



## ASSESSING THE PREVALENCE OF EARLY CHILDHOOD CARIES AND THE ASSOCIATED DETERMINANTS IN A GROUP OF PRESCHOOL CHILDREN: RESULTS FROM A NATIONAL ORAL HEALTH SURVEY IN EGYPT

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### ABSTRACT

**Objective:** This study provides information on the prevalence of early childhood caries among a sample of Egyptian Preschool children and the potential determinants associated with this condition.

**Methods:** A total of 651 preschool children were randomly selected from 160 gathering points in 26 governorates in Egypt. A face to face interview was conducted with children's primary caregivers and data on socioeconomic status, oral hygiene practices and feeding habits was collected. Information on caries experience was also recorded through dental examination following a standardized clinical protocol based on World Health Organization measures.

**Results:** More than 67% of the examined children had at least one decayed primary tooth and the mean dmf score was 3.3. Girls had lower mean dmf scores in comparison to boys. A weak positive correlation was detected between dmf scores in children and maternal caries experience ( $r = 0.130, P < 0.001$ ) whereas the correlation with frequency of tooth brushing was weak negative ( $r = -0.093, p < 0.001$ ).

**Conclusions:** Dental treatment needs among Egyptian preschool children are quite high and thus urging actions towards promoting oral health status of this population group need to be undertaken at community levels.

**KEY WORDS:** Early childhood caries, risk factors, preschool children, Egypt .

### INTRODUCTION

Though dental caries is a preventable disease at both individual and community level <sup>[1,2]</sup> and

despite the steady decline in its incidence in some

developed countries yet it is still considered one of

the most prevalent chronic conditions worldwide. <sup>[3]</sup>

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Early childhood caries (ECC), a common form of tooth decay which affects children 71 months of age or younger, <sup>[4]</sup> poses a serious public health issue especially in deprived and socially disadvantaged populations where the majority of decayed teeth are left untreated.

The pattern of ECC reflects a specific risk profile related to socio demographic, cultural and lifestyle factors. Low income families, malnourishment, low levels of maternal education, for example, have been strongly linked to less positive oral health behaviors, less utilization of dental services and in turn high prevalence of ECC. <sup>[5]</sup> Being associated with eating and sleeping disturbances, and because in its advanced stages it might cause pain and dental abscesses, ECC negatively affects children's quality of life. <sup>[6-9]</sup> Moreover, the condition can adversely affect growth patterns, speech development and increase a child's risk to develop dental caries in the permanent dentition. <sup>[10]</sup>

According to the 2015 Global burden disease study, globally, at least 560 million children have caries in their primary dentition. <sup>[3]</sup> In the Middle East, based on the findings of various epidemiological studies in some countries such as Saudi Arabia, United Arab Emirates, Kuwait and Qatar the prevalence of ECC was found to be high. <sup>[11-15]</sup> In Egypt, however, because epidemiological data on prevalence of various oral diseases was quite scarce, in 2013-2014 a national oral health survey was conducted and is considered the first population-based dental survey at country level in the last two decades. <sup>[16]</sup>

The aim of the current study was to provide information on the prevalence of ECC in a sample of Egyptian preschool children and some of the key maternal and child factors associated with the development of this condition.

## SUBJECTS AND METHODS

### *Study design/ethical considerations*

This cross-sectional study is a part of a national oral health survey which was conducted in Egypt in the year 2013-2014 by the Dental department, Ministry of Health and population under the auspices of the Country office of the World Health Organization(WHO).<sup>[16]</sup> The study proposal was revised and approved by the Research Ethic Committee – Egyptian Ministry of Health and Population on 7<sup>th</sup> May 2013 and the survey was conducted over a period of 9 months from September 2013 to May 2014. The study investigators explained to all participants the purpose of the survey; the benefits for the Egyptian population; privacy protection; and their right to refuse to participate or withdraw at any point while conducting the survey. The caregivers of all examined children had to provide a signed informed consent form in Arabic language prior to children's enrollment in the study.

### **Sampling**

Generally, in the national survey, a "Multi-Stage Stratified Cluster" Sampling technique was used as shown in Table (1). A total of 651 children were randomly selected from 160 gathering points located in 26 governorates in Egypt. The gathering points were mainly in mother and child primary healthcare centers however, in some governorates, some participants were recruited from households, public hospitals and sport clubs. This was done with the assistance of Central Administration of Dentistry and Heads of Dental Departments in each governorate.

### **Inclusion/Exclusion criteria**

Only preschool children with age range from 3 to 6 years whose parents signed an informed consent were included. Any children who participated in the national survey and had any erupting permanent teeth were excluded from the statistical analysis of this study.

## Study Procedures

### Questionnaire

A face to face interview was performed and the primary caregiver of each child participant (i.e. the person with the day to day responsibility for the care of the child) answered the study questionnaire on behalf of the child. Demographic data was collected as regards to place of residence (urban or rural), number of siblings, parents' level of education. The questionnaire measured other risk and protective factors for dental caries such as maternal caries experience, oral hygiene practices and dietary habits among children.

### Clinical examination

Caries experience was measured according to WHO standards using the dmft index which is based on presence of cavitated lesions in primary teeth such that the maximum dmft score (decayed/missing/filled teeth) per child could be 20. <sup>[17]</sup> Dental examiners followed a standardized protocol to record information about caries experience of all participants and the study clinical protocol was designed to collect tooth-specific caries data rather than surface-level measures. Examinations were conducted in a dental office or in the field. The examination for dental caries was conducted with a plane mouth mirror and proceeded in an

orderly manner from one tooth or tooth space to the adjacent tooth or tooth space. Usually subjects were examined seated in a chair with a high backrest with the examiner standing behind or in front of the chair. Investigators used lightweight battery-operated portable light sources and subjects faced away from any natural light source to avoid variation in illumination. Only cotton rolls and gauze were used to dry the teeth.

All examiners followed strict infection control guidelines such that disposable masks and gloves were used throughout the whole procedures of the survey. All instruments were individually bagged and sterilized and surfaces that were touched by the examiners were covered by impermeable plastic barriers.

### Statistical analysis

Categorical variables were presented in frequency tables (number & percent) while continuous variables such as age were provided as descriptive statistics (mean, standard deviation, standard error, median, minimum and maximum). Chi-square test or its subsidiaries were used to calculate the p value for categorical variables and t-test or ANOVA were used to calculate the p value for continuous variables. Spearman's Correlation Coefficient "r" was used to measure the direction and strength of correlation between variables.

TABLE (1) Multi stage Stratified Sampling technique

Sample Stage	Unit	Comments
Strata:	Provinces	4 provinces
Primary Sampling Unit (PSU):	Governorates	27 governorates
Secondary Sampling Unit (SSU):	Civilization (Rural & Urban)	Cairo, Alexandria, Suez, Port Said and Luxor have no rural areas
Elementary Unit (EU):	Mother and child health care centers, public hospitals, work places, schools, sports clubs, orphanages, households.	160 elementary units
Final Unit (FU):	Persons	Total number of persons,= 10144

## RESULTS

In Egypt's national oral health survey, a total of 651 preschool children were examined. The numbers of girls and boys were almost equally distributed in the study, 50.5% and 49.5% respectively, which is close to official census (males: females: 51%: 49%). 67.7% of examined children had at least one decayed tooth in their primary dentition (*Figure 1*) whereas 11.6% had missing tooth/teeth. The mean dmft index score in the overall sample was 3.3, such that the mean d,m & f scores were 3.1,0.2 and 0.1 respectively i.e. 94 % of this index was related to its d-component, while the m- and f-components were 4 and 2%, respectively. (*Figure 2*)

Geographically, Egypt is divided into 27 governorates five of which are fully "urban" (Cairo,

Alexandria, Suez, Port Said and Luxor) whereas all other governorates have a mixture of "urban" and "rural" settings such that 9 governorates comprise Lower Egypt in the Nile Delta region, eight lie in Upper Egypt along the Nile river South and five frontier governorates cover Sinai and the deserts which lie in the West. According to the survey findings, it was found that children living in rural areas were at higher risk to develop ECC when compared to those in urban regions. In addition, boys tend to have higher mean dmft scores than girls. (Table 2)

Regarding factors associated with development of ECC, a weak negative correlation was detected between frequency of teeth brushing and dmft mean values ( $r = -0.093$ ,  $p < 0.001$ ) as shown in figure 3.

TABLE (2) Variations in dmft mean values based on gender and place of residence

	Lower Egypt		Upper Egypt		Civilized		Desert/ Frontier		Total	
	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max
Male	4.1 $\pm$ 3.9	0 - 19	3.2 $\pm$ 3.4	0 - 18	2.6 $\pm$ 3.3	0 - 18	3.2 $\pm$ 3.6	0 - 17	3.5 $\pm$ 3.7	0 - 19
Female	3.5 $\pm$ 3.7	0 - 19	3.2 $\pm$ 3.4	0 - 16	2.6 $\pm$ 3	0 - 20	3.6 $\pm$ 3.3	0 - 10	3.2 $\pm$ 3.5	0 - 20
Rural	3.9 $\pm$ 3.8	0 - 19	3.3 $\pm$ 3.4	0 - 18	-	-	3.4 $\pm$ 2.6	0 - 8	3.7 $\pm$ 3.4	0 - 20
Urban	3.5 $\pm$ 3.8	0 - 18	2.9 $\pm$ 3.4	0 - 18	2.6 $\pm$ 3.1	0 - 20	3.3 $\pm$ 3.5	0 - 17	3.3 $\pm$ 3.6	0 - 20
Total	3.8 $\pm$ 3.9	0 - 19	3.4 $\pm$ 3.5	0 - 15	3 $\pm$ 3.3	0 - 20	3.3 $\pm$ 3.5	0 - 17	3.5 $\pm$ 3.6	0 - 20

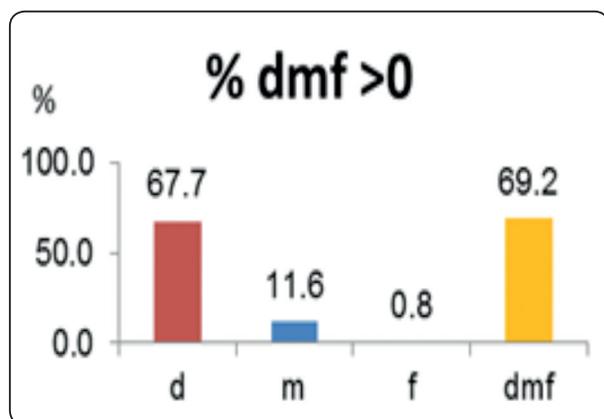


Fig. (1) Percentage of Preschool children with dmft score >0

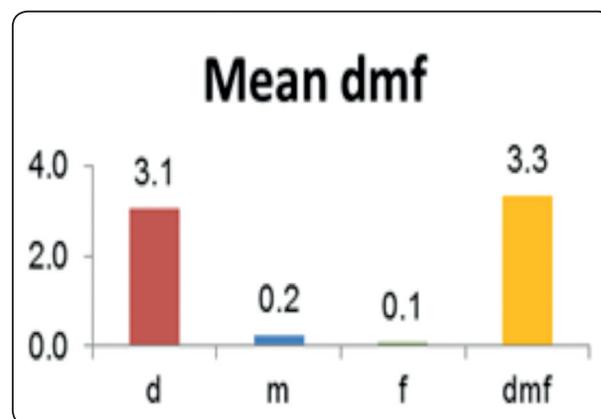


Fig. (2) Mean values of "d", "m", and "f" scores, and mean dmft score

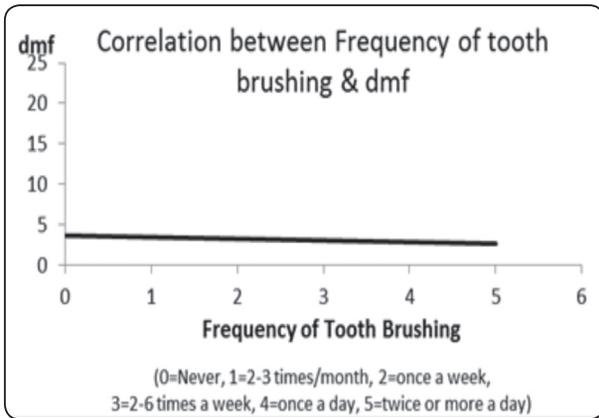


Fig. (3) Correlation between frequency of tooth brushing and dmf scores

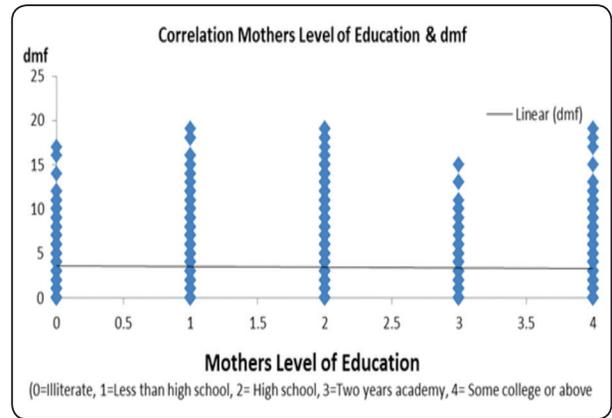


Fig. (4) Correlation between Mother’s level of education and dmf scores

TABLE (3) Relationship between food consumption and dmf scores

	dmf		
	Spearman’s r	Correlation	Sig. (2-tailed) (p<0.05)
Fresh fruits	0.053	zero	0.010
Biscuits & Cake	0.101*	weak positive	0.000
Jam or Honey	0.014	zero	0.494
Chewing gum with sugar	0.111*	Modest positive	0.000
Fizzy drinks or Bottled Juices	0.041	zero	0.043
Halawa	-0.005	zero	0.809
Sugar in hot drinks	0.033	zero	0.109

\*Significant correlation p value<0.001

As shown in Table 3, the association between eating certain sugary food items such as biscuits, cake and chewing gum with sugar was weak positive ( $r=0.101$ ,  $r=0.111$  respectively). Within the sample of preschool children included in this survey, whereas the association between severity of ECC and level of maternal education was insignificant, (Fig. 4) there was weak positive correlation between Mother /siblings caries experience and dmf scores ( $r=0.130$ ,  $p<0.001$ ). (Fig. 5)

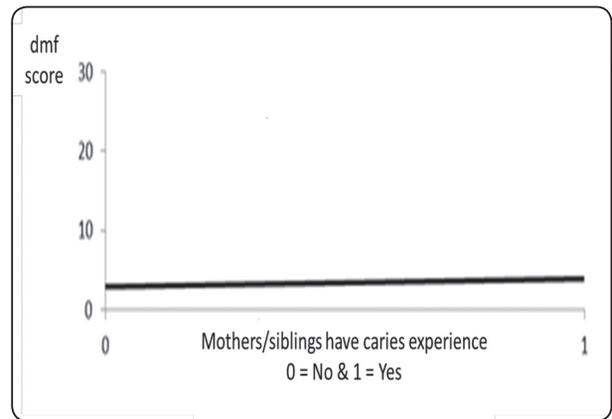


Fig. (5) Correlation between Mother/siblings caries experience and dmf scores

**DISCUSSION**

Though oral health is strongly linked to general health and it is well known that dental caries which is the most common chronic disease in childhood, comprises a costly burden to health services [18] yet in the African and Middle East region countries including Egypt, there is generally scarcity in reliable data on profile of different oral diseases.[19] Based on Egypt’s 2013- 2014 national oral health survey from which data of the current study was extracted, 69.2 % of the examined preschool children had a dmf score greater than zero. The high mean score for decayed (d) primary teeth (3.1) and the very low mean score

for filled teeth (f) which was 0.1 indicate high rates of unmet dental treatment needs for this population group. Similarly at provincial level, in one study in El-Suez governorate, only 113 children (25%) out of 442 were caries-free<sup>[20]</sup> and in another study, in Mansoura city, the capital of Dakahlia governorate, in a sample of 1000 children aged 3 to 6 years the prevalence of ECC was found to be 61.4% and the mean dmft was as high as  $2.93 \pm 3.28$ .<sup>[21]</sup>

According to Abid et al, generally, in low- and middle income countries, health authorities do not consider oral health a priority area and minimal resources are allocated to oral care including oral health promotion and community-based preventive programs.<sup>[19]</sup> This might explain the high caries trends among Egyptian preschool children. Moreover, because parents are their children's decision makers, their level of knowledge and attitudes directly affect children's overall health status.<sup>[22]</sup> As a result, owing to parental poor knowledge of importance of primary teeth for children's growth and development and because of the widespread cultural beliefs that those teeth are temporary and would be replaced by permanent teeth in the long run,<sup>[23-25]</sup> many parents might fail to seek appropriate dental care for their children.<sup>[26]</sup>

Globally, there are rural-urban variations in terms of access to oral care including preventive and health promotion services in addition to disparities in rates of prevalence of ECC and feeding habits in children.<sup>[27,28]</sup> In rural areas, even in developed countries, utilization of oral health care services is not usually a common practice either due to shortage of dental practitioners, lack of transportation or financial constraints.<sup>[29]</sup> Furthermore, generally, people living in urban communities tend to have higher levels of oral health literacy and exhibit more positive oral health-related attitudes than those in rural areas owing to easier access to health information through media among those populations.<sup>[27]</sup> This might explain the higher

percentage of untreated carious lesions among this young age group of Egyptian children residing in rural areas in comparison to their urban counterparts, as indicated by the findings of the current study.

It is also worth mentioning that according to data extracted from Egypt's national oral health survey, Egyptian boys were more liable to suffer from ECC than girls and this goes in line with the findings of another cross sectional study conducted in Cairo governorate.<sup>[30]</sup> In addition, similar gender disparities in caries experience have been observed in other populations and among both children and adults.<sup>[31]</sup> A plausible explanation is that usually girls are more inclined to comply with instructions including health messages and in one study it was found that, when instructed, they brushed their teeth more frequently than boys.<sup>[32]</sup>

Regarding the association between other determinants and prevalence of ECC, it was found that though tooth brushing was a protective factor yet the effects were not significant. This might be attributed to inadequate tooth brushing either due to lack of parents' awareness of importance of their active engagement in brushing their children's teeth in this age group or their failure to manage their children's uncooperative behavior who might be resistant and unwilling to open their mouths while brushing their teeth.<sup>[33]</sup>

On the other hand, there was a weak to moderate positive association between caries experience and consumption of some sugar-containing snacks and sweets. Though, this has been well-elaborated in many studies on the relationship between various risk determinants and development of ECC.<sup>[34-36]</sup> yet, it is likely that due to presence of some protective factors such as fluoride exposure the relationship between sugar consumption and dental caries was not strong.<sup>[37]</sup>

Over decades, in various studies, it has been postulated that a moderate to strong association

exists between maternal caries experience and their children's risk to develop ECC.<sup>[38-40]</sup> In the current study, though there was a positive correlation between maternal-child caries experience yet it was found to be weak. However, it is worth mentioning that in our survey, we did not conduct a thorough clinical oral examination for mothers of the enrolled children, instead their previous caries experience was determined based on a Yes/No question in the study tool and this might explain the difference in the level of the association.

One strength of the current study is that data collection followed standardized well-defined criteria from the WHO, which has been used for decades for conducting epidemiological oral health surveys and for promoting comparisons over time at national and international levels.<sup>[41]</sup> Moreover, the included sample was quite diverse and included different levels of socioeconomic status being selected from various gathering points scattered throughout the country. The sample, also, provided information on caries experience of an age group of children which are not usually part of national oral health surveys.

On the other hand, one limitation is that the sample size might not be large enough, however it is worth mentioning that in the national survey the total sample was divided into two groups according to age; *below and above 18 years old* based on the population census in January 2013 from Center Agency for Public Mobilization & Statistics and 60.8% of the sample was above 18 years old. This might explain why the sample of children in the selected age group (3-6 years) was relatively small.

In conclusion, the findings of this study point out that oral health of preschool children might be a neglected health issue in Egypt and this implies that community-based preventive programs targeting expectant mothers during pregnancy and later in early childhood are imperatively needed.

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