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The Dental Anomalies in Relation to Nutritional Status among Pediatric Patients Attending College of Dentistry/ University of Baghdad

Heba N.Yassin, B.D.S., M.Sc.[1], Noor A. Kadhim, B.D.S., M.Sc.[2], Meena O. Abdul Wadood, B.D.S., M.Sc. [3]

[1]Assistant Lecturer, Department of Pedodontic and Preventive Dentistry, College of Dentistry / University of Baghdad

[2]Assistant Lecturer, Department of Pedodontic and Preventive Dentistry, College of Dentistry /University of Baghdad

[3]Assistant Lecturer, Department of Pedodontic and Preventive Dentistry, College of Dentistry/University of Baghdad

Abstract: ***Background:*** ***Dental anomalies might occur due to abnormal events during teeth development caused by environmental or genetic factors during histo differentiation or morph differentiation stages of embryological development.*** ***Aims of the study:*** ***To evaluate the distribution of developmental dental anomalies according to age and gender in relation to nutritional status in children attending College of Dentistry /University of Baghdad.*** ***Materials and method:*** ***After examination 5760 children aged 5-12 years of both genders only 147child with dental anomalies were found, all developmental dental anomalies that were clinically observable were recorded. The developmental dental anomalies which diagnosed in this study were supernumerary, missing teeth, talon cusp, microdontia, gemination, fusion, peg shape lateral, enamel hypoplasia, dentinogenesis imperfacta and amelodensis imperfacta. Nutritional status for each child assessed by measuring weight and height to calculate body mass index.*** ***Results:*** ***The results of the current study showed that the supernumerary teeth was the first most common anomaly seen in this study followed by localized hypoplasia which the second most common anomaly seen followed by missing teeth and microdontia respectively. Regarding total sample from 5 to 12 years old children, the findings showed that the children percent with number anomalies (42.9%) was highest than children percent with structural anomalies and shape anomalies (32.7%, and 24.5% respectively) with statistically highly significant difference (P<0.01). The shape anomalies and structural anomalies percent (25.0%, and 40.0% respectively) were higher among girls than boys while number anomalies percent (48.3%) was higher among boys than girls with non significant difference (P>0.05). The results showed that the underweight children showed higher percent (53.1%) among all age groups than children who were normal weight, over weight and obese (32.7%, 12.2%, and 2.0% respectively) with highly significant difference (P< 0.01). The results illustrated that both boys and girls showed highest percent of underweight (44.8%, and 65.0% respectively) followed by normal weight, over weight and obese with statistically non significant difference. The results also reported that the underweight children presented with highest shape and structural anomalies percent (75.0%, and 50.0% respectively) except number anomalies showed highest percent (47.6%) among normal weight children. Regarding total sample, the underweight children presented with highest dental anomalies percent of all anomalies types(53.1%)than normal weight, over weight and obese children with highly significant difference (P< 0.01).*** ***Conclusion:*** ***The present study showed the association of nutritional status with dental anomalies among Iraqi children.***

Keywords: Dental anomalies, BMI

1. Introduction

Dental anomalies cover wide range of abnormalities that affect tooth number, shape, size and tooth structures; dental anomalies are not a rare finding during routine dental examination, developmental dental anomalies are an important category of dental symptomatology. Dental anomalies incidence and degree of expression in different population groups can provide important information for phylogenic and genetic studies and help the understanding of variations within and between the different populations [(1)]. Its prevalence differs between countries and families, for example congenitally missing teeth is the most prevalent dental anomaly found in Turkish [(2)], Indians [(1, 3)], Saudi Arabians [(4)], and Norwegian children [(5)]. In Nigeria, enamel hypoplasia is the most common dental anomaly in children while hypodontia is a rare clinical feature [(6)]. A number of these anomalies can be discovered by clinical examination and or radio graphical observations which play an important role in differential diagnosis of these anomalies [(7, 8, 9)]. Dental anomalies have low frequency and their management procedure is more complicated in comparison with more common oral disorders such as dental caries and periodontal diseases [(10)], and although these anomalies asymptomatic, can lead to clinical problems, it's management is important for a number of reasons: they are associated with oral health problems including malocclusion [(11)], caries [(8)], poor oral hygiene [(12)], and aesthetic concerns [(13)]. They could also predispose to functional problems and other diseases [(1)]. In addition, the developmental dental anomalies may be associated with syndromes, especially when the anomalies are multiple [(14, 15)].

Developmental dental anomalies are marked deviations from the normal color, contour, size, number, and degree of development of teeth. Local as well as systemic factors may be responsible for these developmental disturbances, such influences may begin before or after birth, hence deciduous or permanent teeth may be affected. Alteration in the normal number of teeth includes supernumerary teeth (hyperdontia), i.e. excess teeth or hypodontia (teeth missing from the normal compliment) while oligodontia is a developmental absence of six or more teeth excluding the 3rd molars. Anomalies of shape of teeth include microdontia and macrodontia, talon cusp, gemination, fusion [(13, 16)]. Malformation of the teeth can be developmental, congenital or acquired and may be localized to single tooth or involving

systemic conditions [17], congenital abnormalities are typically inherited genetically. Abnormalities in tooth number shape, and structure resulted from disturbances during the morpho-differentiation stage of tooth development, while ectopic eruption, impaction and rotation of teeth result from developmental disturbances in the eruption pattern of permanent teeth [18]. Around 7% of children are born with some of the disturbances in the orofacial system and most commonly are supernumerary teeth, missing teeth, fused teeth and peg lateral incisors [19]. Nutrional status affects the teeth pre-eruptively, although this influence is much less important than the post eruptive local effect of diet. Deficiencies of vitamins D and A and protein- energy malnutrion are associated with enamel hypoplasia and salivary gland atrophy, both of which increase susceptibility to dental caries [20]. Yihong et al. [21], reported that low birth weight and premature children had significantly more hypoplasia than children with normal weight at birth, suggesting that prenatal and neo-natal conditions might play a role in the development of this defect. Different Iraqi epidemiological studies were carried out to compare prevalence of enamel defect among well-nourished and malnourished children with different results, Diab [22], reported that enamel anomalies prevalence were higher among normal children than stunted and underweight children, while picture were different among wasted children, as mild and sever grades had higher prevalence. Gatta [23], found that enamel defect prevalence was higher among well-nourished than under weighted, stunted and wasted children but these differences were not significant in all groups and both genders. Droosh [24], showed that mean number of primary teeth with demarcated opacities were lower among stunted, underweighted and wasted children than well-nourished children, while the enamel defect prevalence was higher among malnourished than well-nourished children reported by Murad [25]. Jabber [26], reported that the enamel anomalies prevalence was highest among well-nourished children than stunted, underweight and wasted children for the total sample as well as for children aged five years, and stunted children aged four years old, while opposite picture found among underweight and wasted children aged four years old. The abnormal structure and morphology of the affected teeth may cause the initiation and progression of caries [27]. Yadav et al. [28], reported that enamel opacities was found more in under-weight group than normal and over weighted groups followed by hypoplasia, also result showed that BMI and enamel opacities/ hypoplasia was associated significantly.

2. Materials and Method

This study extended in period from 2015 till the end of 2016.

The Sample: the present study included children of both genders who attending department of pedodontics and prevention, College of Dentistry /University of Baghdad, after the examination of 5760 child aged 5-12 years of both genders only 147 child with developmental dental anomalies were found; who devoid of any systemic disease, mental or physical abnormality, then the body mass index was calculated for each child.

The clinical details including the patient's age, gender and dental anomalies were carefully checked, and recorded. A comprehensive clinical examination was carried out to detect the presence of dental anomalies. Radiographs such as intra-oral periapical radiographs, orthopantomographs, were advised if the condition demanded.

The following diagnostic criteria were used for dental anomalies assessment [29, 30, 31]:

A-Anomalies in teeth number:
A supernumerary tooth (mesiodens) which found in the premaxilla between the two central incisors, morphologically it may be tuberculated or cone shaped.

B-Anomalies in tooth shape:
- Talon cusp it should extend at least 1mm below the cementoenamel junction or half the distance from CEJ to the incisal edge.
- Fusion it is the union between two separately normal developed teeth.
- Microdontia which are the teeth that physically appear smaller than usual.
- Peg shape lateral which is any upper lateral incisor demonstrating a reduction in its mesiodistal width in a gingivo-incisal direction.
- Germination which is arised from an attempt of single tooth germ division by an invagination which lead to in incomplete formation of two teeth.

C-Anomalies in tooth structure
Amelogenesis imperfecta, dentinogenesis imperfecta, and enamel hypoplasia.
Enamel hypoplasia which is the result of incomplete inorganic enamel matrix of teeth formation or maturation.
Data collected were entered into a spread sheet (Excel 2010; Microsoft Office) and analyzed statistically using Statistical Package for Social Sciences version 16 (SPSS Inc. Chicago, Illinois, USA). Pearson Chi square test was used for analysis. For this test, p- value was set at <0.05.

Assessment of nutritional status:

Measurement of weight:
Children were weighed by bathroom scale, children reading was recording to the nearest of 0.1kg as possible. The instrument used was checked and standardized against a known weight of 5kg and adjusted in the morning before measurements were started and after weighing every 20 children [32].Children were weighed with minimum clothes without shoes and head covering and without touching anything, then 500 gram were subtracted from the total weight to compensate of the light underneath cloths [22].

Measurement of Height:
The height of the child was measured by using ordinary measuring tape fixed at the wall, the child was standing up after removing his/her shoes with feet parallel to each other and pointed forward and the back of the child is straight in upright position. The knee was straight and the child's head was in position that the line between the lower boarder of the orbit and the upper margin of the external auditory meatus (Frankfort plane) is horizontal. The sliding head

piece is lowered to rest on the head; the measurement should be recorded to the nearest 0.1cm [32].

Body mass index (BMI): This index is a number calculated from child's weight and height, according to this formula:

$$BMI = \frac{\text{wight (kg)}}{\text{hight}^2\ (m^2)} \quad (33)$$

Because of unavailability of Iraqi standard for comparison, the value of nutritional indicators were compared with the international reference values, for this purpose it was recommended to use the reference population that defined by National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion and using CDC growth charts.

3. Results

Figure (1) illustrates the distribution of dental anomalies in 147 children according to types.

Concerning number anomalies, this figure shows that 28.57% children had supernumerary tooth which the first most common anomaly seen in this study followed by 14.28% children had missing teeth.

Concerning structural anomalies, this figure shows that 20.4% children had localized hypoplasia which the second most common anomaly seen and 2.04% children had Dentinogenesis imperfecta which the least common anomaly seen in this study.

Concerning shape anomalies, this figure shows that 8.16% children had microdontia.

Table (1) demonstrates the distribution of dental anomalies according to age in 147 children. Concerning shape anomalies, the results showed that the shape anomalies percent (33.3%) was highest among 5-6 years old children followed by 25.0% among 11-12 years old children than other age groups.

Concerning number anomalies, the results showed that number anomalies percent (66.7%) was highest among 7-8 years old children followed by 58.3% among 11-12 years old children than other age groups.

Concerning structural anomalies, the results showed that the structural anomalies percent (66.7%) was highest among 5-6 years old children followed by 53.8% among 9-10 years old children than other age groups.

Regarding total sample from 5 to 12 years old children, the findings showed that the children percent with number anomalies (42.9%) was highest than children with structural anomalies (32.7%) and children with shape anomalies (24.5%) with statistically highly significant difference (Pearson Chi-Square=37.530, P< 0.01).

Table (2) demonstrates the distribution of dental anomalies according to gender in 147 children. The findings showed that the shape anomalies and structural anomalies percent (25.0%, and 40.0% respectively) were higher among girls than boys while number anomalies percent (48.3%) was higher among boys than girls with statistically non significant difference (Pearson Chi-Square =3.147, P>0.05).
Table (3) illustrates the distribution of nutritional status (BMI) according to age in 147 children. The results showed that the underweight children percent was highest among all age groups (83.3%, 46.2%, and 54.2% respectively) except 7-8 age group which showed higher normal weight children percent (50.0%). Regarding total sample, underweight children showed highest percent (53.1%) among all age groups than children who were normal weight, over weight and obese (32.7%,12.2%, and 2.0% respectively) with highly significant difference (Pearson Chi-Square =37.055, P< 0.01).

Table (4) demonstrates the distribution of nutritional status (BMI) according to gender in 147 children. The results illustrated that both genders showed highest percent of underweight (44.8%, and 65.0% respectively) followed by normal weight, over weight and obese with statistically non significant difference (Pearson Chi-Square= 9.356, P>0.05).
Table (5) shows the distribution of nutritional status (BMI) in relation to dental anomalies in 147 children. The results reported that the underweight children presented with highest shape and structural anomalies percent (75.0%, and 50.0% respectively) except number anomalies showed highest percent (47.6%) among normal weight children. Regarding total sample, the underweight children presented with highest dental anomalies percent of all anomalies types (53.1%) than normal weight, over weight and obese children with statistically highly significant difference (Pearson Chi Square= 22.603,P<0.01).

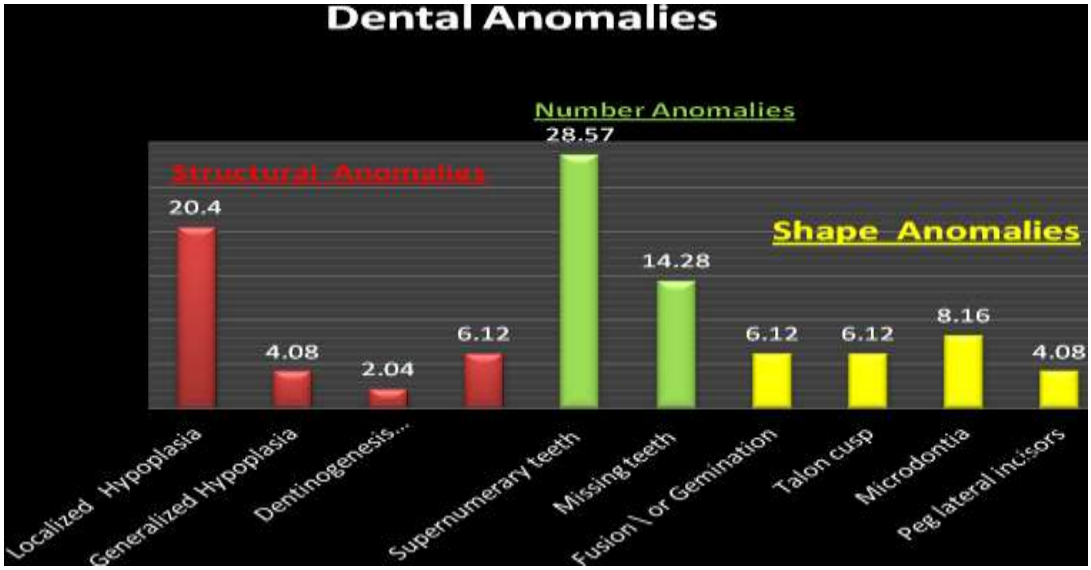

Figure (1): Distribution of dental anomalies in 147 children according to types

Table 1: Distribution of dental anomalies according to age in 147 children

Dental Anomalies	AGE								Total	
	5-6 years		7-8 years		9-10years		11-12years			
	No.	%	No.	%	No.	%	No.	%	No.	%
Shape Anomalies	6	33.3%	3	16.7%	9	23.1%	18	25.0%	36	24.5%
Number Anomalies	0	0%	12	66.7%	9	23.1%	42	58.3%	63	**42.9%
Structural Anomalies	12	66.7%	3	16.7%	21	53.8%	12	16.7%	48	32.7%
Total	18	100.0%	18	100.0%	39	100.0%	72	100.0%	147	100.0%

**highly significant at P<0.01.

Table 2: Distribution of dental anomalies according to gender in 147 children

Dental Anomalies	Genders					
	Boys		Girls		Total	
	No.	%	No.	%	No.	%
Shape Anomalies	21	24.1%	15	25.0%	36	24.5%
Number Anomalies	42	48.3%	21	35.0%	63	42.9%
Structural Anomalies	24	27.6%	24	40.0%	48	32.7%
Total	87	100.0%	60	100.0%	147	100.0%

Table 3: Distribution of nutritional status (BMI) according to age in 147 children

Age		BMI				Total
		Under weight	Normal weight	Over weight	Obese	
5-6 years	No.	15	0	0	3	18
	%	83.3%	0%	0%	16.7%	100%
7-8 years	No.	6	9	3	0	18
	%	33.3%	50.0%	16.7%	0%	100%
9-10 years	No.	18	15	6	0	39
	%	46.2%	38.5%	15.4%	0%	100%
11-12 years	No.	39	24	9	0	72
	%	54.2%	33.3%	12.5%	0%	100%
Total	No.	78	48	18	3	147
	%	**53.1%	32.7%	12.2%	2.0%	100%

**highly significant at P<0.01.

Table4: Distribution of nutritional status (BMI) according to gender in 147 children

Genders		BMI				Total
		Under weight	Normal weight	Over weight	Obese	
Boys	No.	39	30	15	3	87
	%	44.80%	34.50%	17.20%	3.40%	100.00%
Girls	No.	39	18	3	0	60
	%	65.00%	30.00%	5.00%	0%	100.00%
Total	No.	78	48	18	3	147
	%	53.10%	32.70%	12.20%	2.00%	100.00%

Table 5: Distribution of nutritional status (BMI) in relation to dental anomalies in 147 children

Dental Anomalies		BMI				Total
		Under weight	Normal weight	Over weight	Obese	
Shape Anomalies	No.	27	3	6	0	36
	%	75.0%	8.3%	16.7%	0%	100.0%
Number Anomalies	No.	27	30	6	0	63
	%	42.9%	47.6%	9.5%	0%	100.0%
Structural Anomalies	No.	24	15	6	3	48
	%	50.0%	31.3%	12.5%	6.3%	100.0%
Total BMI	No.	78	48	18	3	147
	%	**53.1%	32.7%	12.2%	2.0%	100.0%

**highly significant at P<0.01.

4. Discussion

Developmental teeth anomalies are clinically obvious abnormalities; they may be the cause of various dental problems. Careful observation and appropriate investigations are required to diagnose the dental anomalies and begin with appropriate dental treatment. So, the current study was designed to investigate the distribution and the association of dental anomalies among children who attending College of Dentistry /University of Baghdad with their nutritional status. However, little studies were known about this subject.

The results of the present study concluded that the numbers anomalies was the most common anomaly with congenital supernumerary tooth was the first most common anomaly seen more often in the anterior region as mesiodens, followed by structural anomalies with localized hypoplasia was the second most common anomaly, while the shape anomalies was the least common anomaly with microdontia was most common shape anomaly seen in Iraqi children who attending College of Dentistry /University of Baghdad. These findings were agree with Backman and Wahlin [34], Yassin [35], who concluded that the teeth number anomalies was most common anomaly followed by shape and structural anomalies respectively in Saudi children, and disagree with results reported by Temilola et al.[9], in Nigerian population in which structural anomalies was the most common anomaly.

In the current study the least common structural anomaly was dentinogenesis imperfecta, this result was in line with that obtained in previous studies [35, 36] in Saudi children and in Indian population respectively, the early diagnosis and early management of dental anomalies may prevent the child suffering from esthetic, periodontal and orthodontic problem in the future. The reasons for variation between the current study results and the previous studies results might be attributed to genetic, racial factors, variations in sample nature, subject ethnicity, sample size, settings of these studies as well as the accuracy of the methods and the diagnostic criteria which were used for identifying and classifying dental anomalies. In addition, the types of dental anomalies which evaluated by those studies might be another reason for this variation since previous studies investigated just few types of anomalies, not all of them.
The findings of the present study showed that the shape anomalies and structural anomalies percent (25.0%, and 40.0% respectively) were higher among girls than boys while number anomalies percent was higher among boys than girls (48.3%) with non significant differences, these results were in line with Patil [1], Karadas [37], Yassin [35], definitive reason for those results was not documented but suggested to be due to girls showed higher underweight percent than boys in this study, which might explained this association. This higher underweight percent in girls than boys might be due to the cultural preference of boys who receiving more parental care and better food supplements than girls [38].

In the current study underweight children showed highest percent (53.1%) among all age groups than children who were normal weight, over weight and obese respectively with highly significant difference, this might be due to that the hospital of College of Dentistry /University of Baghdad is educational and almost smi- free of charge, which intended by a large proportion of the low socioeconomic families with limited income, since most malnourished children appear among those low socioeconomic families [39] or this result might be due to sample size or study design.

The outcome of the present study showed that the underweight children presented with highest dental anomalies percent (53.1%) of all anomalies types (shape, structural and number anomalies respectively) than normal weight, over weight and obese children with highly significant difference. These findings were nearly similar to the findings of Al-Etbi [40], who found that the structural anomalies for permanent teeth for both demarcated opacities and hypoplasia were higher among malnourished than well nourished children but statistically no significant differences. This might attribute to fact that the deficiency of nutritional elements is important cause of enamel defects, since ameloblasts are very delicate in nature, they are quite sensitive to various systemic and genetic disturbances, when ameloblasts are damaged they are unable to recover [41]. In addition the nutritional deficiency can affect function of epithelial cell and the mineralization process; such a condition might lead to formation of the structural defect [42, 43].

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