Dental and Periodontal Health Status of Beta Thalassemia Major and Sickle Cell Anemic Patients: A Comparative Study

Jaideep Singh[1], Nitin Singh[2], Amit Kumar[3], Neal Bharat Kedia[4], Anil Agarwal[5]

[1]Reader, Department of Orthodontics and Dentofacial Orthopaedics, Maharana Pratap Dental College, Kanpur, Uttar Pradesh, India; [2]Senior Lecturer, Department of Pediatric and Preventive Dentistry, Saraswati Dental College, Lucknow, Uttar Pradesh, India; [3]Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Dr. B R Ambedkar Institute of Dental Sciences and Hospital, Patna, Bihar, India; [4]Reader, Department of Orthodontics and Dentofacial Orthopaedics, Buddha Institute of Dental Sciences and Hospital, Patna, Bihar, India; [5]Assistant Professor, Department of Public Health Dentistry, New Horizon Dental College, Bilaspur, Chhattisgarh, India.

ABSTRACT

Background: This study aimed to assess the dental and periodontal health status of beta thalassemia major and sickle cell anemic patients in Bilaspur, Chattishgarh, India.

Materials & Methods: A total of 750 patients were included in the study. The patients were randomly divided into three groups I (n=250), II (n=250) and III (n=250), ranging from 3-15 years. After performing a thourough general examination, including their demographic data, intraoral examination was done using Decayed-Missing-Filled Teeth Index (DMFT Index), Plaque index (PI) and Gingival index (GI). Statistical analysis was done using statistical software SPSS 17.5 version. Chi square test & student t test was used for the comparison of study and control groups. The level of significance was set at $p<0.05$.

Results: In the present study, it was found that, prevalence of dental caries and periodontal diseases was significantly more in beta thalassemic patients followed by sickle cell anemic patients than control group. However, when group I (beta thalassemia) was compared with group II (sickle cell anemia), results were found to highly significant ($P<0.001$) only for decayed missing filled tooth.

Conclusion: Appropriate dental and periodontal care improves a patient's quality of life. Preventive dental care is must for thalassemic and Sickle cell disease patients.

Key Words: beta thalassemia, dental caries, periodontal disease, sickle cell anemia.

How to cite this article: 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.*

Source of Support: Nil **Conflict of Interest:** None Declared

Received: **8th June 2013** Reviewed: **1st July 2013** Accepted: **31st July 2013**

Address for Correspondence: Dr. Jaideep Singh. Department of Orthodontics and Dentofacial Orthopaedics, Maharana Pratap Dental College, Kanpur, Uttar Pradesh, India. Phone: +91 – 9305573374.
Email: drjaideep11@yahoo.com

Introduction

Haemoglobinopathies, mainly thalassaemias and sickle-cell anemia, are globally widespread. About 5% of the world's population carries genes responsible for haemoglobinopathies[1]. Each year about 3,00,000 infants are born with major hemoglobin disorders – including more than 2,00,000 cases of sickle-cell anemia in Africa. Globally, there are more carriers (i.e. healthy people who have inherited only one mutant gene from one parent) of thalassemia than of sickle-cell anemia, but the high frequency of the sickle-cell gene in certain areas leads to a high rate of affected newborns.[1-2]

Sickle-cell anemia is particularly common among people whose ancestors come from sub-Saharan Africa,

India, Saudi Arabia and Mediterranean countries. [2-3]

Worldwide, patients with hemoglobin E-beta-thalassemia (Hb E/β-thalassemia) represent approximately 50 per cent of those affected with severe beta thalassemia. The highest frequencies are observed in India, Bangladesh and throughout Southeast Asia, particularly in Thailand, Laos and Cambodia, where it is common for individuals to inherit alleles for both hemoglobin E (Hb E) and beta-thalassaemia.[3-6]

Sickle cell disease (SCD) [7] and thalassemia [8] is an inherited autosomal recessive blood disease.

Sickle cell disease is a chronic disorder has been linked to hypoxia. The pathophysiology of Sickle Cell Disease is thought to result from polymerization of hemoglobin S in red blood cells (RBCs) under hypoxic conditions, which results in the occlusion of blood vessels. The single amino-acid change in the beta subunit causes sickle hemoglobin to polymerize, especially under low oxygen tension. Polymerization causes the RBCs to deform into the characteristic sickle shape, thus plugging blood vessels.[7]

Whereas thalassemia results in reduced rate of synthesis of one of globin chains that form hemoglobin which in turn causes anemia. No hemoglobin chains are produced or only a very small amount is produced which prevents the synthesis of normal adult hemoglobin and severe damage the red blood cells capacity to transport oxygen. The oral structural changes occurs in thalassemic patients are due to maxillary enlargement resulted into protrusion of anterior teeth, increased space between teeth, overbite and open bite and varying degree of malocclusion which further predisposed to dental carries.[9]

Not much information is available on the association of dental & periodontal health status with sickle cell anemic and Beta thalassemic patients separately and comparison of the two former mentioned diseases, which affects both general & oral health, related quality of life. Therefore, there is a need to assess the oral health status of such patients, which poses a major health problem to the society.

Therefore this study was aimed to assess the dental and periodontal health status of beta thalassemia major and sickle cell anemic patients in Bilaspur, Chattishgarh, India.

Materials & Methods

A cross sectional study was conducted in the CIMS medical college Bilaspur, Chattishgarh, India. A total of 750 patients were included in the study. The patients were randomly divided into three groups I, II and III.

Group I comprised of beta thalassemic patients (n=250) and Group II comprised of sickle cell anemic patients (n=250) of both sex and varying age groups. These selected 500 patients were regularly attending the Out Patient Department (OPD) or blood bank for repeated blood transfusion or admitted in the wards of Department of Pediatrics, CIMS medical hospital, Bilaspur, Chattishgarh. Group III was a healthy control group (n=250) of similar age and gender, taken from three different schools in Bilaspur. Ethical committee of hospital approved the study & consent was obtained from the parents of all patients. Study was conducted for a period of one year (June 2011 to May 2012).

Patients who were earlier diagnosed with sickle cell anemia and beta thalassemia, of age ranging from 3-15 years, were only included in the study. Those suffering from other diseases known to influence dental caries or severity of periodontal disease were excluded from the study.

After performing a thorough general examination, including their demographic data, intraoral examination was done using;

1. Decayed-Missing-Filled Teeth Index (DMFT Index), separately for permanent teeth[10] and deciduous teeth.[11]
2. Plaque index given by Silness & Loe.[12]
3. Gingival index given by Loe & Silness.[13]

Autoclaved Plane mouth mirror & pig tail explorer were used to examine the oral cavity. Single examiner & single recorder were maintained throughout the study period. Intra examiner variability was 0.89.

Table 1. Demographic data of study population			
Group	Gender		Total (%)
	Male (%)	Female (%)	
Beta thalassemia	115 (46)	135 (54)	250 (100)
Sickle cell anemia	116 (46.4)	134 (53.6)	250 (100)
Control group	193 (77.2)	57 (22.8)	250 (100)
Total	424 (56.5)	326 (43.5)	750 (100)

Statistical analysis was done using statistical software SPSS 17.5 version. Chi square test & student t test was used for the comparison of study and control groups. The level of significance was set at p<0.05.

Results

Table 1 shows distribution of study population in different groups according to gender (total males were 56.5% and females were 43.5%).

In the present study, prevalence of dental caries and periodontal diseases was found to highly significant (P<0.001) among all the three groups, (Table 2).

When, group I (beta thalassemia) was compared with group III (control group), the mean±standard deviation for decayed missing filled tooth was (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).

Table 2. Prevalance of dental caries, periodontal diseases in study population				
Indicies	**Groups**	**Mean ± SD**	**F value**	**P value**
DMFT*	1. Beta thalassemia	13.33± 6.813	316.036	0.0001£
	2. Sickle cell anemia	6.59±3.494		
	3. Control group	1.131±.072		
PI**	1. Beta thalassemia	3.66±2.115	12.512	0.0001£
	2. Sickle cell anemia	3.33±2.105		
	3. Control group	3.28±1.901		
GI***	1. Beta thalassemia	2.53±1.152	9.347	0.0001£
	2. Sickle cell anemia	2.64±1.071		
	3. Control group	2.04±2.410		

*DMFT- decayed missing filled tooth
**PI- Plaque index
***GI- Gingival index
£ Highly significant

Table 3. Prevalance of dental caries and periodontal diseases between beta thalassemia patients and control group.					
Variables	**Groups**	**Mean ± SD**	**F value**	**T value**	**P value**
DMFT*	1. Beta thalassemia	13.33±6.813	563.746	22.490	0.0001£
	2. Control group	3.51±1.131			
PI**	1. Beta thalassemia	3.66±2.115	68.883	5.179	0.0001£
	2. Control group	2.83±1.407			
GI***	1. Beta thalassemia	2.83±1.152	18.715	3.912	0.018
	2. Control group	2.04±1.410			
Gender	1. Beta thalassemia	0.54±0.499	0.23±0.420	7.557	0.0001£
	2. Control group	0.23±0.420			

*DMFT- decayed missing filled tooth
**PI- Plaque index
***GI- Gingival index
£ Highly significant

Similarly, when group II (sickle cell anemia) was compared with group III (control group), the mean±standard deviation for decayed missing filled tooth (DMFT=6.59±3.494, 3.51±1.131), plaque index (PI=3.33±2.015, 2.83±1.407) and gingival index (GI=2.64±1.071, 2.04±2.410).

Results were found to be highly significant (P<0.001) when comparison was made between above groups (Table 3 & 4).

However, when group I (beta thalassemia) was compared with group II (sickle cell anemia), results were found to highly significant (P<0.001) only for decayed missing filled tooth (DMFT=6.59±3.494, 13.33±6.813) (Table 5).

Gender distribution of findings

When, group I (beta thalassemia) was compared with group III (control group), the mean±standard deviation was 0.54±0.499, 0.23±0.420 and when group II (sickle cell anemia) was compared with group III (control group), the mean±standard deviation was 0.54±0.500, 0.23±0.420. Comparison between above mentioned groups were highly significant (P<0.001) (Table 3 & 4).

In contrast, when group I (beta thalassemia) was compared with group II (sickle cell anemia), the mean±standard deviation was 0.54±0.500, 0.54±0.499. Prevalence of dental caries and periodontal diseases, between group I and II was not statistically significant.

In the present study, it was found that, prevalence of

Table 4. Prevalance of dental caries and periodontal diseases between sickle cell anemic patients and control group.

Variables	Groups	Mean ± SD	F value	T value	P value
DMFT*	1. Sickle cell anemia	6.59±3.494			
	2. Control group	3.51±1.131	207.158	13.259	0.0001£
PI**	1. Sickle cell anemia	3.33±2.015			
	2. Control group	2.83±1.407	45.200	3.216	0.0001£
GI***	1. Sickle cell anemia	2.83±1.152			
	2. Control group	2.04±2.410	3.680	3.612	0.056
Gender	1. Sickle cell anemia	0.54±0.500			
	2. Control group	0.23±0.420	98.586	7.458	0.0001£

*DMFT- decayed missing filled tooth
**PI- Plaque index
***GI- Gingival index
£ Highly significant

Table 5. Prevalance of dental caries and periodontal diseases between sickle cell anemic and beta thalassemia patients.

Variables	Groups	Mean ± SD	F value	T value	P value
DMFT*	3. Sickle cell anemia	6.59±3.494			
	4. Control group	13.33±6.813	161.413	13.925	0.0001£
PI**	3. Sickle cell anemia	3.33±2.015			
	4. Control group	3.66±2.115	1.787	1.787	0.182
GI***	3. Sickle cell anemia	2.64±1.071			
	4. Control group	2.53±1.152	1.925	1.126	0.166
Gender	3. Sickle cell anemia	0.54±0.500			
	4. Control group	0.54±0.499	.032	.090	.032

*DMFT- decayed missing filled tooth
**PI- Plaque index
***GI- Gingival index
£ Highly significant

dental caries and periodontal diseases was significantly more in beta thalassemic patients followed by sickle cell anemic patients than control group.

Discussion

Present study was probably among first attempts in India to compare the prevalence of dental caries and periodontal diseases among beta thalassemic and sickle cell anemic patients in a systematic way.

Navpreet Kaur et al. (2012)[8] and Dr. Veena R. (2006)[14] 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). In their study, no significant increased levels of gingivitis or plaque accumulation were seen in Beta thalassemia patients than in controls as compared to our study. We found significant 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).

However, Mean DMFT score was significantly higher in group I (beta thalassemic patients) compared to group III (control group) (DMFT=13.33±6.813, 3.51±1.131) which is similar to study conducted by Navpreet Kaur et al. (2012)[7], Al- Wahadni A M, Taani D Q, Al- Omari M O[15] and in another study conducted by Sunil Gomber and Pooja Dewan[16] and Dr. Veena R.[14]

The patients with Beta thalassemia had higher caries experience than the normal children. Level of dental caries may be explained on the basis of chronic nature of thalassemia. Patients preoccupied with their main, life threatening problem, neglect basic preventive dental care.[7]

Another reason could be because of the increased sensitivity to local factors (oral hygiene, tooth brushing habit and frequency of sugar intake).[14]

A study conducted Esra Guzeldemir (2011)[6] had found plaque and gingival indices were significantly higher in sickle cell anemic patients than in healthy individuals (Peridontal Disease and Gingival Index (P=0.02; r=0.299), Peridontal Disease and Plaque Index (P=0.01; r=0.343); Bleeding on probing and Gingival Index (P < 0.0001; r=0.503). These results are similar to our study, when comparison was made between sickle cell anemic patients and control group as follows, plaque index (PI=3.33±2.015, 2.83±1.407) and gingival index (GI=2.64±1.071, 2.04±2.410).

Oral health is not a primary concern of Sickle Cell Disease patients. Various studies had now found that, no significant differences existed regarding the periodontal diseases between patients with Sickle Cell Disease and healthy individuals.[6, 17, 18, 19]

Our results were disagreeing with the findings of Crawford[17], Arowojolu and Savage[18] and Arowojolu.[19]

Crawford[17] suggested that Sickle Cell Disease is not associated with increased levels of gingivitis and periodontitis in patients with Sickle Cell Disease. In agreement with the results of a study by Crawford,[17] Arowojolu and Savage[18] found no significant difference in alveolar bone loss patterns between patients and controls. In the same study group, Arowojolu[19] found no clinical periodontal disease or attachment loss in patients with Sickle Cell Disease.

However our study has some limitations. Firstly, sample size of the study population was small and taken from only CIMS hospital, Bilaspur and secondly, the cross sectional nature of the study prevents drawing inferences about casual relationships. Hence more studies are required in this field with increased sample sizes and considerably longer durations to validate our findings.

Conclusions

Appropriate dental and periodontal care improves a patient's quality of life by preventing eating difficulties, oral diseases, and esthetic concerns, and facilitates the management of the disease by the hematologist. Preventive dental care is must for thalassemic and SCD patients.

References

1. Sickle-cell anaemia report by the Secretariat, fifty-ninth world health assembly Provisional agenda item 11.4. World Health Organization; 2006.
2. Weatherall DJ, Clegg JB. Inherited haemoglobin disorders: an increasing global health problem. Bull World Health Organ 2001;79:704-12.

3. Modell B, Darlison M. Global epidemiology of haemoglobin disorders and derived service indicators. Bull World Health Organ 2008;86:480-7.
4. Chen S, Eldor A, Barshtein G, Zhang S, Goldfarb A, Rachmilewitz E, et al. Enhanced aggregability of red blood cells of beta-thalassemia major patients. Am J Physiol 1996;270:H1951-6.
5. De Silva S, Fisher CA, Premawardhena A, Lamabadusuriya SP, Peto TE, Perera G, et al. Thalassaemia in Sri Lanka: implications for the future health burden of Asian populations. Sri Lanka Thalassaemia Study Group. Lancet 2000;355:786-91.
6. Olivieri NF, Pakbaz Z, Vichinsky E. Hb E/beta-thalassaemia: a common & clinically diverse disorder. Indian J Med Res 2011;134:522-31.
7. 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.
8. 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.
9. Kataria SK, Arora M, Dadhich A, Kataria KR. Orodental complications and orofacial menifestation in children and adolescents with thalassaemia major of western Rajasthan population: a comparative study. Int J Biol Med Res 2012;3:1816-9.
10. Klien H, Palmer CE, Knutson JW. Studies on dental caries: I. Dental status and dental needs of elementary school children. Public Health Rep 1938;53:751-65.
11. Gruebbel AO. A measurement of dental caries prevalence and treatment service for deciduous teeth. J Dent Res 1944;23:163.
12. Silness J, Loe H. Periodontal disease in pregnancy, part II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964;22:121-35.
13. Loe H, Silness J. Periodontal disease in pregnancy part I, Prevalence and severity. Acta Odontol Scand 1963;21:533-51.
14. Veena R. Dental caries and periodontal health status in thalassemic major patients. Karnataka, Bangalore Rajiv Gandhi University and Health Sciences; 2006. p. 1-116.
15. Al-Wahadni AM, Taani DQ, Al Omari MO. Dental diseases in subjects with beta thalassemia major. Community Dent Oral Epidemiol 2002;30:418-22.
16. Gomber S, Dewan P. Physical growth & dental caries in thalassemia. Indian Pediatr 2006;43:1064-9.
17. Crawford JM. Periodontal disease in sickle cell disease subjects. J Periodontol 1988;59:164-9.
18. Arowojolu MO, Savage KO. Alveolar bone patterns in sickle cell anemia and non-sickle cell anemia adolescent Nigerians: a comparative study. J Periodontol 1997;68:225-8.
19. Arowojolu MO. Periodontal probing depths of adolescent sickle cell anaemic (SCA) Nigerians. J Periodontal Res 1999;34:62-4.