Parents' Education Level and Children's BMI Explain Caries Distribution Among Kindergarten Students: A Cross-Sectional Study

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Abstract

Background: Dental caries is a common but preventable, multifactorial disease in children. Among several others, it is influenced by child- and parent-related factors.

Aims: To describe knowledge, attitude and practices about oral health among parents of kindergarten children and assess factors influencing caries distribution among the children.

Methods: Parents of 290 kindergarten children in AlMadinah, Saudi Arabia, answered questions concerning their oral health knowledge, attitudes and practices. The children underwent an oral clinical examination. Data were collected between February and April 2018. Comparison between groups was done using the Kruskal–Wallis test.

Results: All parents agreed on the importance of fluoride to strengthen teeth, while 91.7% thought that sweets have a negative impact on teeth. Almost all children ate sweets and candies (99%), while most of them used toothbrushes and fluoride to clean their teeth (98%). Only 66% of parents took their children to the dentist. The 2-step cluster analysis revealed that clusters of children with high body mass index (BMI) and those whose parents had only primary education had the highest caries prevalence compared to clusters of children with lower BMI and parents with higher education ($P < 0.05$).

Conclusions: Within the study limits, parents demonstrated good oral health knowledge, attitudes and practices. Kindergarten children had high caries, especially those with high BMI and whose parents had low educational levels.

Keywords: kindergarten children, dental caries, knowledge, attitudes and practices, parents

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Introduction

Oral health is an essential part of the general health of the child as it has a major effect on psychological and physiological well-being (*1*). Dental caries is considered one of the most common infectious diseases of childhood (*2*). The prevalence of dental caries among children indicates the need for special attention to resolve this problem. In the United States of America, over 50% of 5–9-year-old children have at least one cavity or restoration (*3*). Southeast Asia registered a median caries experience of 79% in children aged 5–6 years (*4*). The Gulf Cooperation Council countries had an overall estimation of 80% prevalence of caries in primary teeth (*5*): in particular, Saudi Arabia indicated a high proportion of decayed, missing and filled teeth (dmft) among preschool and primary school children in different parts of the country (*6*).

Dental caries is well established as a multifactorial disease that can be principally prevented by effective oral hygiene and avoiding frequent consumption of sugary food (*7*). Accordingly, considerable efforts have been directed towards studying attitudes and behaviour towards dental hygiene. In children, the child's attitude has been connected to several factors such as mother's education level, parent's attitude, demographics and the socioeconomic status of the family (*8*). The key elements that have shown an impact on children's oral hygiene behaviour and oral health status are parents' oral health-related attitudes, general knowledge and health status (*9*). Parental and related factors play a major role in the child's attitude towards dental health, and their positive reinforcement may ultimately affect the child's caries experience (*10*).

To the best of our knowledge, no study has attempted to categorize dental caries distribution among preschool children based on child- and parent-related data in Saudi Arabia. The aims of this study were thus to describe parents' oral health knowledge, attitudes and practices and their children's caries experience, and to categorize the children's caries distribution based on child- and parent-related data in a number of schools in AlMadinah AlMunawwarah.

Methodology

Study design and sample

We carried out a cross-sectional analytic investigation involving public kindergartens in AlMadinah AlMunawwarah city, Saudi Arabia. AlMadinah AlMunawwarah is one of the largest administrative regions in the country. It is also one of the 2 holy sites and a destination for religious tourists alongside Makkah AlMukarramah. It has a growing, diverse metropolitan population of approximately 1.1 million (*11*).

There are 76 public kindergartens in AlMadinah, with more than 7 thousand students. These kindergarten schools are divided over 3 administrative areas according to their geographic location: northern, eastern and western (*12*). We selected 6 kindergartens for the study, 2 from each administrative area. The kindergartens were selected through randomized cluster sampling, however, participants were recruited consecutively as a convenience sample based on fulfilment of inclusion criteria.

The sample size was estimated using a sample size calculator (Creative Research Systems, Sebastopol, CA). Considering the total population size (*N*) for finite population correction (fpc) factor = 7541, with a hypothesized frequency (%) of the outcome variable number of dmft in the population (*p*) of 50% (+/– 5), and confidence limits as percentage of 100 (absolute +/– %) (*d*) of 5%, with an anticipated design effect (for cluster surveys-*DEFF*) for the outcome variable of 1, and by adapting the sample size equation (*n*) = [DEFF × Np(1–p)]/[(d2/Z21–α/2 × (N–1)+p × (1–p)] × (1–p)], a minimum sample size of 290 students was required to conduct the study.

Study overview

The participants, parents from the selected kindergartens, responded to a questionnaire that measured their knowledge, attitude and practices regarding the oral health of their children. They received an electronic version of the questionnaire on their smart mobile devices via popular application (WhatsApp, California, USA) used for social communication and portable file exchange.

All children from the selected schools completed an oral health promotion programme to educate them about oral disease, risk factors, the importance of their teeth and how they can maintain them in good health. The correct way of tooth brushing was also demonstrated. Then, those children whose parents had filled out the questionnaire and signed the consent form were given a clinical examination. This included measuring the height and weight of the child to calculate body mass index (BMI), and an oral clinical examination. Data collection was carried out between February and April 2018.

Inclusion and exclusion

Children aged 4–6 years attending public kindergartens whose parents had completed the questionnaires and signed the consent forms were included in this study. Other children or those who were enrolled in private kindergartens were excluded.

Study tools

A pre-structured, self-administered Arabic language questionnaire was distributed among the parents. The majority of questions were adopted from a previously validated questionnaire (*13*). Questions were added to the original version to cover aspects of practices and attitudes of the children at a young age. The answer format for some questions was changed from a dichotomous (yes/no) format to a 5-point Likert scale format. The modified questionnaire was pilot tested on 23 parents of children in the selected kindergartens, and their responses showed understanding of the questions. No modification to the finalized questionnaire was required after the pilot phase. Thus, responses from the pilot phase were included in the final analysis.

The questionnaire comprised 2 parts. The first covered demographic information of the parents and children such as parent's age, education level and occupation, relation to the child, and child's age and sex. The second part included 33 items designed to evaluate the knowledge, attitudes and practices of the parents and their children regarding their child's oral health. The section on parents' knowledge included items asking about causes of dental caries and their prevention, the meaning of dental plaque and its effects, and the effects of brushing and using fluoride on the teeth. Knowledge of the effects of sweets and soft drinks on the teeth was also recorded. Assessment of children's oral health practices included asking the parents about their child's brushing activities such as brushing aids, frequency, duration and time and their nutritional habits, and negative practices such as nail biting and teeth clenching. Some questions probed the parents' attitudes towards their child's oral health. These included the child's feeding pattern and their influence on their child's oral hygiene such as advice and encouragement to brush, watching their child during brushing and taking their child to the dentist.

The children then had their height and weight measured using a measuring tape and a regular scale. This was followed by a full-mouth, oral clinical examination performed using a disposable mouth mirror and a light source to detect the number of dmft. This was carried out according to the World Health Organization's basic methods for assessing children's oral health (*14*). The examination was limited to the primary teeth, as the first permanent molar was only occasionally present, and when present it was often only partially erupted. Accordingly, the decision was made to exclude the first permanent molar for standardization purposes. The examinations were conducted by 8 final-year senior dental students after being carefully trained by an experienced faculty member.

Ethical considerations

The study was approved by the ethical committee at the Taibah University College of Dentistry, AlMadinah Al-

Munawwarah (approval NO. TUCDREC/20180115/Alsisi; 30/01/2018). It followed the ethical principles outlined in the Declaration of Helsinki (*15*). Parent's approval and informed consent were obtained before recruiting their children into the study. Parents were informed that data would be anonymous and treated with confidentiality. They were assured that there would be no intervention and no harm to them or their children. The participants were informed about the results of their oral examination. Participation was voluntary, and no negative repercussions resulted as a consequence for children who were excluded or who chose not to participate in the study.

Data analysis

Descriptive statistics in terms of measures of central tendency and dispersion, and frequency distribution and percentages were used to illustrate the demographic variables, the parent's knowledge and attitudes and the child's practices relating to oral health, and the caries experience. For illustrative purposes, the 5-point answers were combined into 2 during the presentation of the data. Inferential statistics were performed to compare different parent characteristic groups with regard to their children's caries experience. However, no specific patterns were observed that would answer the study questions (data not shown). Accordingly, a 2-step cluster analysis was performed to categorize the studied sample into clusters based on parent- and child-related variables. This was done to explain the distribution of dental caries among the studied sample within clusters of certain characteristics. Different parent- and child-related variables were tried out in the model until the model cohesion read "good" following the entry of the variables: parent education level, sex of child and BMI of child.

The Kruskal–Wallis test was used to compare the resulting clusters in regard to the mean number of dmft. The significance level was set at 0.05. Data were entered and analysed using *SPSS*, version 20.0 (IBM, Armonk, New York, USA).

Results

Out of the entire school population of 7541 children, a total of 290 children were included from the 6 schools selected in the 3 main administrative areas: 133 from eastern schools, 82 from northern schools and 75 from western schools. The children's mean age was 5 [standard deviation (SD) 1] years; 51% were females. The mean BMI was 16 (SD 3) kg/m^2, while the mean number of dmft was 4 (SD 4) (Table 1). No significant differences were observed among children of different sexes or BMI in terms of caries experience (data not shown). Seventy-one percent of the parents or guardians held a higher education degree, while 32% were unemployed (Table 1).

With regard to parents' oral health knowledge, the majority of parents agreed on statements such as the importance of fluoride for strengthening teeth (91.4%) and the negative impact of soft drinks and sweets on teeth (91.7%) (Table 2). Only a few parents agreed that oral bacteria may possibly transfer from parents to their children (14.1%) and that caries affecting primary teeth was permanent (18.6%).

Table 1 Distribution of child- and parent-related variables for the sample (n = 290)

Variable	Value
Child-related	
Mean (SD) age (years)	5 (1)
Sex: no. females/males (%)	149/141 (51/49)
Mean (SD) body mass index (kg/m^2)	16 (3)
Mean (SD) no. decayed teeth	4 (4)
Mean (SD) no. missed teeth	0.1 (0.5)
Mean (SD) no. filled teeth	0.2 (0.7)
Mean (SD) no. decayed, missing and filled teeth	4 (4)
Parent-related	
Mean (SD) age (years)	36 (7)
Relation to child – no. mothers/fathers (%)	141/149 (49/51)
Education, no. (%)	
Primary	15 (5.2)
Intermediate	70 (24.1)
Higher	205 (70.7)
Occupation, no. (%)	
Retired	7 (2.4)
Unemployed/student/housewife	94 (32.4)
Elementary occupations	21 (7.2)
Service occupations	109 (37.6)
Administrative/associate professional	27 (9.3)
Senior official/professional	32 (11.0)

SD = standard deviation.

With regard to child practices, the majority of parents indicated that their children ate sweets and candy (99.7%) but also cleaned their teeth using a toothbrush and toothpaste (96.9%); 18.6% had nail-biting habits (Table 3).

Parents' attitudes towards their children's oral health is described in Table 4: 93.8% reported caring about their child brushing their teeth, while 55.9% reported that they had taken their child to the dentist.

Following the 2-step cluster analysis based on parents' education level, child's sex and BMI, 4 clusters resulted (Figure 1). Parents in the 3rd and 4th clusters had a higher level of education; clusters 1 and 2 comprised 56% females (Figure 1). The mean number of decayed teeth in the 2nd cluster was 6.3 (SD 4.5), compared with around 3 (SD 3) to 4 (SD 4) in the remaining clusters ($P < 0.05$) (Table 5). No statistically significant differences in the number of dmft were observed between the clusters ($P > 0.05$).

Discussion

This study aimed at describing parent's oral health knowledge, attitudes and practices and their children's caries experience. The findings suggest better parental general oral health knowledge, attitudes and practices when compared with other studies (*16*,*17*). This might be

Table 2 Responses of parents (*n* = 290) of kindergarten children in AlMadinah to the oral health knowledge question, 2018

Question	Agree	
	No.	%
Regular visits to the dentist are important	253	87.2
Using fluoride strengthens the teeth	265	91.4
Regular brushing of teeth can protect from caries	256	88.3
Gum bleeding means inflamed gum	233	80.3
Dental plaque can lead to gingivitis	206	71.0
Dental plaque can lead to dental caries	166	57.2
Dental plaque refers to the soft debris on teeth	183	63.1
Frequent snacking between meals can cause dental caries	126	43.4
Soft drinks can affect the teeth adversely	266	91.7
Consumption of sweets can negatively affect the teeth	266	91.7
Bacteria can be transferred from parent to the child via sharing utensils	41	14.1
Bacteria are normally present in saliva and on teeth	162	55.9
Dental caries are caused by bacteria in the mouth	168	57.9
Caries affecting primary teeth is permanent	54	18.6
Primary teeth are important	188	64.8
Dental caries may affect the child's psychology	242	83.4
General health is related to oral health and dental diseases	245	84.5

due to the observed rapid increase in provision of health maintenance information across the media, which presumably reflects on improved oral health awareness among parents (*18*).

The prevalence of caries among children in AlMadinah was similar to that in some European countries (*19*). No differences were observed between the 6 kindergartens or the 3 educational areas with regard to caries prevalence (data not shown). Available literature shows that the number of dmft among preschool children has notably been decreasing since 2013 (*20*). A possible factor could be the growing influence of the health insurance market in the country. One study showed that uninsured children were 2.5 times less likely to receive dental care than insured children (*3*). Children from families without dental insurance were 3 times more likely to have dental care needs than children with either public or private insurance (*3*).

When dividing our sample into clusters, caries prevalence was highest in the cluster with less educated parents. This is in line with a study from Italy where increased caries in children was associated with lower education level of parents and lower income level (*21*). It has been observed that families within the same local community differ in their views regarding prioritizing oral healthcare, where educational background and treatment expenses may be among several contributory factors (*22*).

A higher caries prevalence was observed in the cluster with more girls. This is in contrast to a study in West Virginia in which girls aged 1–5 years had lower caries levels than boys of the same age (*23*). It was suggested that differences in caries experience between boys and girls were related to psychological, economic, hormonal and even cultural reasons (*24*).

Similarly, the cluster with higher BMI demonstrated higher caries experience. Although it is controversial, a systematic review reported that only one-third of the included studies showed a positive relationship between BMI and dental caries in children and adolescents (*25*). It is plausible to assume that children with obesity have an increased risk of caries since unhealthy dietary habits are a common risk factor for obesity and dental caries (*26*).

Our investigation adopted a cross-sectional design, and used a convenience sample with unequal recruitment of the sample from the participating kindergartens. This may have limited the generalizability of the study findings and possible causes. Despite this, the suggested associations due to the study limitations may open

Table 3 Responses of parents (*n* = 290) of kindergarten children in AlMadinah to questions relating to their attitude towards their child's oral health, 2018

Question	Yes	
	No.	%
Does your child clean his/her teeth with tooth brush and toothpaste?	281	96.9
Does your child use dental floss?	12	4.1
Does your child use mouth wash?	24	8.3
Does your child use toothpicks?	32	11
Does your child have nail-biting habits?	54	18.6
Does your child have thumb-sucking habits?	15	5.2
Does your child have tooth-clenching habits?	27	9.3
Does your child have other negative teeth habits?	7	2.4
Does your child eat candy, chocolates or sweets?	289	99.7

Table 4 Responses of parents (*n* = 290) of kindergarten children in AlMadinah to questions related to their attitude towards their child's oral health, 2018

Question	YES	
	No.	%
Does your child have a bottle at bedtime?	27	9.3
Do you care about brushing your child's teeth?	272	93.8
Do you encourage your child to brush his/her teeth?	268	92.4
Do you watch your child during tooth brushing?	268	92.4
Do you advise your child to brush the teeth without watching him/her?	235	81.0
Have you ever taken your child to the dentist?	162	55.9

Figure 1 The output of the 2-step cluster analysis based on the input variables "parent educational level", "sex of child" and "BMI of child" (*n* = 290).

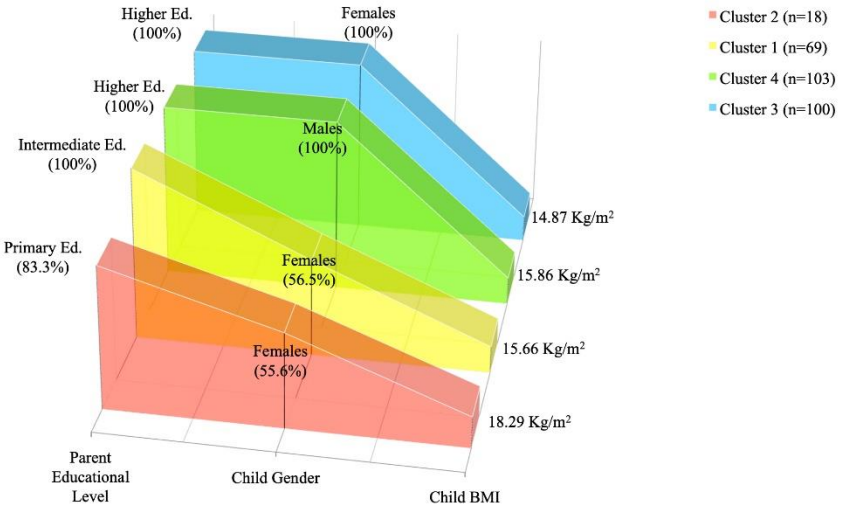

Table 5 Comparison between the 4 clusters in regard to number of decayed, missing and filled teeth

Variable	All (*n* = 290)	Cluster 1 (*n* = 69)	Cluster 2 (*n* = 18)	Cluster 3 (*n* = 100)	Cluster 4 (*n* = 103)	*P*-value
Mean (SD) no. decayed teeth	3.6 (3.8)	3.6 (3.9)	6.3 (4.5)	3.3 (3.6)	3.3 (3.5)	0.044
Mean (SD) no. missing teeth	0.1 (0.5)	0.1 (0.6)	0.0 (0.0)	0.0 (0.2)	0.1 (0.5)	0.847
Mean (SD) no. filled teeth	0.2 (0.7)	0.2 (0.9)	0.2 (0.5)	0.2 (0.6)	0.1 (0.6)	0.731
Mean (SD) no. decayed, missing and filled teeth	3.9 (3.9)	4.0 (4.2)	6.5 (4.6)	3.5 (3.6)	3.5 (3.4)	0.056

Cluster 2 had significantly more decayed teeth than the other clusters (Kruskal–Wallis test).
SD = standard deviation.

numerous possibilities for future research. Second, the questionnaire we used was mostly new, although based on previous versions in the literature. This may affect the validity of the tool. However, the tool was pilot tested to assure the use of an appropriate measure for the study variables. The clinical examination only measured the number of dmft, which may have limited the possible interpretation of the study findings. Nevertheless, the included variables were decided upon based on previous similar studies to facilitate meaningful comparisons. Moreover, permanent first molar teeth were excluded from the examination, which may have resulted in underestimation of the reported caries prevalence. However, this report from Saudi Arabia on the primary dentition may still have value from an epidemiological perspective. The clinical examination was conducted by 8 examiners, which may have impacted its reliability. Training of the examiners by an experienced clinician may have reduced the negative impact of this detail.

Within the limitations of this study, it can be concluded that parents of kindergarten children demonstrated high levels of oral health knowledge. The children exhibited negative dietary and personal habits, but used appropriate tooth cleaning aids. Parents showed positive attitudes towards maintaining their children's oral health. A high caries prevalence was observed, especially in children with obesity and whose parents were of low educational levels.

Findings of this study necessitate the conduct of oral health educational programmes for parents and their children, and highlights the influence of parents and lifestyle on the child's oral and general health.

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Le niveau d'éducation des parents et l'indice de masse corporelle des enfants comme causes de la distribution des caries chez les enfants des crèches : étude transversale

Résumé

Contexte : La carie dentaire constitue une affection multifactorielle courante mais évitable chez les enfants. Comme plusieurs autres affections, elle est influencée par des facteurs liés à l'enfant et aux parents.

Objectifs : Décrire les connaissances, attitudes et pratiques en matière de santé bucco-dentaire chez les parents d'enfants de crèches et évaluer les facteurs influençant la distribution des caries chez les enfants.

Méthodes : Les parents de 290 enfants de crèches à AlMadinah (Arabie saoudite) ont répondu à des questionnaires concernant leurs connaissances, attitudes et pratiques en matière de santé bucco-dentaire. Les enfants ont fait l'objet d'un examen clinique oral. Les données ont été collectées entre février et avril 2018. La comparaison entre les groupes a été effectuée à l'aide du test de Kruskal-Wallis.

Résultats : Tous les parents convenaient de l'importance du fluor pour renforcer les dents, tandis que 91,7 % pensaient que les sucreries ont un impact négatif sur les dents. Presque tous les enfants consommaient des sucreries et des bonbons (99 %), tandis que la plupart utilisaient des brosses à dents et du fluor pour nettoyer leurs dents (98 %). Seuls 66 % des parents emmenaient leurs enfants chez le dentiste. L'analyse par grappes en deux étapes a révélé que les grappes d'enfants ayant un indice de masse corporelle (IMC) élevé et ceux dont les parents n'avaient qu'un niveau d'éducation primaire présentaient également la prévalence de caries la plus élevée par rapport aux grappes d'enfants ayant un IMC plus faible et dont les parents avaient un niveau d'éducation supérieur ($p < 0,05$).

Conclusions : Dans les limites de l'étude, les parents ont démontré de bonnes connaissances, attitudes et pratiques en matière de santé bucco-dentaire. Les enfants de crèches ont un grand nombre de caries, notamment ceux avec un IMC élevé et un niveau d'éducation parental inférieur.

مستوى تعليم الآباء ومؤشر كتلة الجسم لدى الأطفال يوضحان توزيع التسوُّس بين طلاب رياض الأطفال: دراسة مقطعية

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الخلاصة

الخلفية: تسوُّس الأسنان مرض شائع ومتعدد العوامل ويمكن الوقاية منه لدى الأطفال. ويتأثر بعوامل متعلقة بالأطفال والآباء، إلى جانب العديد من العوامل الأخرى.

الأهداف: هدفت هذه الدراسة إلى وصف المعلومات والاتجاهات والممارسات المتعلقة بصحة الفم لدى آباء الأطفال في مرحلة رياض الأطفال، وتقييم توزيع تسوُّس الأسنان لدى الأطفال بحسب العوامل المرتبطة بالأطفال والآباء.

طُرق البحث: أجاب آباء 290 طفلاً في مرحلة رياض الأطفال في المدينة المنورة بالمملكة العربية السعودية على استبيانات تتعلق بمعلوماتهم واتجاهاتهم وممارساتهم المتعلقة بصحة الفم. وخضع الأطفال لفحص سريري للفم. وجُمعت البيانات في الفترة ما بين فبراير/ شباط وأبريل/ نيسان 2018. وأُجريت مقارنة بين المجموعات باستخدام اختبار كروسكال واليس.

النتائج: اتفق جميع الآباء على أهمية الفلوريد لتقوية الأسنان، ويعتقد 92٪ منهم أن الحلوى لها تأثير سلبي على الأسنان. ويتناول جميع الأطفال تقريبًا الحلوى (99٪)، ويستخدم معظمهم فُرش الأسنان والفلوريد لتنظيف أسنانهم (98٪). ويصطحب 66٪ فقط من الآباء أطفالهم لزيارة طبيب الأسنان. وكشف تحليل المجموعات المكوَّن من خطوتين أن مجموعات الأطفال الذين يتمتعون بمؤشر كتلة جسم مرتفع وأولئك الذين لم يحصل آباؤهم إلا على التعليم الابتدائي كان لديهم أعلى معدل لانتشار التسوُّس مقارنةً بمجموعات الأطفال الذين يتمتعون بمؤشر كتلة جسم أقل وحصل آباؤهم على تعليم أعلى (القيمة الاحتمالية < 0.05).

الاستنتاجات: في حدود هذه الدراسة ، أظهر الآباء معلومات واتجاهات وممارسات جيدة بشأن صحة الفم . ويعاني الطلبة في مرحلة رياض الأطفال من نسب تسوس مرتفع خاصةً أولئك الذين لديهم مؤشر كتلة جسم مرتفع والذين لم يحصل آباؤهم إلا على التعليم الابتدائي .

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