Hong Kong Journal of Paediatrics Research
(An Open Access Journal for Paediatrics and Child Health Research)

Case Report

Hong Kong J Pediatr
ISSN (e): 2663-5887
ISSN (p): 2663-7987
2018; 1(1): 14-17

www.hkpaediatricjournal.com

Dental Caries among Sudanese Children with Beta-Thalassemia Major

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Abstract

Background: The aim of this study was to determine the association between β-thalassemia major and dental caries among a sample of Sudanese children compared to healthy control children. **Methods:** This study was carried out in 54 children with β-thalassemia major aged (4-16) years old compared to 54 healthy control group matched with age and gender in Khartoum state. Dental caries was examined using (dmft, DMFT) index by WHO for primary and permanent dentition. Statistical analysis was done using the statically package for social science (SPSS) version 20. The 95% confidence interval for the association between variables were estimated and compared using Chi-square test. P value ≤ 0.05 was considered statically significant. **Results:** The mean dmft and DMFT in β-thalassemia major was double the value in the healthy control group (4.4 vs. 2.3 and 1.5 vs. 0.7) respectively. Significant difference was recorded between the β-thalassemia major group and healthy group in DMFT (p≤0.038) and dmft (p≤0.005). No statically significant difference between boys and girls among children with β-thalassemia major. **Conclusion:** Children with β-thalassemia major experience more dental caries compared to the normal healthy control group. Perception of the situation of β-thalassemia children should contribute for the planning of dental services that can help in reduction of dental caries incidence and avoid future dental problems.

Keywords: β-thalassemia major; Dental caries; Control children; dmft; DMFT.

INTRODUCTION

Haemoglobinopathies are inherited disorders of globin, the protein component of hemoglobin (Hb). Common Haemoglobinopathies are thalassemia and sickle cell disease, primarily characteristics of the tropic and sub tropic regions but are now globally wide spread due to migration.[1, 2]

Thalassemia is defined as an autosomal recessive inherited blood disorder, caused by defects in the synthesis of either Alpha or Beta globin chains, leading to hypochromic microcytic anaemia and decrease hemoglobin production.*[3, 4]

Thalassemia is one of the most widespread genetic disorders and it was first discovered clinically by Dr. Thomas Cooley in 1925.*[5, 6]

Globally it has been estimated that 7% of the world population are carriers of hemoglobin disorders, and every year over 330,000 of born infants have disorders, 17% of them are thalassemia.[2, 7]

Worldwide thalassemia is more common among Mediterranean roots and origin population, predominantly in Italy, Greece, and Cyprus with a prevalence of 10% to 15%. Low prevalence 1.5–5% is reported in Arabian population; Turkey, South East Asia, Africa and Iran.(8) Moreover in India It is a major health concern, the prevalence of β-thalassemia is as high as 17%.[9]

The first clinical manifestations of β-thalassemia major appear at 4-6 month of age as severe anaemia, feeding difficulties, growth retardation and failure to thrive.[5]

The clinical features of β-thalassemia major are characterized by bone marrow hyperplasia, skeletal deformities, hepatospleenomegaly and iron overload as a result of repeated blood transfusion.[10, 11] Affected children are susceptible to foliate deficiency, cardiac failure and infection. It can affect the endocrine system in some cases.*[5, 12-15]

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Diagnosis of thalassemia; by full blood count, hematological tests and molecular genetic analysis.[1, 16]

β-thalassemia major can be life threatening if left untreated before the age of three years.[2, 14] Nowadays prognosis has improved, and life expectancy is approaching normal as a result of medical advances in transfusion, iron chelation therapy and bone marrow transplantation.[2, 7, 12]

In previous literature few studies are available concerning β-thalassemia and its association with dental caries.[14] To our knowledge no such study is available among Sudanese population. Therefore, the present study is designed to assess the association between β-thalassemia major and dental caries among a sample of Sudanese children and compare it with healthy children matching with number and age group.

METHODOLOGY

This study is an analytical cross-sectional carried out in 54 children with β-thalassemia major aged (4-16) years old compared to 54 healthy control group matched with age and gender.

Research hypothesis

Null hypothesis; there is no association between β-thalassemia major and dental caries among Sudanese children.

The β-thalassemia

Patients with β-thalassemia major attending Jaafar Ibn Oaf hospital, Al Buluk pediatric hospital, Mohamed Alamin Hamid pediatric hospital, Al Ban Jadeed hospital from March 2017 – July 2017 were examined after obtaining a written permission from the directors of the hospitals and after receiving an informed written consent from their parents.

All the β-thalassemia major patients who met the inclusion criteria were examined based on the availability of the patients at the four public hospitals, taking advantage of the scheduling of medical appointments and routine tests.

The healthy control group

Multi stage sampling was applied; the first stage schools were selected from the same catchment area of the referral center, the second stage children in each school were selected following stratification by age and gender and the third stage children in each class were selected following systematic randomization technique.

Examination of children was carried out after a request letter explaining the purpose of the study was given to the responsible school authorities to carry out the research and after a written consent was received back from their parents.

Examination of the β-thalassemia patients and the healthy control group was done in an ordinary chair in a doctor's office and teacher's office respectively under artificial light. Before dental examination children were instructed to rinse there mouth for better visualization. Teeth were cleaned with cotton roll whenever necessary. The child was placed in an up-right position and a note taker recorded the information as reported by the dentist during the examination.

An ethical approval was obtained from the research committee of the Faculty of Dentistry-University of Khartoum prior to the conduction of the study.

Dental caries was assessed using the decayed, missed, and filled tooth index DMFT and dmft for permanent and primary dentition of the child respectively according to the WHO guidelines for oral health survey.[17]

Statistical analysis:

Data was collected, cleaned and analyzed using the statically package for social science (SPSS) version 20. The 95% confidence interval for the association between dental caries was estimated and compared using Chi-square test. A level of significance of 5% will be adopted to reject the null hypothesis.

RESULTS

A total of 108 children (70 boys, 38 girls) 4-16 years old were examined in this study.

The sample comprised of two equal groups; 54 patients with β-thalassemia major and 54 healthy group similar in age and sex distribution. The mean age for β-thalassemia major and for the healthy control group was 7.7±3.4 years. It was clear that the majority of the sample was boys, table (1). According to the age the study sample was divided into three age groups, and the majority of them were in the age group 4-6 years old, figure (1).

Table 1: The distribution of the study sample according to gender (%)

Children	Male	Female	Total
β-thalassemia patients	35 (64.8)	19 (35.2)	**54 (100)**
Healthy Control children	35 (64.8)	19 (35.2)	**54 (100)**
Total	**70 (64.8)**	**38 (35.2)**	**108 (100.0)**

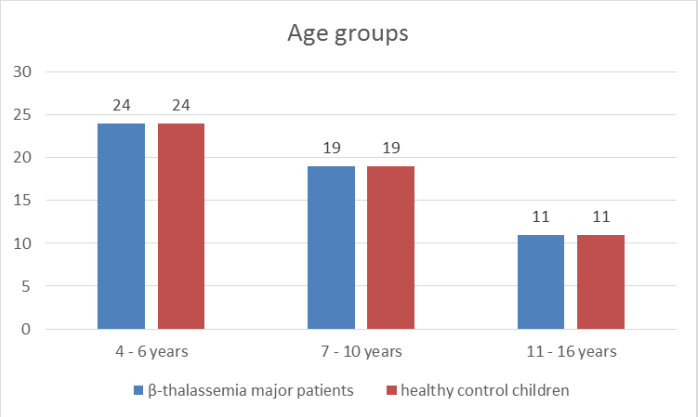

Figure 1: Distribution of the study sample according to age group

Table (2) revealed that the mean dmft and DMFT in β-thalassemia major was twice the value for normal healthy children and significant difference existed between the two groups.

Table 2: Distribution of the mean dmft and DMFT in the β-thalassemia major and healthy control group

Caries index	β-thalassemia patients			Healthy Control children			P value
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	
dmft	43	4.4	3.8	43	2.3	2.9	0.005**
DMFT	30	1.5	1.7	30	0.7	1.3	0.038**

P value significant ≤0.05

In table (3) the boys with β-thalassemia major scored higher mean dmft than girls, and the mean DMFT was slightly higher in girls than boys. No significant difference was noted.

Table 3: Distribution of the mean dmft and DMFT according to gender in the β-thalassemia major group

Caries index	Boys			Girls			P value
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	
dmft	30	4.7	4.0	13	3.7	3.4	0.436
DMFT	16	1.4	1.6	14	1.6	1.8	0.670

P value significant ≤0.05

Table (4) revealed a significant difference in the dmft and DMFT values between the β-thalassemia major and the healthy control in the age group 7-10 years old. No significant difference was found in the age group 4-6 and 11-16years old.

Table 4: Distribution of the mean dmft and DMFT according to the age group in the study sample

Age group	Caries index	Study sample	N	Mean	SD	P value
4 - 6 years	**dmft**	***Case***	24	4.0	3.6	0.191
		Control	24	2.7	3.4	
7 - 10 years	**dmft**	***Case***	19	4.8	4.2	0.007**
		Control	19	1.7	2.2	
	DMFT	***Case***	19	1.5	1.7	0.008**
		Control	19	0.3	0.6	
11-16 years	**DMFT**	***Case***	11	1.5	1.7	0.819
		Control	11	1.4	2.0	

P value significant ≤0.05

DISCUSSION

Thalassemia is characterized by various degrees of extramedullary hematopoiesis and increased hemolysis that can lead to various bony deformities in patients who receive insufficient blood transfusion[18] . The present study was carried out to evaluate dental caries and malocclusion for 4-16 years old Sudanese children with β-thalassemia major in comparison with healthy normal Sudanese children. To our knowledge, this study was the first attempt in Sudan to investigate such problem.

The current results revealed significant evidence against the null hypothesis, children with β-thalassemia major showed statistical significance difference in dental caries than the healthy control group.

Dental caries is one of the most important oral health problems worldwide, that affects individuals in all age groups. However, dental caries as a disease of children has not been eliminated but has only been controlled to a certain extent.[19]

In this study children with β-thalassemia major in the age group 7-10 years old reported higher mean dmft (4.8 vs. 1.7) and DMFT (1.5 vs. 0.3) values than the control group and the result was statically significant.

In the current study, the caries index among the 4-6 and 11-16 age groups were not statically significant between the two study groups. However, it was significant in the age group 7-10 years old. This was in line with Mehdizada *et al*[20]) results, the difference was not statically significant in Iranian children 2-5 years old but highly significant in the age group 6-12 years old. In contrast Al Wahdani[21] in Jordan and Rocihi Arora *et al*[22] in india described a significant difference in caries experience among the thalassemia children within all age groups.

According to AL-Hadithi no statically significant difference between the thalassemia and healthy group in the mean value of dmft and DMFT at the age 6-8 years old, and significant difference were reported at the age 9-12 years old.[23]

The current results showed that β-thalassemia major was associated with higher rates of dental caries than the healthy control group with statically significant difference in dmft (p≤0.005), and DMFT (p≤0.038) values. These results were in agreement with a previous study by Arora Manali *et al* in India among 50 patients with β-thalassemia major, and concluded that thalassemia was associated with higher rates of dental caries and DMFT was significantly higher in thalassemia patients (p≤0.001) in comparison with the healthy control group.[24]

Similarly Mehdizadeh *et al* performed a study for 50 β-thalassemia patients (21 male and 29 female) and the results revealed that dental caries was significantly higher in thalassemia patients in comparison with the healthy control group.[20]

High rates of dental caries was reported by Al-Wahdani *et al* in 61 thalassemia patients compared with 63 healthy control group with statically significant difference in DMFT (p≤0,0001) value. The age range was 6-18 years old. These results although higher are compatible to the results of the present study. Al-Wahdani concluded the high level of dental caries on the basis of chronic nature of thalassemia and patients being preoccupied with their main life threatening problem and neglect basic preventive care.[21]

In contrast Qurashi *et al* in Pakistan reported no significant difference in dental caries experience in 90 (58 male, 32 female) children with β-thalassemia major when compared with 60 (27 male, 32 female) healthy control group, age range 6-15 years old.[25] The same results had been obtained by Rochi Arora in India and Luglie *et al* *[22, 26] in Italy but contradicting to the present study.

In this study gender had no effect on caries as no statically significant difference was reported in caries prevalence between boys and girls among the β-thalassemia group. This result was in agreement with the studies contucted by Hattab *et al* and Rocihi Arora *et al*. However, Al-Hadithi *et al* reported no statically significant differences in dmft values concerning gender variation between total males and females in both groups except for DMFT was significant for females, and justified the findings to the fact that teeth in females erupt earlier than males. Therefore, exposed more to oral environment and subjected earlier to caries attack.(23)

This variation in the results among different populations may be attributed to the sample size, age range, as well as the method used for assessing the prevalence of dental caries in the various studies.

CONCLUSION

- Children with β-thalassemia major experience more dental caries compared to the normal population in Sudan.
- A significant association between β-thalassemia major and dental caries in primary and permanent dentition suggesting that β-thalassemia major may be a risk factor for dental caries.

Conflict of interest

There was no conflict of interest between authors.

Acknowledgment

Thanks to the staff of Pediatric Dentistry Department, University of Khartoum. Special thanks to the schoolchildren who participated in this study and their parents.

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