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**Do expectant mothers know how Early Childhood Caries can be prevented? – A cross sectional Study**

**Short title: Expectant mothers' knowledge on caries prevention**

**Key words: Oral Health Knowledge, Dental care for children, Caries prevention**

**“The authors declare no conflict of interest”.**

**Ethical approval was obtained from the research ethics committees at the hospital and the University of Jordan.**

**“All authors have made substantive contribution to this study and/or manuscript, and all have reviewed the final paper prior to its submission.”**

## **Abstract**

### **Aim**

To evaluate the awareness, knowledge, and beliefs about Early Childhood Caries (ECC) among a sample of expectant mothers and to determine their preferences to help design appropriate interventions.

### **Methods**

Expectant-mothers attending for antenatal care at a large public hospital were interviewed and asked to complete a questionnaire about ECC. The questionnaire was pre-tested and validated and contained questions about risk factors, presentations, management and complications of ECC. Participants were also asked about their preferred method for oral health education about ECC. Data was analysed using SPSS for Windows release and descriptive statistics were generated.

### **Results**

Four-hundred expectant-mothers were approached and 380 (95%) agreed to participate. Fifty-nine percent reported brushing twice or more daily, but only 10% attended the dentist regularly. Only 16% thought that toothbrushing should start as soon as primary teeth erupt. Most (68%) thought bottle-feeding doesn't need to stop before the age of two. The majority believed that sugar is better consumed between meals (81%) and in portions throughout the day (85%). Only 12% thought that a child should have their first dental visit by the age of one. Educational level influenced knowledge on several aspects of ECC prevention. The participants suggested leaflets (38%) and social media (24%) as methods for oral-health-education delivery.

## **Conclusion**

Expectant mothers lack adequate knowledge about ECC prevention. There is a need for interventions that deliver advice on child toothbrushing, dietary practices, and dental attendance as part of wider general-health-promotion.

## **Introduction**

Dental caries is a very common disease that continues to affect children around the globe with children in developing countries being particularly vulnerable (Petersen 2013). The condition has a significant impact on the quality of life of children and their families (Ramos-Jorge et al., 2014). Early Childhood Caries (ECC) is defined as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six (<http://www.AAPD.org/policies>).

ECC is preventable. However; if ECC is to be prevented positive oral-health-practices need to be established early in life (Seow 1998). Strategies for prevention include preventing bacterial transmission, restricting dietary sugars, tooth brushing with fluoridated toothpaste, topical fluoride applications, and early dental visits (Marinho et al., 2009; Public Health England 2014; Seow 2018).

Poor oral health related knowledge and attitudes of parents were associated with higher caries experience of their children (Naidu and Davis 2008). On the other hand parental education on oral health has been proven to be effective in reducing the incidence of caries (Tinanoff and Reisine 2009), and oral health promotion initiated during pregnancy was successful in reducing early childhood caries (Plutzer and Spencer 2008).

In Jordan, caries affects 73% of 5 year old children (Sayegh et al., 2002) and evidence suggests there has been no improvement in child-oral-health over the last few decades (Hamdan and Rock 1993).

Jordanian children have poor oral-health-practices where only half of six-to seven year olds brush their teeth daily, and most are taken to the dentist only when symptoms occur (Rajab et al., 2002). Confectionery, biscuits, cakes and carbonated drinks are regularly consumed and many parents report bottle-feeding and prolonged breastfeeding at night (Sayegh et al.,

2005). However, it is unknown whether the parents, who play an important role in establishing those practices in early life (Hooley et al., 2012), simply lack knowledge on positive oral-health-practices or are aware of those practices but have been failing to implement them in their children due to other difficulties. As such, evaluating parental knowledge and establishing the population's oral-health-education needs would be an important step in designing future interventions.

Targeting expectant mothers has led to reductions in ECC incidence (Henry et al., 2017). In Jordan, 99% of expectant mothers are in contact with medical professionals during their pregnancy, but do not receive any oral-health-advice (Al-Habashneh et al., 2008).

The aim of this study was to evaluate Jordanian expectant mothers' knowledge and beliefs on ECC prevention and their preferences for oral-health-education delivery during antenatal care.

## **Methods**

The study was a cross sectional study of expectant mothers in Amman, Jordan. Recruitment took place in the antenatal clinic of Jordan University Hospital. This is one of the country's largest hospitals, providing health services to those with government health insurance (41% of the population) (The Hashemite Kingdom of Jordan High Health Council (2016)) and private paying patients. Ethical approval was obtained from the research ethics committees at the hospital and the University of Jordan (Reference number 10/2016/13114). The study was conducted in full accordance of the World Medical Declaration of Helsinki and conformed to the STROBE statement for observational studies

A researcher (H.D) attended the antenatal clinic three days a week on average during the period of data collection. All expectant mothers attending the clinic during that period (400) were approached, given the study's information letter, and invited to take part. Those agreeing to participate provided written consent and then completed the interview-questionnaire administered by the researcher. A sample calculation was performed using a simple 'survey' calculator (available on: <http://www.raosoft.com/samplesize.html>). This determined that 377 participants will need to be recruited to achieve a 95% confidence level in the participants' answers with a 5% margin of error.

The research team designed the study's questionnaire after a review of relevant literature. The questionnaire was first written in English, then translated to Arabic, and piloted in a group of ten expectant mothers. It consisted of four sections. In the first section, the participants' socio-demographic characteristics and current oral-health-practices were recorded. In the second section, their knowledge on ECC risk factors (Harris R et al., 2004; Public Health England 2014) and oral-health-care in children (was evaluated using multiple-answer questions. In addition, they were asked to identify sugary foods and drinks from a list of items. In the third section, they were asked a few questions to evaluate their views on the importance of child dental health and whether they had control over it. This was recorded using agree/disagree statements selected from a previous study (Finlayson et al., 2005). Finally, participants chose their preferred method for oral-health-education delivery from a list of options previously used in oral health education. The 57-item questionnaire can be seen in **Table 1**.

Data were entered to SPSS (version 20) and analysed. Descriptive statistics and frequency tables were used to report the participants' responses. Chi-square analysis was used to

investigate any potential associations between the participants' socio-demographic characteristics and oral health practices/knowledge in respect to caries preventive measures in children.

## **Results**

### *Sample characteristics*

Recruitment took place from May to December 2017. Four hundred expectant mothers were invited to take part and 380 (95%) consented and completed the questionnaire. The mean age of the participants was 29.5 years (range: 17-45) with a mean of 1.8 children (range: 0-4). Two hundred and sixty-six participants (70%) completed university education, while 84(22%) completed high school education, and 30(8%) stopped their education before highschool. One hundred and nineteen mothers (31.3%) were employed and 371 (95%) reported that the child's father was employed. Two hundred and thirty four (64%) lived in Amman.

### *Self-reported oral health practices of the participants*

Three hundred and seventy-five participants (99%) reported brushing their teeth using toothpaste, but only one knew the concentration of fluoride in the toothpaste she was using. Two hundred and twenty-four (59%) reported brushing twice or more daily, and 32(8.4%) reported using a dental floss. Only 38 (10%) reported attending the dentist regularly, while 312 (82%) attended only when having problems, and 30(8%) had never been to the dentist before.

### *Knowledge of child dental development and oral hygiene methods*



Two hundred and thirty-nine participants (63%) knew that eruption of primary teeth starts at the age of six months and 133 (35%) knew that the permanent first molars erupt at the age of six years. Two hundred and eighty six mothers (71%) thought that children should brush their teeth two or more times a day, and 233 (61%) knew that bedtime is the most crucial time. Only 61 participants (16%) thought tooth brushing should start as soon as primary teeth erupt, while 68 (18%) thought it should start at the age of one, 106 (28%) at the age of two, and 130 (34%) at the age of four. Fifteen mothers (4%) thought brushing primary teeth was not necessary.

One hundred and twenty-two participants (32%) thought that children should be supervised when tooth brushing up to the age of seven years, while 224 (59%) thought supervision isn't necessary after the age of three years. Eighty mothers (21%) reported that standing behind the child was the most appropriate position for assisting in tooth brushing, 201 (53%) suggested standing beside the child, 73 (19%) suggested standing in front, and 27 (7%) were not sure.

#### *Knowledge of recommended dietary practices in early childhood*

One hundred and twenty-two participants (32%) reported that bottle-feeding should be stopped by the age of one year, while 209 (55%) thought it should be by the age of two, and 49 (13%) by the age of three. One hundred and sixty-five (43%) participants thought that bottle-feeding with milk at night was not likely to cause caries, while 52 (14%) reported that adding sugar to the milk did not increase the risk of caries and 222 (58%) reported that using fruit juice in a bottle did not cause caries.

Three hundred and eight expectant mothers (81%) thought that the best time for sugar consumption is in-between meals, and 327 (85%) thought it is better if sugar consumption is divided in portions through the day. Regarding between-meals snacking, 194 participants (51%) reported that children could safely have one snack daily, 148 (39%) thought that children could have 2-3, and 38 (10%) believed they can have more.

Three hundred and sixty-four mothers (96.6%) thought that chocolate contained sugar, while 356 (94.5%) thought fizzy drinks did, and 338 (89.7%) thought fruit drinks did. Meanwhile 247 (65.8%) said biscuits contained sugar, and only 166 (44.5%) thought natural fruit juice had sugar.

#### *Knowledge on dental attendance during early childhood*

Forty-six participants (12%) knew that the child's first dental visit should be by their first birthday, while the rest thought it should be at the age of four (n= 91) (24%), once problems arise (n=163) (43%), or once the permanent teeth start erupting (n=65) (17%). When asked about the optimum frequency of children's visits to the dentist, 175 mothers (46%) thought it was only necessary when problems occurred, while 167 (44%) thought there should be regular visits once or twice a year, and 27 (7%) thought it should be up to four times per year. Three hundred and nineteen mothers (84%) said they did not know that a dentist could provide fluoride varnish.

#### *Attitudes towards child dental health*

Three hundred and sixty-five participants (96%) reported that oral health is important, 331 (87%) reported that primary teeth are important, and 304 (80%) and 300 (79%) respectively, that tooth brushing and regular dental visits can prevent dental caries. Regarding sugar

consumption and frequency of sugar snacking; 201 participants (53%) thought that restricting consumption would prevent child dental caries. One hundred and eighty two participants (48%) reported that they could not prevent caries.

#### *Preferred method for oral health education delivery*

One hundred and forty five mothers (38.2%) preferred leaflets as the method for delivering oral health education, 90 (23.7%) preferred social media, 65 (17.1%) preferred television shows, 58 (15.2%) preferred face to face visits, and 22 (5.8%) preferred phone calls.

#### *Impact of socio-demographic characteristics on oral health practice and knowledge*

Mothers' age and employment status did not have an impact on reported oral health knowledge or practices. However, educational level did have a statistically significant impact, as those with university or higher educational levels (n= 269) had better knowledge and attitudes relating to several items and were more likely to choose leaflets for oral health education delivery. **Figure 1** displays the impact of educational level on the participants' responses.

The presence of previous children also had a statistically significant impact, as mothers with children (n=266) were more likely to know when primary teeth erupt, think they can't stop caries, and attend only when problems arise. **Figure 2** details the impact of having previous children on the participants' responses.

## **Discussion**

The study aimed to evaluate Jordanian expectant mothers' knowledge and beliefs on ECC prevention and their preferences for oral-health-education delivery during antenatal care.

Mothers in this study lacked awareness and had major defects in their knowledge about ECC prevention. Their self-reported oral health practices were generally good. However; regular dental attendance was not common. The majority attended the dentist only when ‘in pain’ and intended to do so with their child. Most Expectant mothers in this study were not planning to start tooth brushing in their children before the age of two, or in some cases, the age of four or even later. They were also not aware of the importance of supervised tooth brushing up to the age of 7 where most thought that children could efficiently brush their teeth alone after the age of 3 (Public Health England 2014). In addition, they were unaware that dietary habits such as bottle-feeding at night, bottle-feeding past the age of 18 months, and frequent snacking in-between meals can lead to ECC (Harris 2004; Seow 2018).

Previous studies have similarly reported poor infant related oral health knowledge of expectant mothers and caregivers (Rothnie et al., 2012; Ashkanani and Al-Sane 2013).

Although most mothers in this study knew that chocolate, fizzy drinks, fruits drinks, and biscuits are cariogenic, many were unaware that fruit juice does contain sugar. Moreover, most were not familiar with the application of fluoride varnish and its benefits. Similar findings were reported in The UK (Correia et al., 2017).

Those with higher educational level demonstrated slightly better knowledge in some aspects, but overall knowledge was poor regardless of educational level. This coupled with the high prevalence of ECC in Jordan (Sayegh et al., 2002) means that at this stage, oral health education needs to be delivered in a ‘universal’ rather than ‘targeted’ approach.

Ninety-nine percent of Jordanian mothers attend for antenatal care (Department of Statistics (2016)), making this stage of medical care a good time to target them with an oral-health-intervention. Studies in other populations suggest that programs initiated during pregnancy

can be effective in reducing caries rates in young children (Plutzer and Spencer 2008; Henry et al., 2017).

Health-providers in Jordan should consider having a “dental check-up” visit as part of the antenatal care pathway to encourage mothers’ dental attendance, introduce them to fluoride varnish, and provide them with oral-health-education. The content of oral-health-education should be guided by the findings of this study. As such, key messages should include:

- Toothbrushing needs to start as soon as primary teeth erupt, using fluoridated toothpaste, and under parental supervision (Public Health England 2014).
- Bottle feeding at night, frequent bottle-feeding, and late weaning can lead to caries (Harris et al., 2004).
- Sugar intake in-between meals should be limited (Public Health England 2014) and natural fruit juice can be cariogenic (Tahmassebi et al., 2006).
- Regular dental attendance should start within the first year of life (Public Health England 2014). All children in Jordan under the age of six have access to free medical and dental care.
- Fluoride varnish can protect against caries in children (Marinho et al., 2009)

Face-to-face oral-health-education is valuable (Harris et al., 2012). However, it requires trained staff, which could present an issue for health-policy makers. Furthermore, most mothers in this study chose other methods for delivery including leaflets and social media. Children of mothers that have used oral health education leaflets in a previous study were less likely to develop caries (Plutzer and Spencer 2008). However, readability might present

an issue in those with lower health literacy (Johnson et al., 2003). This is why in this study, leaflets were popular with mothers that received university education, but were less popular with lower-educated mothers. Social-media is another option worth exploring. At the moment, it should not be used as a trusted source for advice on ECC prevention (ElKarmi et al., 2017), but evidence-based material could be designed and delivered to Jordanian mothers, as most have access to smart phones these days (Pew Research Center (2018)). A future study needs to evaluate those three methods of oral-health-advice delivery (leaflets, social-media, face-to-face).

Many mothers in this study felt helpless to stop caries in their children, and targeting them with an “educational” intervention will likely not be sufficient to tackle the issue of ECC. A previous study has shown that knowledge was weakly correlated with practice, which suggests that changing health related behaviors takes more than just improving knowledge (Ashkanani and Al-Sane 2013). As such, there is a need for a wider national oral-health-promotion strategy that helps families learn, apply, and sustain good oral health practices.

The issues that need to be explored include:

- Training primary medical care providers to deliver oral-health-advice, screenings and fluoride varnish (Douglass et al., 2009).
- Evaluating dental practitioners approach towards caries prevention in children and providing them with the training and support they need to deliver evidence-based preventive advice and care.

- Utilising schools for the delivery of child-friendly oral-health-education and fluoride application in schools. Video-games can be used as an option to be explored (Aljafari et al., 2017)
- Establishing a national policy of banning the sale of cariogenic foods in schools.

This study had its limitations; the questionnaire used was designed by the research team due to the lack of a validated Arabic questionnaire on child caries prevention. In addition, the use of a 'structured' questionnaire limited insight into some interesting issues, such as the parental belief that sugar should be given in portions. A qualitative study granting further insight into the beliefs and practices of Jordanian families might be beneficial. Furthermore, the study relied on self-reported oral-health-practices, which cannot be verified. Finally, recruitment took place in a hospital that does not serve all segments of the population, since those not insured attend for care at other facilities. Despite this, the results of this study can probably be generalized to the Jordanian expectant mothers population, as the sample compares well with the Jordanian ever-married-women population in terms of age, education, and employment (Department of Statistics (2016)). The capital Amman might have been over-represented as 64% were from the city, which is home to 40% of the Jordanian population (Department of Statistics (2016)). It is important to note that Jordan is a country with over a million Syrian refugees (Department of Statistics (2016)) and those have not been part of the study as they receive maternal care elsewhere in the country. It is possible that the knowledge and beliefs of mothers in this study reflects those of mothers from other culturally similar middle-eastern countries. However, because of the variance in the socioeconomic and

political conditions and health-care systems across the region, generalization of these results without further investigation is not possible.

## **Conclusion**

Jordanian expectant mothers have significant gaps in their knowledge of caries prevention in children, when it comes to oral hygiene methods, dietary practices or dental attendance and preventive care. The findings underline the need for oral health promotion action in this cohort that would include oral health education in addition to wider action sustaining and facilitating healthy oral health practices in their children.



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**Table 1: Questionnaire**

**Sample characteristics**

- Age
- Residence
- Insurance
- Education level of mother
- Employment (mother and father)
- Number of children
- Age of eldest child

**Self-reported oral health practices of the expectant mothers**

- Use of toothbrush
- Use of toothpaste
- Use of floss
- Use of mouthwash
- Use of Siwak
- Frequency of tooth-brushing
- Knowledge of fluoride in toothpaste
- Frequency of dental visits
- Last dental visit
- Reason for the last dental visit

**Knowledge of child dental development and oral health**

- Knowledge of eruption time of first primary tooth
- Knowledge of eruption time of first permanent tooth
- Age to start brushing
- Size of toothbrush
- Age to start using toothpaste
- Tooth brushing frequency in children
- Tooth paste size in children
- Most important time to brush
- Age of supervision on tooth brushing
- Position during tooth brushing

**Knowledge of recommended dietary practices for children under six years of age**

- Do the following food and drink items contain sugar
  - Biscuits
  - Chocolate
  - Cheese
  - Vegetables
  - Fruits
  - Fizzy drinks
  - Fresh fruit juice
  - Artificial fruit juice
  - Milk
- Frequency of snacks per day
- Best time for sugar consumption
- Sugar consumption at once or in portions
- Age to stop bottle feeding
- Which of the following behaviours may cause caries
  - Bottle use for short time during the day
  - Bottle use for long time during the day
  - Bottle use throughout the night
  - Consumption of sugar in bottle
  - Consumption of natural juice in bottle

**Do you agree with the following statements**

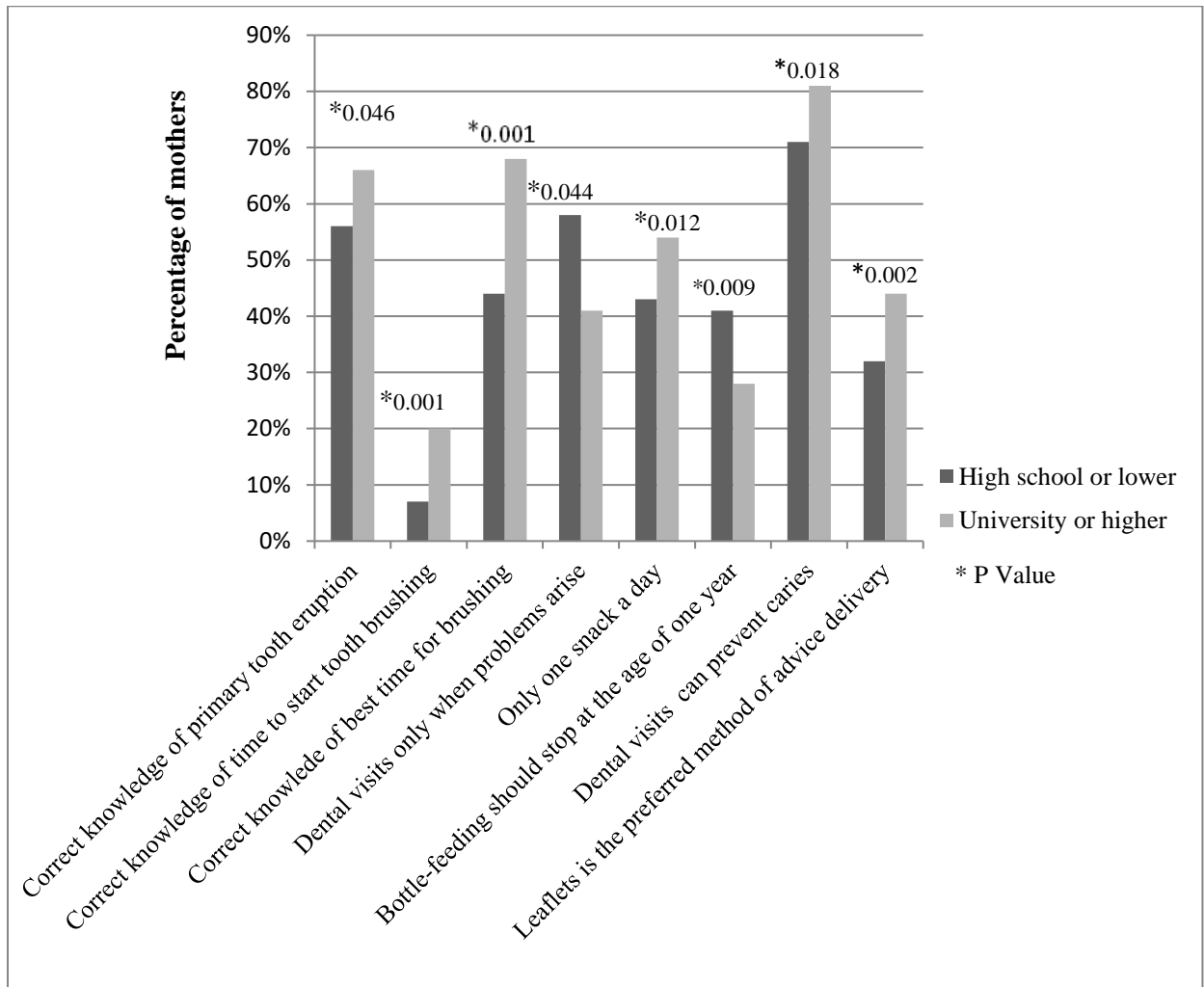
- Restricting sugar consumption stops caries
- Tooth brushing stops caries
- Regular dental visits stop caries
- Oral health is important to general health
- Primary teeth are important
- I can't stop caries

**Preferred method for oral health related advice delivery**

## Figure Legends

<b>Figure 1</b>	Impact of educational level on survey responses
<b>Figure 2</b>	Impact of previous children on survey responses

**Figure 1:** Impact of educational level on survey responses



**Figure 2:** Impact of previous children on survey responses

