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Original Research Article

Prevalence of Dental Caries, Oral Hygiene Status, Malocclusion Status and Dental Treatment Needs in Thalassemic Children –A Cross sectional Study

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Abstract: Thalassemia is an inherited blood disorder in which the body makes an abnormal form of hemoglobin which results in improper oxygen transport and destruction of red blood cells. Patients with thalassemia have been found to have lower bone mineral density. Prominent cheek bones, maxillary enlargement due to erythroid hyperplasia are the major facial changes in thalassemic patients. Wide spacing of the teeth, protrusion of the maxilla and maxillary incisors, defective anterior open bite and saddle nose deformity are the major oro-facial abnormalities. Aim of the study was to evaluate prevalence of dental caries, oral hygiene status, malocclusion status and dental treatment needs in thalassemic children. A group of 72 thalassemic major patients were considered for study. All the patients belong to Thalassemia major group and registered in Thalassemic society. The sample included 57 male and 15 female thalassemic children between the ages of 0 to 17 yrs. A control group of 72 normal children of the same age group are included in the study for comparison. In this study, it was found that dft, DMFT, Debris Index, Calculus Index, Simplified oral hygiene Index (OHI-S) is poor in beta thalassemia patients when compared to the control group children of same age groups. Thalassemia is a hematological disorder with life threatening problems. Dental ailments are often neglected. Thalassemia patients and parents of the thalassemia patients are to be educated regarding the prevention of caries and the importance to maintain good hygiene of the oral cavity.

Keywords: Thalassemia, Hemoglobinopathy, Chipmunk Facies, Debris Index, Calculus Index, Simplified Oral Hygiene Index.

INTRODUCTION

Thalassemia is an inherited blood disorder where abnormal form of hemoglobin is synthesized. Improper oxygen transport and destruction of red blood cells occur due to the formation of abnormal hemoglobin. According to the Centers for Disease Control (CDC), thalassemia is most common in people from Asia, the Middle East, Africa, and Mediterranean countries such as Greece and Turkey. The two main forms of thalassemia are alpha-thalassemia and beta-thalassemia. The α-thalassemias (Alpha) involve the genes Hemoglobin A1 (HBA1) and Hemoglobin A2 (HBA2), inherited in a Mendelian recessive manner. There is a deletion of the 16p chromosome. Alpha Thalassemia result in decreased alpha-globin production, therefore fewer alpha-globin chains are produced, resulting in an excess of β chains in adults and excess γ chains in newborns. The excess β chains form unstable tetramers known as hemoglobin H or HbH. Beta thalassemia also inherited as autosomal,

recessive fashion occur due to mutations in the HBB gene located on chromosome 11, the severity of the disease depends on the nature of the mutation and on the presence of mutations in one or both alleles. The beta form of thalassemia is particularly seen among Mediterranean population, and this geographical association is responsible for its naming [1]. β thalassemia major or Mediterranean anemia or Cooley anemia is caused by a β^o/β^o genotype. No functional β chains are produced, and thus no hemoglobin A can be assembled. This is the most severe form of β-thalassemia. β thalassemia intermedia is caused by a β^+/β^o or β^+/β^+ genotype. In this form, some hemoglobin A is produced, thalassemia minor is caused by a β/β^o or β/β^+ genotype. Only one of the two β globin alleles contains a mutation, so β chain production is not terribly compromised and patients remain relatively asymptomatic. Signs and symptoms of β-Thalassemia Major appear within the first 2 years of life. According to the literature few cases have been reported even earlier at the age of 4- 6 months of life. Affected infants are usually having low circulating hemoglobin, failure to thrive, and become progressively pallor. Diarrhea, recurrent fever, spontaneous fractures, bleeding, susceptibility to various infections, hepatosplenomegaly, and growth retardation are some of the commonly presenting symptoms. Also patients with thalassemia have been found to have lower bone mineral density [2]. According to the literature, prominent cheek bones, enlargement and protrusion of maxilla caused by erythroid hyperplasia with depression of the bridge of the nose is the major facial change in thalassemic patients. These oro-facial changes result in the characteristic facial appearance in the thalassemia children called as "Chipmunk facies or Rodent facies" [3]. Oro-facial abnormalities in children include wide spacing of teeth, forward drift and protrusion of maxillary incisors, abnormal anterior bite, protrusion of maxilla, abnormalities in occlusion, and nose deformity often referred as saddle nose deformity, pneumatization of maxillary antrum is often delayed in the thalassemia affected children [4].

AIM

The aim of this study was to evaluate prevalence of dental caries, oral hygiene status, malocclusion status and dental treatment needs in thalassemic children.

MATERIALS AND METHODS

A group of 72 thalassemic major patients were considered for study. All the patients belong to Thalassemia major group and registered in Thalassemic society, a part of Hematological society of Hyderabad. The sample size included 57 male and 15 female thalassemic children between the ages of 0 to 17 yrs. The sample included subjects from all socioeconomic backgrounds and most of them hailing from below poverty line. Institutional ethics committee approval and consent from the parents of study group and control group were also taken before the study.

A control group of 72 normal children of the same age group are included in the study for comparison. The decayed and filled teeth (dft) and decayed missing filled teeth (DMFT) indices were used to determine caries prevalence in deciduous and permanent dentition respectively putforth by World Health Organization (WHO). Oral hygiene status was determined using debris index, calculus index and Simplified Oral Hygiene Index (OHI-S). Malocclusion status was determined by using Angle's classification and Baume's classification in the respective dentitions. Inclusion criteria used was the children attending the pediatric outpatient department with diagnosis of thalassemia or the children registered in the thalassemia society and getting regular blood transfusions were included. Children suffering from other diseases which are known to cause dental abnormalities are excluded from the study.

RESULTS

In this study 72 thalassemia major children and control group children in the age groups of 0 – 17 were considered. The thalassemic and control group age and sex distribution are shown in Table-I. Table – II, III and IV shows average scores of caries indices, oral hygiene indices, malocclusion status and dental treatment needs of thalassemic children.

- The caries index scores were DMFT – 1.6 ± 0.14 and dft – 1.44 ± 0.14.
- The debris index scores, calculus index scores and OHI – S scores were 0.96 ± 0.19, 0.34 ± 0.19 and 1.47 ± 0.14 respectively.
- Malocclusion status incidence is found to be 15.27%; the treatment needs were oral prophylaxis 43%, restorations 50%, extractions 26.3%, endodontic treatment 5.55% and orthodontic treatment 15.27% (Table V).
- The control group results are shown in Table – III.
- The caries indices scores are DMFT – 0.52 ± 0.5 and dft -0.47 ± 0.5.
- The oral hygiene indices scores are debris index 0.62 ± 0.48 calculus index – 0.3± 0.48 and OHI-S - 0.96 ± 0.33.
- The malocclusion incidence is 38%. The treatment needs are oral prophylaxis 30%, restorations 16.36%, and extractions 1.81%, Endodontic treatment 3.63% and 38% orthodontic treatment (Table V).

Table 1: Age and sex distribution of thalassemic and control group

	Thalassemia Group			Control Group		
AGE	**MALE**	**FEMALE**	**TOTAL**	**MALE**	**FEMALE**	**TOTAL**
00 to 02 years	4	1	5	3	2	5
03 to 05 years	15	4	19	12	8	20
06 to 08 years	18	6	24	13	11	24
09 to 11 years	11	3	14	8	7	15
12 to 14 years	5	1	6	4	1	5
15 to 17 years	3	1	4	3	0	3
TOTAL	**56**	**16**	**72**	**43**	**29**	**72**

Table 2: DMFT and DFT observations in study and control groups

Age in Yrs	Thalassemia Group DMFT	Control Group DMFT	Thalassemia Group DFT	Control Group DFT
0 – 2	0	0	0.5	0.2
3 – 5	0	0	2.51	1.66
6 – 8	0.8	0.14	3.9	0.02
9 – 11	1.05	0.65	0.82	0.2
12 – 14	4.1	1.28	0	0
15 – 17	3.66	1.05	0	0
Average	**1.6±0.14**	**0.52±0.5**	**1.44±0.14**	**0.478±0.5**

Table 3: Debris And Calculus Index Observations In Study And Control Groups

Age in Yrs	Debris Index Thalassemia Group	Debris Index Control Group	Calculus Index Thalassemia Group	Calculus Index Control Group
0 – 2	0	0	0	0
3 – 5	0.9	0.34	0.09	0.34
6 – 8	1.15	0.63	0.23	0.42
9 – 11	1.27	0.87	0.5	0.33
12 – 14	1.46	0.65	0.59	0
15 – 17	0.9	1.27	0.6	0.71
Average	**0.96±0.19**	**0.628±0.48**	**0.36±0.19**	**0.3±0.48**

Table 4: Ohi-S And Malocclusion Comparison In Study And Control Groups

Age in Yrs	Thalassemic Group OHI-S	Control Group OHI-S	Thalassemic Group Malocclusion	Control Group Malocclusion
0 – 2	0	0	0	0
3 – 5	0.99	0.68	0	0
6 – 8	1.89	1.03	1	2
9 – 11	1.73	1.2	5	4
12 – 14	2.11	0.53	4	6
15 -- 17	2.6	2.32	1	7
Average	**1.47±0.14**	**0.96±0.33**	**TOTAL = 11**	**Total = 19**

Table 5: Dental treatments in study group and control group

	Thalassemia Group	Control Group
Oral Prophylaxis	**43**	**30**
Restorations	**50**	**16.36**
Extractions	**26.3**	**1.81**
Endodontic Treatment	**5.55**	**3.63**
Orthodontic Treatment	**15.27**	**38**

DISCUSSION

Thalassemia is characterized by impaired synthesis of one or more globin chains of the blood protein hemoglobin. It is an autosomal recessive inherited genetic disorder. Thalassemia disease was first recognized clinically in the year 1925 and described a

syndrome of anemia with smaller sized erythrocytes by Dr. Thomas Cooley. This impairment which is the characteristic of thalassemia leads to varying degrees of anemia that can range from significant to life threatening. These hereditary anemias are caused by mutations mainly located on chromosome 16 that encodes α-globin genes and on chromosome 11 which encodes the γ, δ, and β-globin genes. This defect affects either α or β polypeptide chains of the globin portion of the hemoglobin molecule. Based on the globin chain/chains affected, the disease may be classified as α-thalassemia or β-thalassemia. Based on clinical and genetic entities, thalassemias are classified as homozygous, heterozygous, or compound heterozygous. Although the heterozygous form of β-thalassemia disease (thalassemia minor) is milder with minimum clinical expression, the homozygous form of β-thalassemia (thalassemia major) exhibits the most severe clinical symptoms with marked oro-facial defects. Rarely, a less severe form called thalassemia intermedia also occurs [5].

Thalassemia poses a great challenge to quality of life of children. The clinician and the dentist should have very good knowledge about the oro- facial and other oral manifestations of thalassemic patients. Thalassemic patients need more psychological and social support from the family and the treating doctors which might help in improving treatment outcomes of these patients. It is important to know and understand the dento-facial changes associated with these patients and their implications for orthodontic treatment [5]. With only limited research and literature available in this area, this study is an attempt to find out both the prevalence of intraoral findings of children and adolescents affected with the disease - thalassemia major. Patients with thalassemia major present with great clinical variability in the signs and symptoms. Because of the severe anemia they suffer in early childhood and growing phase of life, bony changes, retardation of growth, and splenomegaly may occur. It has been stated that the effects of thalassemia on bones depend on the severity of anemia, patient's age, duration of clinical symptoms, and the timing of both therapeutic blood transfusion and splenectomy [6]. The transfusion therapy may diminish or indeed, prevent development of bony abnormalities in growing patients [7].

The beta thalassemia patients had higher prevalence of caries than the normal children. Level of dental caries in beta thalassemia patients may be explained on the basis of chronic nature of the disease. One main reason could be that the patients and the parents of the patients are preoccupied with their main, life threatening problems arising from the disease and neglecting the basic preventive dental care [8]. Another reason for high prevalence of debris, dental caries and calculus index could be because of the increased sensitivity to local factors (oral hygiene, tooth brushing habit and frequency of sugar intake) [9].

Present study was aimed to study the prevalence of dental caries, oral hygiene status, malocclusion status and dental treatment needs in thalassemic children. In the study we have found that dft, DMFT, Debris Index, Calculus Index, Simplified oral hygiene Index (OHI-S) is poor in beta thalassemia patients when compared to the control group children of same age groups, on contrary malocclusion was less in the study group than the control group.

Our study correlated with the study done by Navpreet Kaur *et al* [10] and Dr. Veena R [9]. They concluded that the patients with beta thalassemia had higher caries experience (DMFT=3.45 ± 4.20, 3.14±1.92) prevalence than the healthy controls (DMFT=1.82 ± 2.51, 1.52±1.55). Our study also correlated with the recent study conducted by Jaideep singh *et al* [11] where there was significantly higher prevalence of both dental caries and periodontal diseases among beta thalassemic patients (DMFT=13.33±6.813, 3.51±1.131), plaque index (PI= 3.66±2.115, 2.83±1.407) and gingival index (GI=2.83±1.152, 2.04±1.410).In other study conducted by Eugenio Pedulla *et al* [12], where they have concluded that younger population of thalassemic had greater prevalence of dental caries and poor oral hygiene when compared to the older population which is in correlation with the present study. But in the study conducted by Jahangirnezhad *et al* where 56 cases of beta thalassemia major cases were included and they had reported that the decayed, filled and extracted teeth in major Thalassemia patients were not significantly higher than the control group [13].

Our results were also in near correlation with the findings of the author Mohammad Shooriabi *et al* [14] in terms of DMFT indicator where the study group involved 50 patients, the results showed that the mean of DMFT indicator in the patient group was 4.94 with a standard deviation (SD) of 1.5 and in control group was 5.8 with standard deviation of 2.04. Also, the average of decayed teeth in the patient group was 7.7 + 3.3 and in control group was 6.9 + 1.9. In other words, the number of decayed teeth was higher in the patient group. The average of missing teeth was 0.34+ 0.7 in the patient group and 0.58 + 0.9 in control group. The number of missing teeth was higher in healthy subjects. The average of filled teeth was 0.54 + 1.1 in the patient group and 2.4 + 2.2 in control group. In other words, the number of filled teeth was higher in healthy subjects and this difference was statistically significant.

Regarding the malocclusion status, the findings in this study are in contrary with the findings

and the studies conducted by Manali Arora *et al* [15] and Mehdizadeh M *et al* [16] where the malocclusion status was higher in thalassemic patients.

All dental treatments are to be planned with the valuable opinion of the treating hematologist. The hemoglobin levels are to be regularly monitored and maintained so as to reduce the dental caries and malocclusion [17]. This decreases the extent of malocclusion. The dental treatment should be performed in a short time as possible and should be done after the patient receives blood transfusion to improve the hemoglobin percent of the patient. Dental interventions are preferably done when the hemoglobin is more than 10 gm%. If any orthodontic treatment is needed, the dental movement should be watched closely because there may be faster movement compared to the normal situation.

LIMITATIONS

There was discrepancy in the sample size in the groups of the study and also the sample size was small. Moreover, the study design was that of a cross-sectional analysis. Further prospective studies can be conducted in future to substantiate the present study results.

CONCLUSION

The beta thalassemia patients has high rate of prevalence of caries than the normal children. Level of dental caries in beta thalassemia patients is attributable to the chronic nature of the disease. One main reason could be that the patients and the parents of the patients are preoccupied with their main, life threatening problems arising from the disease and neglecting the basic preventive dental care. Preventive dental care is must for thalassemic patients. Thalassemia patients and parents of the thalassemia patients are to be educated regarding the prevention of caries and the importance to maintain good hygiene of the oral cavity. Patient's quality of life can be improved by appropriate dental and periodontal care.

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REFERENCES

1. Greer JP, Arber DA, Glader B, List AF, Means RT, Paraskevas F, Rodgers GM. Wintrobe's Clinical Hematology 2013.
2. Pirinççioğlu AG, Akpolat V, Köksal O, Haspolat K, Söker M. Bone mineral density in children with beta-thalassemia major in Diyarbakir. Bone. 2011;49:819-23.
3. Singh A, Varma S. β-Thalassaemia intermedia masquerading as β-thalassaemia major. BMJ Case Rep. 2014. doi:10.1136/bcr-2014-207637.
4. Van Dis ML, Langlais RP. The thalassemias: Oral manifestations and complications. Oral Surg Oral Med Oral Pathol. 1986;62:229-33.
5. Abu Alhaija ES, Hattab FN, Al-Omari MA. Cephalometric measurement and facial deformity in subjects with Thalassemia major. Eur J Orthod. 2002;24:9-19.
6. Kaplan RI, Werther R, Castano FA. Dental and oral findings in cooley's anemia: A study of fifty cases. Ann N Y Acad Sci. 1964;119:664-6.
7. Drew SJ, Sachs SA. Management of the thalassemia-induced skeletal facial deformity: Case reports and review of the literature. J Oral Maxillofac Surg. 1997;55:1331-9.
8. Guzeldemir E, Toygar HU, Boga C, Cilasun U. Dental and periodontal health status of subjects with sickle cell disease. J Dent Sci. 2011;6:227-34.
9. Veena R. Dental caries and periodontal health status in thalassemic major patients. Karnataka, Bangalore Rajiv Gandhi University and Health Sciences. 2006;1-116.
10. Kaur N, Hiremath SS. Dental caries and gingival status of 3-14 year old beta thalassemia major patients attending paediatric OPD of vanivilas hospital, Bangalore. Arch Oral Sci Res. 2012;2:67-70.
11. Singh J, Singh N, Kumar A, Kedia NB, Agarwal A. Dental and Periodontal Health Status of Beta Thalassemia Major and Sickle Cell Anemic Patients: A Comparative Study. J Int Oral Health. 2013; 5(5):53-8.
12. Pedullà E, Scibilia M, Saladdino G, Colletta G, Rapisarda S. Dental and Periodontal Condition in Patients affected by β-Thalassemia Major and β-Thalassemia Intermedia: A Study among Adults in Sicily, Italy. J Dent Health Oral Disord Ther. 2015;3(1): 00081.
13. Jahangirnezhad M, Keikhahi B, Robati M, Yousefimanesh H, Karimifar A, Abdevand MZ. Evaluation Oral and Dental Health Status in Major Thalassemia Patients Referred to Ahvaz Shafa Hospital. Jundishapur Scientific Medical Journal 2014; Supplement:1-8.
14. Shooriabi M, Zareyee A, Gilavand A, Mansoori B, Keykhaei Dehdezi B. Investigating DMFT Indicator and its Correlation with the amount of Serum Ferritin and Hemoglobin in Students with Beta-thalassemia Major in Ahvaz, South West of Iran. Int J Pediatr. 2016;4(3):1519-27.
15. Arora M, Nayeemuddin SM, Ghatak S, Singh B. Growth Impairment and Dental Caries in Thalassemia Major Patients. Indian Journal of Clinical Anatomy and Physiology. 2014;1(1):15-20.

16. Mehdizadeh M, Zamani G. Orodental complications in patients with thalassemia. Dental research Journal. 2008;5(1):17-20.
17. Gupta DK, Singh SP, Utreja A, Verma S. Prevalence of malocclusion and assessment of treatment needs in β-thalassemia major children. Progress in Orthodontics. 2016;17(7). DOI 10.1186/s40510-016-0120-6.