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CORRELATING THE CONSEQUENCES OF UNTREATED DENTAL CARIES (PUFA/pufa scores) AND BODY MASS INDEX RELATED TO AGE IN A GROUP OF EGYPTIAN CHILDREN: A CORRELATION STUDY

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Objectives: The present study aimed to investigate the correlation between dental caries and its consequences in terms of pulp involvement, ulceration, fistula, abscess utilizing (PUFA/pufa) indices and specific Body Mass Index (BMI) with reference to age in a group of Egyptian Children

Methods: A total of 201 children (101 female and 100 male) from Pediatric Dentistry Department in Cairo University having PUFA/pufa ≥1 were included. PUFA/pufa index was used according to the standard procedure to assess the consequence of untreated dental decay. The height and weight of the children were determined using standardized scales. The BMI percentile was computed using Centers for Disease Control and Prevention (CDC) growth charts.

Results: The correlation between PUFA/pufa and body mass index (BMI) showed no significance correlation (P = 0.740). The correlation between PUFA/pufa scores and BMI in reference to gender also showed no significance correlation. However, the correlation between pufa and BMI percentile group showed positive correlation (P=0.405).

Conclusions: The result show High prevalence of untreated dental caries between children. The younger children have positive correlation between pufa scores and BMI as compared with older children.

Keywords: Untreated dental caries, PUFA/pufa index, Egyptian children, BMI

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The authors declare no conflicts of interest.

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CORRÉLATION ENTRE LES CONSÉQUENCES DES CARIES DENTAIRES NON TRAITÉES (SCORES PUFA/pufa) ET L'INDICE DE MASSE CORPORELLE LIÉE À L'ÂGE, DANS UN GROUPE D'ENFANTS ÉGYPTIEN: UNE ÉTUDE DE CORRÉLATION

Objectifs : La présente étude visait à investiguer la corrélation entre les caries dentaires et leurs conséquences en termes d'atteinte pulpaire, d'ulcération, de fistule, d'abcès utilisant des indices (AGPI/pufa) et un indice de masse corporelle (IMC) spécifique en référence à l'âge dans un groupe de Enfants **égyptiens**

Méthodes : Un total de 201 enfants (101 filles et 100 garçons) du département de dentisterie pédiatrique de l'Université du Caire ayant des AGPI/pufa ≥1 ont **été** inclus. L'indice PUFA/pufa a **été** utilisé selon la procédure standard pour **évaluer** les conséquences d'une carie dentaire non traitée. La taille et le poids des enfants ont **été** déterminés à l'aide d'échelles standardisées. Le percentile de l'IMC a **été** calculé à l'aide des courbes de croissance des "Centers for Disease Control and Prevention" (CDC).

Résultats : La corrélation entre AGPI/pufa et indice de masse corporelle (IMC) n'a montré aucune corrélation significative (P = 0,740). La corrélation entre les scores PUFA/pufa et l'IMC en fonction du sexe n'a **également** montré aucune corrélation significative. Cependant, la corrélation entre les pufa et le groupe centile d'IMC a montré une corrélation positive (P = 0,405).

Conclusions : Les résultats montrent une forte prévalence de caries dentaires non traitées entre enfants. Les enfants les plus jeunes ont une corrélation positive entre les scores pufa et l'IMC par rapport aux enfants plus **âgés**.

Mots clés:
Carie dentaire non traitée, indice PUFA/PUFA, enfants égyptiens, IMC

Introduction

Oral diseases such as tooth decay, periodontal disease, tooth loss, oral mucosal lesions, oropharyngeal cancers and orodental trauma continue to pose serious public health problems today. There are significant impacts on individuals and communities in terms of pain and suffering, functional impairment and reduced quality of life. The current pattern of oral diseases shows different risk profiles in various nations related to societal variables, environmental and behavioral factors, oral health systems and the application of preventive measures [1]. In improve oral health care facilities, there is a need for a diagnostic index that presents an accurate picture of consequences of advanced stages of dental caries to the authorities. An index called as "pufa" index (i.e., pulpal involvement, ulcer due to root fragments, fistula and abscess) was developed by Monse et al [2. This new index makes an effort to enhance the original DMF (def) index sensitivity and record the effects of a carious lesion.

The Body Mass Index (BMI) is based on a person's weight and height. For the majority of people, BMI is a fairly accurate indication of body fatness. Although BMI does not directly measure body fat, research has shown that it correlates with other measures of body fat. BMI can be considered an alternative for direct measures of body fat [3].

The present study aimed to investigate the correlation between dental caries and its consequences in terms of pulp involvement, ulceration, fistula, abscess utilizing (PUFA/pufa) indices and specific Body Mass Index (BMI) with reference to age in a group of Egyptian Children.

Subjects and Methods

This study was designed and carried out in the Pediatric Dentistry and Dental Public Health Department, Faculty of Oral and Dental Medicine, Cairo University. Ethical approval for the study was obtained from the institutional ethical committee board (4/9/2014-25/5548). The examination was performed during faculty working hours at the diagnosis clinic, Examiner was responsible for maintaining adequate infection control by using a disposable dental diagnostic kit containing plastic tray, disposable mouth mirror, sharp explorers, scarf (napkin), personal protective barriers (gloves, masks). At the end of each day the used instrument were placed in a safety box and safely discarded. The dental chair unit was used to examine the patient and the oral cavity was illuminated by a dental chair light.

Patients were chosen if they met the following requirements:

1- Children aged between 5 and 7 years old.
2- Children healthy (free from systemic diseases).
3- Children with at least one permanent or primary tooth with presence of either a visible pulp, ulceration of the oral mucosa due to root fragments or crown sharp edges, a fistula or an abscess.
4- Positive parental acceptance for participation in the study.

Personal data including name, age, gender, address and past and present medical history was documented via an interview chart.

The Examination was carried out by one examiner to allow for standardization of methods. An examination chart was used to record the extra oral and intra oral examination, the oral examination included soft and hard tissue by using the PUFA/pufa index [2]especially in children. Most caries in developing countries remains untreated. Only limited data are available on the clinical consequences of untreated dental caries because there is no measure to quantify the prevalence and severity of oral conditions resulting from untreated dental caries. OBJECTIVES: To present a new index to evaluate the prevalence and severity of oral conditions resulting from untreated dental caries. To validate the index within the Philippines National Oral Health Survey, 2006. METHODS: The PUFA index records the presence of severely decayed teeth with visible pulpal involvement (P/p for the primary and permanent teeth was calculated for each examined patient.

After the dental examination, the height and weight of the children with positive PUFA/pufa scores were determined using a digital scale and height measurements were taken using a tape measure fixed at about 125 cm on a wall. (Figure1)

No adjustments were made for clothing, but children were only lightly dressed. The BMI was calculated using the formula BMI = Kg/m^2 using height and weight measures then, BMI percentile was computed using CDC (Centers for Disease Control and Prevention) Growth charts [4]. Based on percentiles [5] children were grouped into categories.

The study was reviewed again and the data were collected after a period of two to three weeks at the child's second visit and the children whose data were identical at the second visit were included in the study.

Figure 1. Digital scale and a tape measure fixed on a wall

Statistical analysis of data

Comparison of numerical variables between the study groups was done using Mann Whitney U test for independent samples. Correlation between various variables was done using Pearson moment correlation equation for linear relation in normally distributed variables and Spearman rank correlation equation for non-normal variables/non-linear monotonic relation. *p* values less than 0.05 was considered statistically significant. All statistical calculations were done using computer program SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) release 15 for Microsoft Windows (2006).

Results

A correlational study was conducted on 201 children attending the Department of Pediatric Dentistry and Public Dental Health, Cairo University. The age of the children included in the study was between 5 and 7 years. Study sample consisted of 101 girls and 100 boys.

When the PUFA/pufa index was utilized the following data were revealed:

1. The highest pufa score for primary teeth was 14 and this observed in three children.
2. Eight children had a total PUFA score for permanent teeth of 2.
3. The highest PUFA score was 3 and this was seen in one child.
4. The mean pufa score was 4.94 while the mean PUFA score was 2.
5. The mean "p" was 4.48. The mean "a" score was 1.3.

Only 10 patients from 201 child age 5-7 years had PUFA for permanent teeth and 201 patient had pufa for primary teeth.

In the pufa used for primary teeth we found the "p" component formed majority of the pufa codes (88.78%) and abscess formation due to periapical infection was second most frequent finding (7.97%). There were only 10 cases of ulcer formation due to root fragment and sharp edges of pulpally involved teeth (1.01%) and 22 cases of fistula formation were recorded (2.22%).

In the permanent teeth only "P" component found.

Females were having significantly higher individual "p" and "u" while male having significantly higher individual "f" and "a" values in pufa index while "P" component is higher in female.

When the study group was examined according to CDC (Centers for Disease Control and Prevention) growth percentile [6] the following data were revealed: (Figure 2)

- 4 underweight (3 female &1 male)
- 126 child in normal weight (70 female & 56 male)
- 45 overweight (18 female & 27male)
- 26 obese (11 female & 15 male)

Prevalence of normal weight among females and males were 69.3% and 65%, respectively. As observed there was a higher incidence of overweight and obese among male (60%) than in female (40%).

The mean weight in the studied group was from 15 to 42 kg and the mean weight was 21.53 kg. The mean height ranged from 101 to 130 cm and the mean height was 113cm. The mean weight of males was (22.1 kg) which is more than the female (20.9 kg) and the same was found in height as male showed (113.9 cm) more than female (112.1 cm).

The correlation between PUFA/pufa and body mass index (BMI) showed no significance correlation.

Table 1 shows the Pearson Correlation between pufa and BMI is 0.405 and the Pearson Correlation between PUFA and BMI is 1.000.

However, the correlation between pufa and BMI percentile group showed a positive correlation. The mean standard deviation for an underweight child was 2.062, for a normal weight child 2.497, for an overweight child 2.379, and for an obese child 2.593. (Table 2)

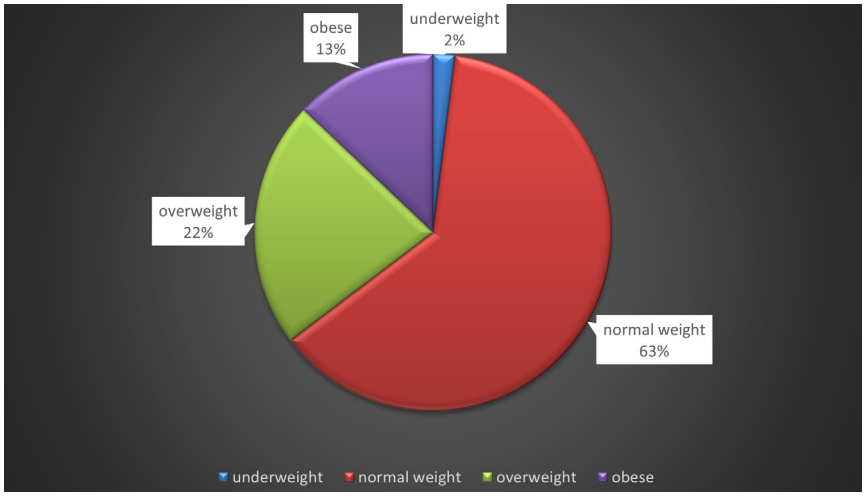

Figure 2. Pie chart for BMI distribution

Table 1. The correlation between pufa/PUFA scores and body mass index

Correlations			
			BMI percentile group
Spearman's rho	pufa	Correlation Coefficient	0.059
		p value	0.405
		N	201
	PUFA	Correlation Coefficient	0.000
		p value	1.000
		N	10
	Mean	Correlation Coefficient	0.121
		p value	0.740
		N	10

Discussion

Few studies have been conducted on the correlation between pufa/PUFA score and Body Mass Index (PJ van Wyk and M van der Walt, 2013;Chauhan et al.,2019; Kaur et al., 2014) [7-8-9].

The results of the present study showed no significance correlation between PUFA/pufa index and body mass index in children aged from 5 to 7 years old. However, there is a correlation between pufa for primary teeth and Body Mass Index. This is consistent with Lopez et al. 2012 who found no significant association between body mass index status and PUFA/pufa levels. Kaur et al. 2014 also found that there is no correlation between PUFA/pufa scores and Body Mass Index but the correlation exists in low socioeconomic status [7].

Ludwig et al. 2001 in a longitudinal study, found that the increasing prevalence of childhood obesity was linked to the consumption of sugar-sweetened drinks [10].

The "p" component of pufa accounted for the majority of the total score at 88.78%, followed by an abscess "a". This finding is consistent with other comparable studies by Monse et al. 2010[2] and Bagińska et al. 2013 [12].

Table 2. Mean (standard deviation) experience of pufa/PUFA scores due to caries in children with differing body mass index

BMI percentile group		pufa	PUFA	Mean
Underweight	Mean	5.25		
	N	4		
	Std. Deviation	2.062		
	Minimum	3		
	Maximum	8		
	Median	5.00		
Normal	Mean	4.79	2.00	5.22
	N	126	9	9
	Std. Deviation	2.497	0.500	2.048
	Minimum	0	1	2
	Maximum	14	3	8
	Median	4.00	2.00	6.00
Overweight	Mean	5.42		
	N	45		
	Std. Deviation	2.379		
	Minimum	1		
	Maximum	12		
	Median	5.00		
Obese	Mean	4.81	2.00	6.00
	N	26	1	1
	Std. Deviation	2.593	.	.
	Minimum	1	2	6
	Maximum	10	2	6
	Median	4.00	2.00	6.00
Total	Mean	4.94	2.00	5.30
	N	201	10	10
	Std. Deviation	2.473	0.471	1.947
	Minimum	0	1	2
	Maximum	14	3	8
	Median	5.00	2.00	6.00

This study was able to identify information about odontogenic infections due to dental caries in children, which has never been reported in Egyptian children. In the study by Pine et al. 2006 of 5-year-old Scottish children, the prevalence of sepsis (the presence of an abscess or fistula) was reported to be 11 % for children living in the most deprived areas in Scotland, while the a and f components currently amounted to 10.19 % in the present study. Therefore, this high percentage of odontogenic infections suggests that tooth extraction will be required more frequently in this setting [13].

A systematic review and meta-analysis conducted showed that, overall, there is a significant association between childhood obesity and dental caries [14]. The connection between caries and underweight remained unclear [15].

The population with the poorest oral health status tend to have low SES (socioeconomic status) [16] and therefore have a higher risk of untreated dental caries. There is evidence from several longitudinal studies that treatment of severe caries resulted in weight gain [15].

The pufa/PUFA index is suitable for quantifying the consequences of severity of tooth decay. It is universally applicable in all environments, including simple field conditions. The index is easy and safe to use, requires little time to perform and requires no additional instruments [2]especially in children. Most caries in developing countries remains untreated. Only limited data are available on the clinical consequences of untreated dental caries because there is no measure to quantify the prevalence and severity of oral conditions resulting from untreated dental caries. OBJECTIVES: To present a new index to evaluate the prevalence and severity of oral conditions resulting from untreated dental caries. To validate the index within the Philippines National Oral Health Survey, 2006. METHODS: The PUFA index records the presence of severely decayed teeth with visible pulpal involvement (P/p).

On the other hand, a survey of 12-year-old Filipino children showed a significant association between odontogenic infections and below normal BMI [15].

Various studies, cross-sectional (Honne et al., 2012) [17] and prospective cohort studies (Alm et al., 2008) [18] in different countries showed a positive correlation between dental caries and BMI.

Conclusions

According to the methodology proposed and the results obtained from the present study it was concluded that:

1. No significance correlation between pufa/PUFA and BMI in age from 5 to 7.
2. The correlation between pufa and BMI percentile group showed positive correlation.
3. No variation in correlation in male and female.
4. Most children in this study had a normal weight.
5. High prevalence of untreated dental caries between children was found.

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