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ORIGINAL ARTICLE

Craniofacial growth Pattern of Thalassemia Major Patients in the heamatological institutes of populations of Karachi Pakistan.

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ABSTRACT… Objective: To look at patients with -thalassemia's skeletal patterns. **Study Design:** Cross sectional, Observational. **Setting:** Karachi Medical and Dental College, Baqai Dental College Baqai Medical University, Husaini Institute of Heamatological Studies and Fatmid Foundation. **Study Period:** 2012 to 2020. **Methods:** Fifty patients with major thalassemia were voluntarily chosen at random, and 50 lateral cephalometric X-rays were taken using the Steiner Analysis inclusion criteria major Thalassemia Patient under 35 without any systemic disorders. exclusion criterion any additional forms of thalassemia, as well as other systemic illnesses such as heart disease, diabetes, and down syndrome, patient age is greater than 35. **Results:** Patients with 50 thalassemic patients have an average ANB angle of 4.8 degree. No patients fit into Skeletal Class III, as indicated by the ANB ranges for 21 (42%) patients being between 2 and 2 o (0 to 4 o) and for 29 (58%) patients being above 4 o degree. **Conclusion:** 42% of beta thalassemia patients with Class 1 skeletal and orthoganathism. In 58% of cases, Class II and mandibular retroganathism are present. and there were no patients in skeletal class III found. The effects of anemia are less severe in patients from Karachi's thalassemia community.

Key words: Thalassemia, Craniofacial, Growth Pattern, Mandible, Maxilla.

INTRODUCTION

Thalassemia is an inherited single gene (-thalassemia) or multiple gene (Beta-thalassemia) recessive, autosomal blood disorder in which haemoglobin is only partially produced or not produced at all.[1,2,3] It is particularly prevalent in the Mediterranean region.[4] The hemoglobin is composed of a pair of beta-globin chains and two beta-globin chains arranged in a hetro-tetramer, making four protein chains.[5] Patients with thalassemia have either one or both of these globin chains that produce inadequate abnormal red blood cells.

The severity of the disease depends on the type of mutation that occurs in the HB gene at chromosome No. 11 in -thalassemia. Intermediate thalassemia; III) thalassemia minor (amount of thalassemia varies on disease severity). However, tetramers do not form in each subclass and they adhere to the membranes of red blood cells, damaging them.[6,7,8,9,10,11] Two hereditary genes, HB 1 and HB 2, are involved in - thalassemia, producing an excess of globin chains in adults and excess globin chains in newborns. Atypical oxygen dissociation curves are a characteristic of the unstable tetramers produced by the extra -chains.[2,12,13] Generally, haemoglobin, is composed of α and β–chains, however approximately 3% of adult haemoglobin is made of α and Δ chains. Mutations also effect the production of Δ- chains.[13]

The general symptoms of thalassemia patients have been brought on by a total or partial loss of production of either globin chain, which has devastating implications on their bodies. The specifics of these effects have been well covered by many researchers.[2,3,7,8,14,15] Additionally, thalassemia causes a variety of symptoms

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and consequences in varying degrees on a patient's various organs.[1,16,17,18,19,20,21,22,23,24,25] In β - thalassemia, the oral and maxillofacial manifestation has been reported in several reports.[14,16,17,18,22,24,26]

In most of the part of the world lateral Cephalometric studies has been done by several workers.[13,21,22,24,27,28,29] Radiological changes are not apparent until one year of age. Large bone marrow gaps are one of the most significant radiographic characteristics of thalassemia.

The reason for this enlargement is because the body responds by increasing RBC production when inefficient erythropoiesis destroys the RBC (red blood cells) membrane and causes severe anemia, which leads to the development of the bone marrow by up to 15–30 times the normal rate.

The skull radiograph shows the increased diploid space and arrangement of trabeculae in the vertical rows, causing hair on end appearance.[21] The enlarged diploid space and vertical rows of trabeculae that result in the appearance of hair on end are visible on the skull radiograph.[21]

The depressed cranial vault, frontal bossing, maxillary expansion, retracted upper lip, saddle nose, yellowish tinge at the junction of the hard and soft palate, yellow-tinged fingernails, and spaces with widened trabeculae are all characteristics of the classical Chipmunk facies.[24] The cephalometric investigation conducted by Amini et al. (2007)[22] on 30 thalassemic major patients revealed no maxillary prognathism. The thalassemic individuals' mandibles, however, appeared to be smaller and more retruded in the face.

Both angular and linear measurements showed a clear vertical development trend. The proclination, notable over eruption of incisors, and enhanced over jet were the most common dental abnormalities in thalassemic individuals. Soft tissue measures revealed a markedly convex lower face and pronounced upper and lower lips. In Pakistan no research work on Radiological (lateral Cephalometric) aspect of thalassemic patient has been done therefore present study has been under taken.

METHODS

This Cross sectional study was conducted from 2012 to 2020 at The Hussaini Blood Bank and Institute of Haematological Diseases, Fatimid Blood Bank and Thalassemia Centre, the National Institute of Oral Diseases, Department of Oral and Maxillofacial Surgery at Abbasi Shaheed Hospital and Baqai Dental College in Karachi.

The study's enrolled participants fulfilled the criteria for inclusion and exclusion as well as the statistical analysis of the data performed using IBM SPSS version 23.

Inclusion Criteria

Beta Thallasemia Major Patient without any Systemic Disease from 5-35 years

Exclusion Criteria

Normal Healthy Individual Without any Systemic Disease.

Fifty patients with major diagnoses of - thalassemia were randomly and voluntarily selected from among the patients who had registered for therapy. Additionally, consent from the patients' parents was sought

Ethical Approval

This work was approved by the Karachi Medical and Dental College's ethical and research committee as well as the Board of Advanced Studies and Research at the University of Karachi (2012–2020). This work has received approval from the Baqai Dental College Board of ethical review (BDC/ERB/2023/992 Dated: 26th April 2023) and is a component of the M.S. Oral Surgery thesis from the Faculty of Medicine University of Karachi, Pakistan. Additionally, all ethical guidelines were completely observed in this investigation.

Cephalometric Radiography

1) Asahi Model III ECM Cephalostat Machine, 1.19–1.5 second (Time of Exposure), 65–80 KvP, 7–11

mA, and a chair that could be raised or lowered; Lead apron, sterile gloves, an aluminium filter, an adjustment to the vertical height, and a nose piece Technology has altered the situation; fixers and developers are no longer required because automatic digital photographic machines can handle all of this work automatically.

Radiographic Interpretation

1) Room with subdue ambient illumination; 2) Radiographic viewer; 3) Magnifying lens; 4) All the processed radiographs.

For Cephalometric Tracing

1) Room with subdued ambient illumination; 2) Tracing board; 3) 0.003-inch thickness acetate sheets (8" x 10"); 4) 0.3mm pencil; 5) Cello tape; 6) Scale 7) Eraser

Cephalometric Analysis by Steiner Criteria

Skeletal analysis of thalassemia patients, Steiner Analysis (1960)[30] was used and according to Steiner analysis following criteria were used ANB angle ranges 2 º degree ± 2 º used for skeletal pattern

Cephalographs

These films were interpreted for skeletal pattern was assessed by calculating ANB angle using Steiner's analysis. Tracing of lateral Cephalometric After suitable positioning, the lateral Cephalometric X-ray was traced on acetate paper. The lateral cephalometric x-rays were traced on the acetate paper once it had been properly aligned on the radiograph. It was attached to the radiograph on one side with cellophane tape.

The radiograph was then traced on acetate paper after being marked with three reference points. Then the soft tissue outline was traced and 3 Cephalometric points were registered on the tracing paper. N> Nasion > Most anterior point midway between frontal and nasal bones on frontonasal suture. S> Sella > geometric centre of Sella tursica.

The constructed point is located between the two central incisors and the anterior nasal spine in the mid-sagittal plane, point A > point A > deepest point. Sub spinal is another name for it. For the skeletal study of individuals with thalassemia, Steiner study (1960)[30] was applied after recording the cephalometric landmarks, and the following criteria were utilized in accordance with Steiner analysis.

ANB angle of 50 patients are studied. 21(42%) patients have ANB angle ranges 2 °± 2 °, (0 ° to 4º), and 29(58%) patients have ANB angle above the 4º degree. No patient have ANB angle below 0 degree.

RESULTS

The average ANB angle (ANB) of 50 thalassemia individuals in the current study is 4.8 degrees. 29 (58%) patients show skeletal Class II due to mandibular retroganathism, while 21 (42%) patients show skeletal Class I connection and no Patient angle above 4 º no Patient found in Skeletal Class III.

ANB	Angle in Degree	Cases
Skeletal class 3	Below 0.0 °	N= 0 (0%)
Skeletal class 2	Between 0.0 ° to 4 °	N=21 (42%)
Skeletal class 1	Above 4.0 °	N=29 (58%)

Table-I. Profile of patients according to Skeletal classes.

Angle in Degree	Frequency	Percent	Valid Percent	Cumulative Percent
1 o	1	2.0	2.0	2.0
2 o	8	16.0	16.0	18.0
3 o	5	10.0	10.0	28.0
4 o	7	14.0	14.0	42.0
5 o	13	26.0	26.0	68.0
6 o	5	10.0	10.0	78.0
7 o	5	10.0	10.0	88.0
8 o	4	8.0	8.0	96.0
9 o	2	4.0	4.0	100.0
Total	50	100	100	

Table-II. Frequency of patients according to the ANB angle in degrees.

DISCUSSION

According to Steiner's analysis, the ANB angle range (0 to 4 degrees) falls under the skeletal class 1 relationship, the angle beyond 4 degrees falls under the skeletal class II, and the angle below o degrees falls under the skeletal class III.

The average ANB angle (ANB) of 50 thalassemic individuals in the current study is 4.8 degrees. ANB is present in 21 (42%) individuals with angles between 2 and 4 degrees, indicating a skeletal class I relationship. In contrast, angles over 4 degrees are present in 29 (58%) patients, indicating a skeletal class II relationship because of mandibular retroganathism.

As no patients have an angle below 0 degrees' angle, there are no patients in skeletal Class III. Toman et al. (2014)[29] reported a mean ANB of 4.3°, which is closer to the results of the current investigation, belongs to class II skeletal base, and can be placed at lower limit.

All thalassemic patients have a class II skeletal base relationship with an average ANB angle of 8.75°, according to Amini et al. (2007).[22]

No evidence of severe maxillary Prognathism was found. Moreover, it results in a delay in the condylar and ramus growth of the mandible, resulting in a Class II skeletal pattern Thajeel and Al-Taei (2013) reported 20 patients having mean ANB 7.6º

In the present study ANB is 4.8º it come as skeletal Class II (above 4.0º) but in bottom line where as Toman et al. (2014)[29] reported (above 4.0º) 4.3º skeletal class II more near to present study, Hattab et al. (2013)[31] also reported skeletal Class II, but Amini et al. (2007)[22] reported 8.75º on upper limit skeletal Class II.

CONCLUSION

The consequences of anemia are less severe in beta thalassemia patients from multiple haematological centers in Karachi, Pakistan, as a result of routine testing and blood transfusions. The following recommendations could be helpful for preventing disease.

1. Conjoined and intercommunity unions are discouraged or illegal. Due to the significant cultural and familial ties, working in Pakistan might be difficult. But by all means, you can use public awareness campaigns to do this (through electronic, social, print, lectures, or seminars).
2. Premarital thalassemia testing must be required. Despite the fact that this topic has previously been covered by measures enacted by the Sindh Assembly and the Pakistan National Assembly. Application of the legislation is the sole problem at the moment.
3. More thalassemia and bone transplantation facilities should be established by the public and private sectors, with the aid of international donor organizations or through public donations, so that patients can receive treatment for nothing or at a minimal cost.
4. In both public and private hospitals, the Pakistani government should take the required action to establish free yearly dental checkups and dental care for those with thalassemia.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Syed Muhammad Ali	Data collection, Data analysis, Writing, Review, Proof reading.	
2	Syed Mahmood Haider	Supervisor of Project Main idea.	
3	Kashif Ikram	Critical review, Help in writing.	
4	Uzair Ahmed	Data Collection, Statiscally Analysis.	
5	Sana Ahmed	Critical Review, Help in data collection.	
6	Syed M. Abdullah Salman	Critical Review, Help in data collection