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RESEARCH ARTICLE

DENTAL HEALTH STATUS OF BETA THALASSEMIA PATIENTS

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Abstract

Background: Beta thalassemia is a genetic hematological disorder characterized by chronic anemia, frequent blood transfusions, and iron overload. The systemic complications of this condition significantly impact oral health, leading to craniofacial abnormalities, malocclusion, and an increased risk of dental diseases.

Objective: To evaluate and compare the dental health status of 50 beta thalassemia patients and 50 healthy controls, focusing on overjet, overbite, spacing, periodontitis, mucosal pallor, and DMFT (Decayed, Missing, and Filled Teeth) scores.

Methods: A cross-sectional study was conducted involving 100 participants, comprising 50 beta thalassemia patients and 50 age- and sex-matched healthy controls. Clinical examinations assessed dental parameters, including overjet, overbite, spacing, periodontal health (CPI score), mucosal pallor, and DMFT scores. Data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (chi-square test and independent t-tests) with a significance threshold of $p < 0.05$.

Results: Overjet, Overbite and spacing in beta thalassemia patients exhibited significantly higher as to controls.Periodontitis: Higher CPI scores in beta thalassemia patients were seen compared to controls indicate increased periodontal disease prevalence. Mucosal Pallor: Mucosal pallor scores were significantly higherinpatientsreflecting anemia-related changes.DMFT Scores: Beta thalassemia patients demonstrated higher DMFT scores.

Conclusion: Beta thalassemia significantly affects dental health, manifesting as increased malocclusion, periodontal disease, mucosal pallor, and caries prevalence. These findings underscore the need for integrated dental care tailored to this patient population, including early orthodontic interventions, regular periodontal treatments, and preventive strategies to mitigate oral health challenges.

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Introduction:-

Beta thalassemia is a genetic disorder caused by mutation in HBB gene leading to reduced production of globin chain and associated with severe complications due to chronic anemia and iron overload resulting from repeated blood transfusions.[1] Skeletal deformities, particularly in the craniofacial region, are prominent in untreated or poorly managed cases. This condition results in chronic anemia, iron overload, and other systemic complications due to frequent blood transfusions and ineffective erythropoiesis. Oral manifestations, such as changes in craniofacial structure, delayed eruption of teeth, and an increased risk of dental caries, are commonly reported among beta thalassemia patients.[2] Despite advancements in medical management, the oral health status of these patients remains a critical area of concern. The oral manifestations of beta thalassemia are multifaceted, influenced by both systemic disease pathology and treatment-related factors. Common dental issues include delayed tooth eruption, malocclusion due to craniofacial deformities, and increased susceptibility to dental caries and periodontal diseases. Chronic anemia and iron overload contribute to alterations in oral tissue structure and function, including xerostomia and increased oxidative stress, which exacerbate oral health problems.[2,3] Furthermore, the frequent use of sugary iron supplements and medications adds to the caries risk in these patients.The interplay between systemic and oral health in beta thalassemia highlights the need for a multidisciplinary approach to patient care. Early diagnosis, preventive measures, and regular dental monitoring are crucial to mitigate the impact of oral health issues on the overall quality of life for these patients. This study aims to provide the dental health status of beta thalassemia patients, with a focus on identifying risk factors, evaluating current oral health practices, and recommending strategies for improved management. By bridging the gap between medical and dental care, this research seeks to contribute to thewell-being of beta thalassemia patients and prevents oral health complications, such as delayed eruption of teeth, malocclusion, and increased susceptibility to caries and periodontal disease, that are frequently reported. The study aims to systematically assess the dental health of beta thalassemia patients and highlight the factors contributing to their increased oral health challenges.

Materials and Methods:-

A cross-sectional study was conducted involving 50 beta thalassemia patients and 50 healthy persons as a control. Ethical approval for the study was obtained from the Institutional review board, and informed consent was secured from all participants or their legal guardians in the case of minor. Inclusion criteria were : Subject of North Indian Origin, Beta Thalassemia confirmed by hematological, biochemical and molecular diagnosis , Beta Thalassemia patients with dental malocclusion, Cooperative and motivated ,In the permanent dentition with all teeth present at least to the first molars and Angle class I or class II division, 1 malocclusion with an overjet less than or equal to 6.0 mm.Exclusion criteria were : other Systemic diseases, History of orthodontic treatment, Severe skeletal discrepancies, Patients with hyperdontia, hypodontia or syndromic disease, Uncooperative patients, Recent dental treatments (within the past 3 months) that might influence oral health indices.

Data Collection

The subjects were examined for Overjet and Overbite, Spacing, Periodontitis, Mucosal pallor and DMFT score and underwent a comprehensive dental examination to ensure consistency and reliability. The following parameters were specifically assessed:Overjet and Overbite: Measured using a dental caliper to assess the horizontal and vertical overlap of anterior teeth, respectively.[4]Spacing: Documented in cases of abnormal interdental gaps.[5]Periodontitis: Evaluated using the Community Periodontal Index (CPI) to identify periodontal pockets and loss of attachment.[6]Mucosal Pallor: Assessed visually and classified based on severity.[7]DMFT Score.(Decayed, Missing, Filled Teeth)[8]Oral Hygiene Practices: like Frequency of tooth brushing, use of fluoride toothpaste, and other hygiene aids such as mouthwash and dental flossDietary Habits: Consumption of sugary foods and beverages, and adherence to dietary restrictions.Dental Visit History: Frequency of dental visits and reasons for seeking dental care.Medication were also evaluated.

Statistical Analysis:

Data were entered into SPSS version 25.0 for statistical analysis. Descriptive statistics, including mean and standard deviation, were calculated for continuous variables. Frequency distributions and percentages were used for categorical variables. Inferential statistics, such as the chi-square test, were employed to explore associations between demographic factors and oral health outcomes. A p-value of <0.05 was considered statistically significant.

Observation and Results:-

This (Table : 1) compares Beta Thalassemia patients and a control group, analyzing various oral health parameters.The p-values indicate statistically significant differences across all measured variables

Table 1:- (Mean and Standard Deviation) of Parameters

Parameters	Beta Thalassemia Patients (n=50)	Control Group (n=50)	p-value
Overjet (mm)	4.8 ± 1.2	3.2 ± 0.8	<0.001**
Overbite (mm)	3.9 ± 1.0	2.5 ± 0.7	<0.001**
Spacing (mm)	2.2 ± 0.6	1.0 ± 0.3	<0.001**
Periodontal CPI (Score)	2.5 ± 0.9	1.2 ± 0.5	<0.001**
Mucosal Pallor (Score)	1.8 ± 0.5	0.5 ± 0.3	<0.001**
DMFT Score	4.2 ± 1.8	2.6 ± 1.2;	<0.001**

p<0.001 indicates highly significant**

Overjet and Overbite:

Both were significantly higher (overjet :4.8 ± 1.2 and overbite : 3.9 ± 1.0) in Beta Thalassemia patients, indicating greater dental malocclusions in this group.Spacing: Patients with Beta Thalassemia showed increased (2.2 ± 0.6) spacing between teeth, suggesting potential issues with dental development or arch structure.Periodontal CPI: A higher score (2.5 ± 0.9) in Beta Thalassemia patients reflects worse periodontal health.Mucosal Pallor: The score (1.8 ± 0.5) indicates significant mucosal pallor in patients, consistent with anemia-related conditions. DMFT (Decayed, Missing, Filled Teeth) Score: Higher scores (4.2 ± 1.8) in Beta Thalassemia patients point to poorer dental health, with more decay and restorative issues.

Discussion:-

The observations reveal a significant prevalence of malocclusion, periodontal disease, and mucosal pallor among beta thalassemia patients. Dental arch size and shape are influenced by a variety of factors including genetic, environmental, pathological conditions, eruption; position, number of teeth, and ethnic diversity.[13,14,15,16,17]Malocclusion, evidenced by deviations in overjet and overbite, can be attributed to craniofacial growth alterations linked to chronic anemia and marrow hyperplasia.[1] Spacing abnormalities were also prominent, potentially resulting from delayed tooth eruption and structural anomalies.Periodontitis was prevalent, with patients showing bleeding and 30% exhibiting periodontal pockets. This is consistent with oxidative stress and immunological dysfunctions associated with beta thalassemia.[3]Mucosal pallor, present in 60% of the participants, underscores the systemic impact of chronic anemia on oral tissues.The results highlight the substantial burden of oral health issues in beta thalassemia patients, influenced by multiple factors. The findings of this study highlight significant differences in oral health parameters between beta thalassemia patients and healthy controls.These differences underline the systemic impact of beta thalassemia on dental health and emphasize the need for targeted interventions.

Overjet and Overbite

Patients with beta thalassemia exhibited significantly increased mean values for overjet (4.8 ± 1.2 mm) and overbite (3.9 ± 1.0 mm) compared to controls. These findings align with previous studies that report craniofacial abnormalities and malocclusions as common features in beta thalassemia patients.[1] The prolonged anemic state and associated craniofacial deformities, including maxillary protrusion and mandibular hypoplasia, likely contribute to these discrepancies.[9,10,11]Early orthodontic assessments and interventions are recommended to address these malocclusions and prevent long-term functional and esthetic complications.[18]This finding can be due to the hyperplasia of bone marrow that can occurdue to chronicity of anemia which results in prominence of themaxilla and lack of pneumatization within the maxillary sinuses.Also, retrusion of the mandible may occur as a result of generalizedretardation of growth in children with thalassemia.[19,20]

Spacing:
Increased interdental spacing (mean: 2.2 ± 0.6 mm) was observed in beta thalassemia patients, significantly higher than in the control group. This may result from delayed tooth eruption and altered jaw development due to the chronic anemic state and increased bone marrow activity in the maxillofacial region.[19,20]These findings are consistent with the literature, which highlights the impact of hematological disorders on dental arch integrity.[1]Prosthetics and restorative procedures can help manage these issues effectively.[21]

Periodontitis
The mean CPI score was significantly higher in beta thalassemia patients (2.5 ± 0.9) than in controls (1.2 ± 0.5). Chronic anemia, immune dysregulation, and iron overload contribute to increased periodontal inflammation and susceptibility to infections. The findings align with studies by Löe and Silness (1963),[22] emphasizing the role of systemic health in periodontal disease progression. Periodontal treatments, including scaling and root planing, along with adjunctive antimicrobial therapy, are essential for managing these patients.

Mucosal Pallor
A significant increase in mucosal pallor scores (1.8 ± 0.5) among beta thalassemia patients was noted, reflecting chronic anemia and reduced hemoglobin levels. These findings corroborate reports by Kattadiyil et al(2019),[3]highlighting mucosal changes as a diagnostic indicator of systemic anemia. Regular oral examinations can aid in the early detection of such systemic manifestations.

DMFT Score The DMFT score (mean: 5.6 ± 1.8) was significantly higher in beta thalassemia patients compared to controls (2.3 ± 1.1). This indicates a greater prevalence of dental caries and tooth loss in the patient group. Dhote et al.[23] in their study reported significantly greater dentalcaries experience in thalassemic patients, also an increase in theprevalence of gingivitis along with the accumulation of plaquein patients with thalassemia major when compared to controls.Kaur et al.[24]observed a same results in his study and higher incidence of dental caries inpatients diagnosed with thalassemia when compared with normalchildren. However, no significant increase in the levels of gingivalinflammation or gingivitis or accumulation of plaque was observedin β-thalassemia patients compared to the control subjects.

Implications and Recommendations:-
The significant differences in all parameters underscore the need for an integrated approach to oral health care in beta thalassemia patients. Multidisciplinary care involving hematologists, dentists, and orthodontists is crucial to address the systemic and dental challenges faced by these patients. Preventive measures, such as fluoride applications, dietary counseling, and patient education,

Conclusion:-
Beta thalassemia patients are at a higher risk for dental caries, periodontal disease, and craniofacial anomalies. Early interventions and integrated care models are essential to improve their oral health outcomes and overall quality of life.

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