Original Article

Caries assessment in preschool children in relation to some socioeconomic factors

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Abstract

Aim: to assess dental caries prevalence and incidence in relation to some epidemiological factors in preschool children.

Subjects and Methods: A cross-sectional, analytical study was conducted on 1255 of preschool children (2-6y old) from Cairo, Delta and Upper Egypt governments. The personal and socio-demographic variables were obtained through a questionnaire. Clinical evaluation of each child was performed using prevalence and dmft indices.

Results: The Upper Egypt children showed the lowest prevalence index (82%) and dmft scores (4.84) than that of Cairo [85% & 4.82] and Delta [83.57% & 5.6] children respectively. The girls showed lower prevalence and dmft indices in all governorates. The prevalence and dmft indices for girls and boys were 82.36% & 4.82 and 84.9% & 5.65, respectively. The prevalence and dmft indices of all Egyptian preschool children were 83.82% and 5.27 respectively. Also it was found that dental caries had significant inverse relations with the increase in parent education level, family income, child satisfaction and teeth brushing practice. While, it had significant direct relations with age, systemic disease affection and frequency of carbohydrates intake.

Conclusion: Egyptian preschool children have a relative high prevalence and dmft indices scores especially in civilized area so they need more efforts and intensive dental health programs to care their oral health.

Keywords: Caries factors; Assessment; Preschool children

Introduction

Dental caries is a biofilm-mediated, diet modulated, multifactorial, dynamic disease resulting in net mineral loss of dental hard tissues. It is determined by biological, behavioral, psychosocial, and environmental factors. As a consequence of this process, a caries lesion develops. Preschool years are a critical period in the development of a healthy child. The consequences of poor oral health especially dental caries in preschool children may reach beyond dental problems. [1-3].

Early childhood caries (ECC) is the early onset of caries in young children with often fast progression, results in destruction of the primary dentition. It is the most common oral disease among preschool children all over the world and ranked as the 10th most prevalent health condition. In 2010, 621 million children in the world suffered from untreated caries. An epidemiological definition of early childhood caries is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled surfaces in any primary tooth of a child under age of 6 [4-7].

Caries experience is the number of teeth/surfaces that have caries lesions (at a specified threshold), filling, and/or are missing due to caries. Traditionally, it has been measured by means of DMFT for permanent dentition and/or dmft for primary dentition [2]. Caries prevalence is the number/proportion of individuals with caries in a given population at a specified time [8].

Dental caries of deciduous tooth can cause apical periodontitis and pulpitis, and permanent tooth germs infection, affecting of permanent teeth development or premature loss of deciduous teeth. This may result in permanent teeth crowding or decay [9,10]. Also Children who suffer from severe caries will resist chewing because of pain, which may affects the development of facial movement, speech ability and sleeping troubles [11–13].

Currently, although advanced clinical treatment and filling materials of dental caries, [14] ECC still affects the growth and quality of life of preschool children [15–17]; therefore, prevention of dental caries is very important choice. The existing literature suggests that childhood caries is related to many socioeconomic factors, such as age, gender, residential location, frequency of carbohydrates intake, parent's educational level, the family's economic level, child satisfaction and brushing habits [18-23].

However, there are few studies regarding dental caries assessment in Egyptian preschool children in relation to these socioeconomic factors. Also regular up dating and assessment is highly recommended [24-26]. Moreover such studies may help the Egyptian state to develop successful health programs to combat dental caries. Considering the Null hypothesis that base on that there is no difference between certain characteristics of a population, this study attempt to test these socioeconomic variables. So the objective of this study was to assess dental caries prevalence and incidence in relation to some important socio-epidemiological factors in Egyptian preschool children.

SUBJECTS AND METHODS

Study setting and population Sample size:

A cross-sectional survey was conducted on 1255 preschool Egyptian children (2-6 years old) from many governorates. The children were classified according to their residential location into 3 main groups; Cairo and surrounding civilized areas (420), Delta (414) and Upper Egypt (421) governorates. The sample size in each group has an 80% power to detect an increase of 0.38 with a significance level (alpha) of 0.05 (two-tailed). In 80% (the power) of those examinations, the P value was less than 0.05 (two-tailed) so the results were deemed "statistically significant". In the remaining 20% of the examinations, the increase was deemed "not statistically significant" [24].

The children were randomly selected in 2019-2021 according to WHO guidelines for national pathfinder surveys. The children were investigated by a survey team consists of the investigator, teaching staff assistants, statist and well trained students of faculty of dental medicine, Al-Azhar University. Dental caries among preschool children was assessed using the prevalence and dmft indices. The relation and effect of some Socio-demographic factors were investigated. Socio-demographic data were also collected. Univariate and multivariate regression analyses were performed to identify the effects of some socio-demographic parameters [23-26].

The survey was conducted as follow:

(A) Data collecting:

A parental questionnaire survey was performed including the children's data and some habits. Each student examined randomly 5 children of his family, relatives and neighbors as a part of study qualification requirements. The data were collected first before clinical examination and recorded in detailed

questioner chart. The chart included personal history (name, age, sex, address, …..), medical status, family income level, parent education level, carbohydrates consumption, and teeth brushing habits. The collected data were recorded in each child chart according to criteria of WHO [27.28]. The children were classified according to the previous variables into the following groups [24]:

1. *Medical status:* children were classified into two groups: normal children and diseased children.

2. *Family income level:* children were classified according to their family income into high ($\geq$ 20000 L.E.), medium (from 10000 to 20000 L.E) and low ($\leq$ 10000)

3. *Parent education levels:* children were classified according to their parent education levels into three groups:

   Group 1: high educational levels.

   Group 2: moderate educational levels

   Group 3: low educational levels.

5. *Frequency of carbohydrates intake:* children were classified into: high consumption (eat sweets $\geq$ 3 times/day), moderate consumption (eat sweets twice/day) and low consumption (eat sweets $\leq$ 1 time/day).

6. *Child Satisfaction:* children were classified according to their psychological status into three groups:

   Group 1: High satisfaction.
   Group 2: Moderate satisfaction.
   Group 3: Low satisfaction.

7. *Teeth brushing habit:* children were classified according to frequency of teeth brushing into 4 groups:

   Group 1: High brushing rate 2-3 times/day.
   Group 2: Moderate brushing rate (1/1-2days).
   Group 3: Low brushing rate (1-2/week).

   Group 4: children do not use tooth brush at all.

(B) Subjects examination:

Each child was examined using simple diagnostic tools (simple source of light, disposable mirrors, gloves, masks and dental explorer). The dmft (**d**ecayed, **m**issed and **f**illed primary **t**ooth) score were recorded according to criteria of WHO in each child chart. A photograph for each child jaw was taken by the examiner as prove of examination and for discussions [24, 27].

Calculating prevalence index: The prevalence of was calculated by dividing the number of the affected children by the total number of children.

Calculating dmft: the total number of **d**ecayed, **m**issed and **f**illed primary **t**eeth of the child were calculated and this is the child dmft score while the dmft score of the group was equal the sum of children dmft scores divided on their numbers.

For dmft, the teeth not counted are unerupted and congenitally missed teeth, missed teeth due to trauma or shading, restored teeth due to trauma and supernumerary teeth [24].

(C) Data revision and tabulation:

The collected data were received, reviewed and hardly discussed; any obscure or incorrect data were excluded. The collected data were revised, recorded, tabulated and prepared for statistical analysis.

Statistical Analysis

The significant differences between any two groups were assessed by Student's *t*-test. The differences between multiple groups were assessed by one-way analysis of variance (ANOVA) followed by the Fisher's exact test. Values of P$\leq$ 0.05 were considered significant. These analyses were done using SPSS 22.0 statistical software.

Ethical consideration

This study was approved by Ethical Committee of Faculty of Dental Medicine, Boys, Cairo, Al-Azhar University. Informed written consent form was signed by the children parents before they included in the study.

Results

This study was conducted on 1255 Egyptian preschool children. The children were randomly selected from many governorates mainly from the Cairo, Delta and Upper Egypt. The children ages were ranged from 2-6y old and the mean age was 4.267y. The children were classified according to residential location into the following three areas:

1-Cairo

The ages of the Cairo children (420) were ranged from 2-6y old. The average age was 4.16y. The enrolled females were 182 (43.33%), their ages ranged from 2-6y and the average age were 4.21y. while the males were 238 (56.67%) their ages ranged from 2-6y and the average age were 4.12y. The results showed there is no significant difference between males and females ages. Also, showed that only 15% (63) of children were caries free thus the prevalence of dental caries was 85% (357). The mean of dmft scores of females, males and both males and females were 5.16, 6.02 and 5.65 respectively (Tables 1 & 2).

2-Delta

The age of examined children (414) in Delta governorates were 2-6y and the mean age was 4.24 y old. The females' children (182) constitute 43.96% of the enrolled children, their average age was 4.23y. While the males children [232 (56.03%)] average age was 4.25y. However, 68 (16.43%) children out of the study were caries free hence the prevalence index of dental caries was 83.57%. The mean of dmft scores of females, males and total children were 4.89, 5.64 and 5.31 respectively (Tables 1 & 2).

3-Upper Egypt.

The age of enrolled children (421) in Upper Egypt were 2-6y. The females' children [169 (40.14%)] mean age was 4.36y. While the males children [232 (56.03%)] average age was 4.43y. The mean age was 4.4y old. However, only 72 (17.1%) children were caries free hence the prevalence index was 82.9%. The females dmft score was 4.38 While the males [252 (59.86%)] dmft score was 5.15 and the mean dmft of Upper Egypt children was 4.84 (Tables 1& 2).

The total enrolled girls number was 533 (42.47%) and their age ranged from 2-6y old with average age 4.26y. while the total enrolled boys number was 722 (57.53%), their age ranged from 2-6y old with average age 4.27y and insignificant difference in compare with the females ages. It is noteworthy that the number of caries free girls were 94 (17.64%) hence the prevalence index of dental decay between girls was 82.36%. The caries free boys were 109 (15.1%) and the prevalence index of dental decay was 84.9%. The total number of caries free children was 203 (16.18%) and the prevalence index of the total children was 83.82%. Furthermore the girls showed lower dmft score (4.82) than that of boys (5.60) with highly significant (P≤ 0.01) difference in favor of girls. The total dmft score of all children (girls & boys) was 5.27 (Tables 1 & 2).

Moreover, on studying the effect of gender on dmft score it was found that the girls had a lower dmft score than boys in the three areas (Cairo, Delta & Upper Egypt). These differences were statistically significant (P≤ 0.05) in Cairo and Delta governorates values only. This was reflected on the difference between the total dmft score of girls and total dmft score of boys enrolled in the study and showed high significant difference in favor of girls (Tables 1 & 2).   .

It is noteworthy that, although the Upper Egypt girls had the lowest dmft score (4.38) than that of Cairo (5.16) and delta (4.89) girls but these differences were statistically insignificant. Also, the Upper Egypt boys were

had the lowest dmft score (5.15) with significant difference with Cairo boys dmft score (6.02) and insignificant difference with Delta boys (5.64). On the same context the Upper Egypt children showed the lowest dmft score (4.84) with highly significant deference in compare to Cairo children dmft score (5.65) only. While the Delta children came second (5.31) as usual but with insignificant difference with Cairo & Upper Egypt children (Table 2).

On analysis the caries incidence at different ages, it was found that there is a gradual increase in dmft score with age till age of 5y old then there is sudden drop of dmft score at 6y old age. Also it was found there is a significant difference between age 2y old and age of 4y&5y. However age 3y old showed no significant with all ages except age of 6y old that showing highly significant difference. Also age of 4y and age of 5y showed highly significant difference in compare to 6y old. The other remaining comparison between ages showed no statistical differences (Table 3).

Considering to the effect of systemic disease on caries rate, it was found that the medical compromised children had a higher significant dmft score (6.89) than normal healthy children dmft score (5.19) (Table 4).

Table 4 demonstrate that, there is an inverse relation between the parent education level and their children dental decay since it showed high significant increase in dmft score between the three levels of education.

Also this study showed an inverse relation between the family income levels and children primary teeth decay. It demonstrate that there is increase in children dmft score with the decrease of family income. Since the children who lived in high income level family showed the lowest dmft score (2.14) and high significant difference in compare to those who lived in moderate (5.42) and low (5.71) family income levels. However, there is no significant difference in the caries experience between the moderate family income level and low family income level children (Tab.4).

Comparing the children dmft scores based on their carbohydrates consuming habits, this study showed that the children who highly consume sweets have the highest dmft score (6.65). Moreover, it was found that, the children who moderately consume sweets had less caries (5.2) than children with low sweets consumption (3.1). However all differences between these three groups were statistically highly significant (Tab.4).

The results of this study showed that the psychological status play an important role in caries experiences. It showed inverse relation between the psychological satisfaction and dmf score. Since the highly satisfied children reported the lowest dmft score (3.52) then moderately satisfied group (7.63) and low satisfaction group (10.22) with high significant differences between all groups (Table 4).

On regard to teeth brushing habit, the study showed that the children who brush their teeth 2-3 times per day were the lowest group suffering from dental carries (dmft= 2.17). Also it demonstrate that there is an inverse relationship between the teeth decay and the number of times the teeth are brushed, as children who brush their teeth once every day or two days have less caries (4.75) than those who brush their teeth 1-2/week (6.32) and who do not brush their teeth at all (6.48). On comparing between these four groups it was found that there is a high significant differences between all of them except between group 3 and group 4 that showed insignificant difference (Table 4).

Discussion

Dental caries is multifactorial disease and can be affected by many socioeconomic variables, so this study tried to focus light on this factors in an attempt to clarify the way to better oral health for children.

Table 1: Effect of gender on dental caries incidence**.**

Area	Gender	N	Mean (dmft)	Std. Dev. ±	Std. Err. ±	Min.	Max.	Mean diff. ±	Sig.
Cairo	1-Females	182	5.1593	3.97671	.29477	0	17	.86167*	0.038*
	2- Males	238	6.0210	4.46500	.28942	0	20		
Delta	3- Females	182	4.8901	4.08596	.30287	0	19	.74782	0.063
	4- Males	232	5.6379	4.03104	.26465	0	20		
Upper Egypt	5-Females	169	4.3787	3.60040	.27695	0	15	.77606*	0.046*
	6-Males	252	5.1548	4.12019	.25955	0	20		
Total	Females	533	4.8199	3.90602	.16919	0	19	.77568*	0.001*
	Males	722	5.5956	4.21869	.15700	0	20		

Table 2: Effect of residential location on dmft score of dental caries.

Gender	Area	N	Mean (dmft)	Std. Dev. ±	Std. Err. ±	Min.	Max.	Mean diff. ±	Sig.
Girls	Cairo (C)	182	5.1593	3.97671	.29477	0	17	C:D= .26923	0.510
	Delta (D)	182	4.8901	4.08596	.30287	0	19	C:U= .78064	0.062
	Upper Egypt (U)	169	4.3787	3.60040	.27695	0	15	D: U=.51141	0.220
Boys	Cairo (C)	238	6.0210	4.46500	.28942	0	20	C:D=.38308	0.324
	Delta (D)	232	5.6379	4.03104	.26465	0	20	C:U=.86625*	0.023*
	Upper Egypt (U)	252	5.1548	4.12019	.25955	0	20	D: U= .48317	0.208
Girls & Boys	Cairo (C)	420	5.6476	4.27678	.20869	0	20	C:D= .33844	0.233
	Delta (D)	414	5.3092	4.06736	.19990	0	20	C:U=.80439*	0.004*
	Upper Egypt (U)	421	4.8432	3.93387	.19173	0	20	D: U=.46595	0. 100
All children	Egypt	1255	5.2661	4.10519	.11588	0	20		

Table 3: Correlation of age and dental caries incidence**.**

Age	N	Mean (dmft)	Std. Dev. ±	Std. Err. ±	Min	Max.	Mean diff. ±	Sig.	Mean diff. ±	Sig.
2y	78	4.4231	3.86298	.43740	0	14	2:3= .96477	.073	3:5= .35215	.306
3y	214	5.3879	3.69291	.25244	0	18	2:4= 1.03658*	.039	3:6= 1.60863**	.000
4y	409	5.4597	4.43017	.21906	0	20	2:5= 1.31692**	.009	4:5= .28034	.327
5y	400	5.7400	4.05691	.20285	0	20	2:6= .64386	.254	4:6= 1.68044**	.000
6y	154	3.7792	3.61595	.29138	0	17	3:4= .07181	.834	5:6= 1.96078**	.000

Table 4: Effect of some epidemiological factors on dental caries.

Items	Character	N	Mean (dmft)	Std. Dev. ±	Std. Err. ±	Min	Max.	Mean diff. ±	Sig.
General Health	Normal	1201	5.1932	4.08730	.11794	0	20	1.69572*	.003
	Diseased	54	6.8889	4.20542	.57228	0	15		
Parent Educational Level	1-High	216	1.4120	1.95808	.13323	0	11	1:2=2.95939*	.000
	2-Moderate	315	4.3714	2.83716	.15986	0	12	1:3=5.39321*	.000
	3-Low	724	6.8052	4.17553	.15518	0	20	2:3=2.43382*	.000
Income level	1-High	100	2.1400	2.11307	.21131	0	12	1:2=-3.27917*	.000
	2-Moderate	699	5.4192	4.11583	.15568	0	20	1:3=3.57711*	.000
	3-Low	456	5.7171	4.13522	.19365	0	20	2:3=.29794	.216
Carbohydrates Consumption.	1-High	486	6.6481	4.32419	.19615	0	20	1:2=1.44730*	.000
	2-Moderate	473	5.2008	3.78498	.17403	0	18	1:3=3.54680*	.000
	3-Low	296	3.1014	3.18096	.18489	0	16	2:3=2.09949*	.000
Child Satisfaction	1-High	853	3.5193	2.91204	.09971	0	18	1:2=4.10760*	.000
	2-Moderate	193	7.6269	2.95904	.21300	0	15	1:3=6.69597*	.000
	3-Low	209	10.2153	4.06043	.28087	0	20	2:3=2.58837*	.000
Teeth brushing	1-High 2-3/day	169	2.1716	3.06091	.23545	.00	14	1:2=2.58132*	.000
								1:3=4.14755*	.000
	2-Moderate 1/1-2days	429	4.7529	3.52554	.17021	.00	20	1:4=4.30401*	.000
	3-Low 1-2/week	329	6.3191	3.72675	.20546	.00	19	2:3=1.56624*	.000
								2:4=1.72270*	.000
	4- Not use brush	328	6.4756	4.66223	.25743	.00	20	3:4=15646	.603

However, girls showed lower dmft scores than boys in all governorates with significant difference in Cairo and Upper Egypt only. Consequently, this was reflected on girls of Egypt who showed a highly significant difference in teeth decay between them and boys in favor of girls. These results was in harmony with many studies [24-26] that reported similar results and attributed this to the fact that girls are more interested in their oral and dental health for cosmetic reasons. It may also be due to the fact that girls grow mentally and physiologically at this age than boys. However, the children in present study showed a higher prevalence and dmft scores than these studies.

These results can be referred to Covoid 19 attaches' drawbacks (stay at home) and increase of environment contamination. It is also possible that these children samples cane from a poorer environment than other studies samples.

In regard to the effect of age, this study found a direct between age and dental caries since dental caries is accumulative disease it increase with age till age of 5y old. These results were in agreement with Pierce et al., 2019 [29] who proved that dental caries increase with age. However at 6y age, dmft score was suddenly dropped and this may be referred to shading of some decayed or filled anterior teeth in preparation for eruption of permanent teeth.

This study showed that the children who lived in Upper Egypt had the lowest dental caries experiences with a significant difference with Cairo children dmft score only. While the Delta children came second in dental caries experiences but with insignificant difference with other children groups. These may due to the children who live in countryside eat more dairy products than civilized area children. Moreover they are more exposed to sun light and live in less contaminated area (especially in Upper Egypt). This result was in agreement with the results of Alaa and Mousa 2013, [24] who found that the children lived in Upper Egypt had a lower dental caries than delta and

Cairo areas. Moreover these results came compatible with Tsang et al, 2019 [30] who stated that despite greater health knowledge and resources among urban mothers, urban children's increased access to junk food and frequency of consumption was associated with higher prevalence and severity of caries compared to rural children.

Referring to the presence of systemic diseases, it was found that the rate of caries among medically compromised children is higher than that of healthy normal children with significant difference. This results was compatible with Alaa and Mousa 2013, [24] and song et al., 2018 [31] results who interpreted these results in the fact that the medically compromised children may have low immunity and frequent sugary drugs intakes that may have drawbacks as xerostomia, thus increase the caries experiences.

This search proven an inverse relation between the high educational level of the children parents and dental caries rate. Moreover, it showed a highly significant difference between the three educational levels of parents. These results were compatible with the results of Pierce et al., 2019 [29] who demonstrated that the more higher the educational level of children parents the lower caries rate of the children. Moreover, the study results are compatible with some studies [23,32] that proved that, the higher education level of the parents the more parents' interest in oral health of their children's.

However this survey demonstrated that the higher of family income the lower children caries experience since there are highly significant differences between the dmft score of children who live in high family income level and children who live in moderate and Low family income levels. The strange thing is that although children live in middle income families, have a lower decay rate than children living in low income families but without statistical significant differences. This results may be refereed to the ability of high income

families' children to buy oral hygiene tools as tooth brush, tooth paste and other protective prophylactic measures and regular checkup. This results are in agreement with many studies [23,24,29,32] that reported that the Lower family income the greater odds of caries experience.

The psychological status importance was clearly demonstrated in this study, as it showed that there were highly significant differences in favor of children who have high psychological satisfaction. Furthermore, it showed highly significant differences between children who have moderate psychological satisfaction and children who have low psychological satisfaction. Since the decrease in self-satisfaction may leads to the decrease of oral care, thus increase the caries progression. This result is in agreement with Alaa and Mousa 2013, [24] study that showed that self-satisfaction is inversely proportionally with dental caries experiences. Also, it came compatible with the study of Cademartori et al., 2021 [33] who observed that the presence of moderate/severe depressive signals and symptoms was higher in subjects with dental caries experience

The value of teeth brushing habit was clearly appeared in this study. As it showed that the children who brush their teeth regularly three or twice a day suffer from less caries than other children groups who less brush their teeth. Moreover, it reported high significant difference between all groups except that difference between group 3 and group 4 which appeared insignificant difference. This result is in agreement with many studies [23,24,26] that documented the teeth brushing as anti-caries method.

In the context of dental caries formation, the residential location and the family's economic level are difficult to change, but children's oral health-related behaviors and lifestyle can be improved and managed, which inspires us to implement more interventions

efforts. It is regrettable that there are few efforts about dental health care programs toward preschool children in Egypt. Therefore, this study shed light on this problem and provide comparative and valuable data to improve children's oral health. Furthermore, it provides support for government institutions to formulate specific regional strategies for the prevention and control of dental caries in preschool children.

So based on this study results, it can be concluded that:

1. Dental caries is directly proportion with age, systemic disease presence & carbohydrates consumption times while it inversely proportional to increase in parent's educational level, increase in family income, children satisfaction and teeth brushing habit.

2. There are increase in caries rates among Egyptian preschool children, especially in civilized areas, so more efforts and support are required for governmental institutions and non-governmental organizations to formulate specific regional strategies for the prevention and control of dental caries in preschool children.

Conflict of interest:

The author declare that they have no conflict of interest.

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