better oral health attitudes and more positive preventive behaviours than men, particularly due to their higher knowledge and awareness on oral health. Sfeatcu and colleagues (27) were also on the same note, stating that women have higher oral health literacy and education than men, which later influences their good oral health behaviours, attitudes and practice.

The findings from this study revealed a disparity between the medical nurses' knowledge, attitude, and practice on ECC. The medical nurses have a good level of knowledge on ECC and this was reflected by their good caries-preventive practice. Nevertheless, their attitude is at the lower end of the spectrum. For instance, the medical nurses' knowledge on the type of food related to dental caries is very good, where all of them agree that foods high in sugar can cause dental caries. Due to this knowledge, most of them never or only sometimes expose their child towards sugary food or drinks, either through the bottle or sweetener-dipped pacifier and practice a good habit of rinsing their child's mouth with plain water after every meal. However, with regards to attitude, less than half of them agreed that prolonged bottle/breastfeeding can cause dental caries while approximately only two-thirds of them agree that naptime bottle feeding is associated with ECC. The delayed introduction of semi-solid food further supports their attitude towards prolonged bottle/breastfeeding beyond the suggested time. This reflects that the medical nurses acknowledge the role of sugar in dental caries formation, but were not aware on the role and impact of hidden sugar in relation to the initiation of ECC.

Similar outcomes have been reported by Gussy et al. (28) and Mani et al. (20), where parents and caregivers respectively have high knowledge on cariogenic foods, but are unable to identify the hidden sugars in their child's diet. This later may lead to the formation of ECC secondary to prolonged naptime bottle/breastfeeding. Interestingly, a study done among healthcare professionals in the United Kingdom involving paediatric nurses, auxiliaries and midwives showed that most of the respondents thought that there was no link between breastfeeding and dental caries formation (19).

In addition, the medical nurses also lack awareness on the potential bacteria transmission vertically from parents to the child. The majority of them failed to recognise that oral bacteria particularly from their saliva can be 'passed down' to their children, especially when feeding them. The transmission can occur when parents tend to bite hard food into smaller pieces before feeding it to their child (20). One study in Myanmar reported that mothers, as part of their cultural belief, pre-chewed the rice for around 20 seconds when feeding their children. This poor attitude can lead to the introduction of the bacteria to the child, which later predisposes them towards poor oral health (29). Further, studies have proved that poor parental oral health has a positive linkage with high caries-risk children, attributed to the spread of bacteria from the parents which later colonise their child's pristine mouth (30, 31).

Another concerning aspect is the usage of fluoride. Despite most of the medical nurses knowing the preventive effects of fluoride, less than one-third of them

practice or dispense the right amount of fluoridated toothpaste for their child. To add more woe to this issue, only 18% of them agree that swallowing fluoridated toothpaste can lead to dental fluorosis and only 31.7% of the medical nurses agree that toothbrushing in children below the age of 6 should be supervised by their parents. Surprisingly, most of the literature reported similar outcomes. While the knowledge on the preventive effects of fluoride is well-known by the parents, most of them failed to identify the correct amount of fluoridated toothpaste that should be used and were not sure when to start using it (32,33,34). These findings showed that although the parents knew about the importance of using fluoridated toothpaste for caries prevention, the rationale behind it was not apparent to them as they were not aware of the detrimental effects of excessive fluoride usage on oral health (20). One of the possibilities is that the parents may have received the information on the importance of fluoridated toothpaste from the toothpaste advertisements in the media, but none of the advertisements manages to convey the important message on how and when to use it.

Therefore, in order to improve the knowledge, attitude and practice of the medical nurses on ECC, a specific and tailored-made oral health care module should first be introduced to the existing and in-service medical nurses. The module should not only cover the knowledge aspect but should also emphasise on the practical side of oral health care. Live demonstrations and hands-on training program will definitely improve their practice and attitude on the preventive aspect of ECC. The use of artificial intelligence online platform or a virtual reality simulation practise can be utilised to achieve better engagement with the nurses. On the other hand, the medical nurse's curriculum should also be revised to incorporate the oral health component in its syllabus. This will enlighten the newly graduated medical nurses on oral health care and its preventive strategies. In addition to that, incentives such as a day off or monetary payment can be introduced to attract more medical nurses involved in this program. Further, the willingness of the medical nurses to involve themselves with this program and the burden of their existing workload should be investigated as well. A research, either qualitative or quantitative can be conducted in the future to look into this aspect.

The present study has some limitations which can be improved in the future. Firstly, this was a cross-sectional study done among the medical nurses in the hospital. A focus group discussion and qualitative analysis can be done to capture any undefined themes or problems that may not be able to be captured through the questionnaire. Apart from that, the use of self-reported questionnaires also may be inaccurate if the respondents do not answer the questionnaire truthfully. This may lead to misinterpretation of the actual scenario. However, we believe that the medical nurses have answered the questions with full integrity and honesty. We did not anticipate any language issues or misinterpretation of the question since the questionnaires were prepared in dual language, both English and the native language of the medical nurses.

CONCLUSION

The role of medical nurses in combating the rise of ECC is pivotal, given their frontline position in paediatric care. Despite their high level of knowledge in understanding the aetiology and preventive measures of ECC, the translation of this knowledge into consistent attitude and practice appears limited. However, one should note that this study was conducted using a questionnaire which may limits the information needed to tackle the exact problem. A focus group discussion or qualitative study may be necessary to gain more information related to the KAP of the medical nurses on ECC. Further, training of the medical nurses through a specific oral health care module is necessary to plug this notable gap. Incorporating the current technology using the artificial intelligence and virtual reality simulation may increase the learning experience of the medical nurses. The preparedness of the medical nurses to involve with this program also need to be investigated and warrant future research.

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REFERENCES

1. Pitts NB, Baez RJ, Diaz-Guillory C, Donly KJ, Alberto Feldens C, McGrath C, et al. Early Childhood Caries: IAPD Bangkok Declaration. Int J Paediatr Dent. 2019;29(3):384-6. doi: 10.1111/ipd.12490.
2. Meyer F, Enax J. Early Childhood Caries: Epidemiology, aetiology, and prevention. Int J Dent. 2018;2018:1415873. doi: 10.1155/2018/1415873.
3. Kassebaum NJ, Bernabй E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of untreated caries: A systematic review and meta-regression. J Dent Res. 2015;94(5):650-8. doi: 10.1177/0022034515573272.
4. National Oral Health Survey of Schoolchildren 2017, Ministry of Health Malaysia. Available from: https://hq.moh.gov.my/ohp
5. National Oral Health Survey of Preschool Children 2015, Ministry of Health Malaysia. Available from: https://hq.moh.gov.my/ohp
6. Pitts N, Amaechi B, Niederman R, Acevedo AM, Vianna R, Ganss C, et al. Global oral health

inequalities: dental caries task group--research agenda. Adv Dent Res. 2011;23(2):211-20. doi: 10.1177/0022034511402016.
7. Vйlez-Leyn EM, Albaladejo-Martнnez A, Cuenca-Leyn K, Encalada-Verdugo L, Armas-Vega A, Melo M. Caries Experience and treatment needs in urban and rural environments in school-age children from three provinces of Ecuador: A cross-sectional study. Dent J (Basel). 2022;10(10):185. doi: 10.3390/dj10100185.
8. Oo MMT, Naing L, Mani S, Ismail AR. Dental caries experience and treatment needs in the mixed dentition in North East Malaysia. Arch Orofac Sci. 2011;6(2):41-8. Available from: https://aos.usm.my/index.php/content?view=article&id=117:vol-6-no-2&catid=45
9. Velasco SRM, Pistelli GC, Razera FPM, Menezes-Silva R, Bastos RS, Navarro MFL. Dental caries spectrum profile in Brazilian public school children and adolescents. Braz Oral Res. 2021;35:e067. doi: 10.1590/1807-3107bor-2021.vol35.0067.
10. Kastenbom L, Falsen A, Larsson P, Sunnegerdh-Grunberg K, Davidson T. Costs and health-related quality of life in relation to caries. BMC Oral Health. 2019;19(1):187. doi: 10.1186/s12903-019-0874-6.
11. Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: The human and economic cost of early childhood caries. J Am Dent Assoc. 2009;140(6):650-7. doi: 10.14219/jada.archive.2009.0250.
12. Nakre PD, Harikiran AG. Effectiveness of oral health education programs: A systematic review. J Int Soc Prev Community Dent. 2013;3(2):103-15. doi: 10.4103/2231-0762.127810.
13. Garbin CAS, Soares GB, Dycusse FRM, Garbin AJS, Arcieri RM. Oral health education in school: parents' attitudes and prevalence of caries in children. Rev Odontol UNESP. 2015;44(5):285–91. doi: 10.1590/1807-2577.0097.
14. Bramantoro T, Santoso CMA, Hariyani N, Setyowati D, Zulfiana AA, Nor NAM, et al. Effectiveness of the school-based oral health promotion programmes from preschool to high school: A systematic review. PLoS One. 2021;16(8):e0256007. doi: 10.1371/journal.pone.0256007.
15. Nicopoulos M, Brennan MT, Kent ML, Brickhouse TH, Rogers MK, Fox PC, et al. Oral health needs and barriers to dental care in hospitalized children. Spec Care Dentist. 2007;27(5):206-11. doi: 10.1111/j.1754-4505.2007.tb00348.x.
16. Martнnez-Beneyto Y, Navarrete-Garcна C, Serna-Mucoz C, Ausina-Mбrquez V, Poza-Pascual A, Expysito-Delgado A, et al. Spanish paediatricians' knowledge, attitudes and practices regarding oral health of children under 6 years of age: A cross-sectional study. Int J Environ Res Public Health. 2022;19(15):9550. doi: 10.3390/ijerph19159550.
17. Prakash P, Lawrence HP, Harvey BJ, McIsaac WJ, Limeback H, Leake JL. Early childhood caries and infant oral health: Paediatricians' and family physicians' knowledge, practices and training. Paediatr Child Health. 2006;11(3):151-7. doi: 10.1093/pch/11.3.151.
18. Eke CB, Akaji EA, Ukoha OM, Muoneke VU, Ikefuna AN, Onwuasigwe CN. Paediatricians' perception about oral healthcare of children in Nigeria. BMC Oral Health. 2015;15:164. doi: 10.1186/s12903-015-0151-2.
19. Nancy J, Barsby T, Theillaud M, Barbey-Massin C, Thйbaud NB. Early childhood caries prevention: non-dental health professionals' viewpoint. Br J Nurs. 2020;29(15):884-890. doi: 10.12968/bjon.2020.29.15.884.
20. Mani SA, John J, Yen W, Mastura N. Early childhood caries: Parent's knowledge, attitude and practice towards its prevention in Malaysia. Oral Health Care - Pediatric, Research, Epidemiology and Clinical Practices. In: Virdi, MS, editor. London: IntechOpen; 2012. Available from: https://www.intechopen.com/chapters/29333
21. Baskaradoss JK. Relationship between oral health literacy and oral health status. BMC Oral Health. 2018;18(1):172. doi: 10.1186/s12903-018-0640-1.
22. Limicana-Gras RM, Sбnchez-Lypez MP, Romбn AIS-S, Corbalбn-Bernб FJ. Health and gender in female-dominated occupations: The case of male nurses. J Men's Studies. 2013;21(2):135-48. doi: 10.3149/jms.2102.135.
23. Chen L, Hong J, Xiong D, Zhang L, Li Y, Huang S, et al. Are parents' education levels associated with either their oral health knowledge or their children's oral health behaviors? A survey of 8446 families in Wuhan. BMC Oral Health. 2020;20(1):203. doi: 10.1186/s12903-020-01186-4.
24. Kuter B, Uzel I. The influence of maternal factor on children's oral health: Mother's age, education level, toothbrushing habit and socioeconomic status. J Pediatr Res. 2020; 7(4):331-5. doi: 10.4274/jpr.galenos.2020.96977
25. Ellakany P, Madi M, Fouda SM, Ibrahim M, AlHumaid J. The effect of parental education and socioeconomic status on dental caries among Saudi children. Int J Environ Res Public Health. 2021;18(22):11862. doi: 10.3390/ijerph182211862.
26. Lipsky MS, Su S, Crespo CJ, Hung M. Men and oral health: A review of sex and gender differences. Am J Mens Health. 2021;15(3):15579883211016361. doi: 10.1177/15579883211016361.
27. Sfeatcu R, Balgiu BA, Mihai C, Petre A, Pantea M, Tribus L. Gender differences in oral health: Self-reported attitudes, values, behaviours and literacy among Romanian adults. J Pers Med. 2022;12(10):1603. doi: 10.3390/jpm12101603.
28. Gussy MG, Waters EB, Riggs EM, Lo SK, Kilpatrick NM. Parental knowledge, beliefs and behaviours

for oral health of toddlers residing in rural Victoria. Aust Dent J. 2008;53(1):52-60. doi: 10.1111/j.1834-7819.2007.00010.x.
29. vanPalensteinHeldermanWH, SoeW, van'tHofMA. Risk factors of early childhood caries in a Southeast Asian population. J Dent Res. 2006;85(1):85-8. doi: 10.1177/154405910608500115.
30. Law V, Seow WK, Townsend G. Factors influencing oral colonization of mutans streptococci in young children. Aust Dent J. 2007;52(2):93-100. doi: 10.1111/j.1834-7819.2007.tb00471.x.
31. Matsuyama Y, Isumi A, Doi S, Fujiwara T. Poor parenting behaviours and dental caries experience in 6- to 7-year-old children. Community Dent Oral Epidemiol. 2020;48(6):493-500. doi: 10.1111/cdoe.12561.
32. Alshehri M, Kujan O. Parental views on fluoride tooth brushing and its impact on oral health: A cross-sectional study. J Int Soc Prev Community Dent. 2015;5(6):451-6. doi: 10.4103/2231-0762.167728.
33. Wang Y, Jiang L, Zhao Y. Awareness of the benefits and risks related to using fluoridated toothpaste among doctors: A population-based study. Med Sci Monit. 2019;25:6397-6404. doi: 10.12659/MSM.918197.
34. Sudradjat H, Meyer F, Fandrich P, Wiesche ES, Limeback H, Enax J. Doses of fluoride toothpaste for children up to 24 months. BDJ Open. 2024;10(1):7. doi: 10.1038/s41405-024-00187-7.