International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 9; Issue 10 (A); October 2020; Page No.23172-23175
DOI: http://dx.doi.org/10.24327/ijcar.2020. 23175.4588

Research Article

THALASSEMIA: A BRIEF STUDY

Dr. Suby Singh[1] Dr. Ravinder Singh[2] and Dr. Mandeep Kaur[3]

[1]Dept. Of Pathology, Govt. Medical College, Jammu.
[2]Medical officer, J&K Health services, Jammu.
[3]Dept. Of Oral Pathology & Microbiology, Indira Gandhi Govt. Dental College, Jammu.

A R T I C L E I N F O

Article History:
Received 14th July, 2020
Received in revised form 29th August, 2020
Accepted 05th September, 2020
Published online 28th October, 2020

Key words:

Thalassemias, genetic, Blood disorder, anemias.

A B S T R A C T

The thalassemias are a group of congenital anemias that have in common deficient (reduced or absent) synthesis of one or more of the globin subunits of the normal human hemoglobins .This results in excess production of the other chain which damages the red cell membrane and begins with cascade that ends with significant morbidity and mortality. They are inherited autosomal recessive disorders. The thalassemias are the commonest monogenic diseases in man. The main aim of presenting this paper is to quote various studies done in the clinical research of thalassemias.

INTRODUCTION

Originally there was a disease called anemia splenica infantum that included several conditions, often not well distinguished from one another. Syphilis was considered a possible cause, as were tuberculosis and leishmaniasis. These children were usually born normally and grew normally until the second half of first year, when they were noticed to become paler and paler, and to develop an enormous abdomen containing a spleen that could extend from a few centimetres below left costal margin to the iliac crest and below, sometimes visible from outside. At this time in the disease course, patients liked to be left alone and to lie down "in a monotonus morbid state". Bone deformities especially of the skull, soon appeared, giving the children a distinctive "Mongolian appearance". The disease was often present in more than one sibling or more frequently the other sibling had died of the same disease.

The first systematic description of what was going to be identified as thalassemia major came from Cooley & Lee from Michigan, who observed the disease in Italian and Greek children and from Maccanti, a paediatrician from Ferrara, Italy who also noted that the children were often coming from malarial areas near the Po river

DISCUSSION

Thalassemia in 19th Century

In 1889 Von Jaksch described an anemia accompanied by splenomegaly and leucocytosis which he gave the name 'Anaemia infantum pseudoleucaemica', this was subsequently called"Jaksch- Hayem-Luzet's" anemia after the names of the authors. It was ultimately considered a wastebasket that included response of infants to be horrendous combination of nutritional and infectious insults at that time.

Thalassemia in 20th Century

In Italy, Rietti described a disease having a symptomatology similar to the Cooley's anaemia but later, that became known as 'La Malattia di Rietti-Greppi-Micheli and today as thalassemia intermedia. Whipple and Bradford in 1932 reported the first complete autopsy with Cooley's anemia in which they called attention to excessive pigment deposition in many organs; they first suggested the term thalassemia. The name of this condition derives from the Greek word *Thalassa* (θάλασσα), sea, and *haema* (αἷμα), blood. The term was first used in 1932. In 1938 Caminopetros pointed that the disorder was transmitted as a Mediterranean recessive. He also proposed the existence of genetic carrier, as evidenced by blood studies, fragility tests and mild roentgenographic changes. Valentine WN & Neel JV in 1944 coined out the term "thalassemia major" and "thalassemia minor.

Corresponding author:* **Dr. Mandeep Kaur
Dept of Oral Pathology, Indira Gandhi Govt Dental College, Jammu India.

Mahadik C *et al.* (1986) found out the one tube osmotic fragility as a useful screening test for thalassemia carriers.[1]
El-Hazmi MA *et al.* (1994) determined the level of testosterone, cortisol, luteinizing hormone(LH), follicle stimulating hormone (FSH), free thyroxine (T4), tri-iodothyronine(T3), growth hormone(GH), iron, ferritin, and haematological parameters in thalasemic patients.[2]

Thalassemia in 21st Century

Balgir RS *et al.* (2003) studied clinical and hematological profile of hemoglobinopathies in two tribal communities of sundargarh district in Orissa. For the first time, hemoglobin E has been detected in a tribal population, i.e. Delki Kharia in the state of Orissa. Except beta-thalassemia trait, no other hemoglobinopathy was detected in Dudh Kharia tribe showing their genetic isolation from Delki Kharia.[3]

Laksmitawati DR *et al.* (2003) demonstrated significant increase in serum iron ferritin, AST, ALT, and bilirubin. Results can be summarized that non-transfused thalassemia intermedia patients exert slight signs of oxidative stress, and increased haemoglobin degradation but no significant indication of tissue or cell damage.[4]

Wirawan R *et al.* (2003) assessed the alteration of plasma glucose concentration and the hemochromatosis prevalence in beta thalassemic major patients. They concluded that beta thalassemia major patients who receive frequent transfusions will develop hemochromatosis that will in turn impair the pancreatic function.[5]

Khan JA *et al.* (2004) studied hematological parameters and elements level in three different groups of thalassemia major. A comparison of these parameters in the three groups with healthy matching controls revealed that the concentration of RBC, Hb, HCT, MCH are significantly lower in patient than in the healthy controls, while there was no significant difference in MCHC value. The concentration of platelet and RDW are higher in patients than the healthy controls. The level of Ca, P and Mg has no significant differences in the serum of few patients groups, whereas there's a considerable increase of Fe (due to treatment by red cell transfusion therapy and the lack of adequate utilization of the chelator desferroxamine) and copper ions concentration.[6]

Napoli N *et al.* (2006) found increased serum ferritin, AST and ALT as well as low bone density in 90 thalassemic major Italian patients. They concluded that calcium metabolism is frequently impaired in thalassemic patients.[7]

Ali D *et al.* (2008) evaluated renal findings in Beta-thalassemia major and intermedia. They concluded that significant renal involvement is not a frequent complication in children and young adults suffering from thalassemia. Hyperuricemia and microscopic hematuria are more common in thalassemia intermedia than thalassemia major. Microscopic hematuria in thalassemia intermedia might be related to either hypercalciuria or hyperuricosuria.[8]

Tritipsombut J *et al.* (2008) studied hemoglobin profiles and hematologic features of thalassemic newborns. Based on the findings, effective primary screening with 100% accuracy for α thalassemia 1(SEA and THA1 deletion) and haemoglobin E in newborns in the region could be carried out using mean corpuscular volume less than 95 fL, mean corpuscular hemoglobin less than 30 pg, or hemoglobin Bart greater than 8.0% and hemoglobin E greater than 0.5%, respectively.[9]

Al-Kataan MA *et al.* (2009) studied the serum iron status in beta-thalassemic patients with clinical signs of iron overload. The clinical signs of iron overload included in this study were bronze colour, splenomegaly, facial expression (mongolian face), cardiomegaly and stunded growth. They concluded that patients with thalassemia major in Iraq are poorly managed though iron chelator is used and percentage saturation of TIBC is recommended to estimate iron overload.[10]

Bharat V et al. (2010) screened about 450 individuals for β-thalassemia carrier detection through NESTROFT and CBC. Of 450 individuals, 125 individuals were found to be NESTROFT positive and 325 were found negative.[11]

Hamed EA & ElMelegy NT (2010) reported significant decrease in serum calcium and significant increase in uric acid in 69 thalassemic major patients compared to controls.[12]

Niazi M *et al.* (2010) studied usefulness of red cell indices in differentiating microcytic hypochromic anemias especially beta thalassemia trait and iron defeciency anemia They concluded that RDWI, Mentzer and Shine & Lal are the most reliable formulae in discrimination between iron deficiency anemia and beta-thalassemia trait.[13]

Patil VW & Mujawar SA (2010) studied deficiency of folic acid, vitamin B12 and their correlation with ferritin in 30 β thalassemia major patients in the age group 4-8 years for a period of one year. These tests were determined by means of immulite 1000 analyzer. There was decrease in serum folic acid and vitamin B12 levels whereas increased concentration of ferritin in all 30 study subjects.[14]

Yousafzai YM*et al.* (2010) studied haematological parameters in patients suffering from β-thalassemia trait. They concluded that β-thalassemia trait present with a microcytic hypochromic blood picture, detected on simple haematology analysers and low MCV, MCH and MI provide a useful screening tool for β-thalassemia trait.[15]

Attia MMA *et al.* (2011) studied the effects of antioxidant vitamins on antioxidant status and liver function in homozygous β thalassemic patients. The results of enzymes showed that thalassemic major children suffer from high levels of ALT, AST, glutathione peroxidase, and superoxide dismutase enzymes activities before vitamins treatment.[16]

Sadeghi-Bojd S *et al.* (2011) studied kidney function tests in children with Beta-thalassemia minor in Zahedan, Southeast of Iran. There is little information regarding kidney function in patients with beta-thalassemia minor. This group of children with beta-thalassemia showed some evidence of tubulopathy such as proteinuria (32%), β2-microglobulin excretion (36%), calciuria (4%), phosphaturia (4%), and uricosuria (20%). Their findings support the existence of renal tubular dysfunction in beta-thalassemia minor.[17]

Aminianfar M *et al.* (2012) studied the prevalence of hepatitis B and C among hemodialysis and thalassemic patients in a special medical center in East of Tehran. Serologic markers of hepatitis B such as hepatitis B surface antigen (HBs-Ag), hepatitis B surface antibody (HBs-Ab) and hepatitis B core antibody (HBcAb) were negative in all patients. Serologic markers of hepatitis B and C should be evaluated because

defect of cellular and humoral immune system could be present in these patients.[18]

Hashimizadeh H *et al.* (2012) performed the cross- sectional descriptive study to assess hepatomegaly and liver enzymes in 100 patients with beta thalassemia major, aged between 2-18 years old. They concluded that hepatomegaly is one of the most common findings in the thalassemic patient that induced with hemosiderosis and hepatitis.[19]

Younus ZM *et al.* (2012) evaluated conventional renal function tests in β-thalassemia major patients in Nineveh province**.** The results of the present study showed no deterioration in renal functions in β-thalassemia patients in both groups A and B regarding serum creatinine and urea in addition to microalbuminuria, although, subclinical alteration in renal functions could be expected in those patients, so that measurement of other early markers of renal dysfunction is occasionally recommended.[20]

Bastawy SA *et al.* (2013) made an antioxidant and hematological study among Egyptian thalassemic children. They found significant decrease in MCV, MCH and low PCV in both the newly diagnosed group and the regular transfused group compared to control group. Among the studied groups there was significant increase in reticulocytes, TLC, and platelets. The enzymatic markers significantly correlated with serum ferritin levels which significantly rose in this.[21]

Bhukanwala D *et al.* (2013) studied parents of β-thalassemia major children to determine cut off values of hematological parameters for diagnosis of β-thalassemia trait and assessment of anemia in them. In their setup, the cutoff values are MCV (≤78.0 fl), MCH (≤28 pg) and HbA2(>3.8%) for BTT diagnosis and there is a mild to moderate anemia in BTT cases.[22]

Mirbehbahani NM *et al.* (2013) studied the national approach to premarital diagnosis of trait thalassemia and silent carriers. He concluded that present results showed that there are a few cases of thalassemia disorders with normal MCV, MCH, RBC, Mentzer index and Hb electrophoresis which could be missed in routine and pre-marital screening tests, resulted in a thalassemia child that is possible in every screening test.[23]

Munir B *et al.* (2013) studied effect of β thalassemia on hematological and biochemical profiles of female patients. The elevated level of ALT and AST in the patients (119±10 U/L) is due to hepatic and myocardial toxicity of iron overload, a characteristic of thalassemia. The increased ALT level is also due to prevalence of hepatitis C virus in thalassemic patients as all the patients were HCV positive There was significant correlation among biochemical parameters like ALT with alkaline phosphatase, AST with cholesterol, creatinine with total protein, cholesterol, and total protein with glucose and cholesterol ,ABO and rhesus blood groups in Northern Uttar Pradesh, India.[24]

Eghbali A *et al.* (2014) evaluated serum ferritin level and T2* MRI in patients with beta thalassemia major. They observed an association between hepatic
T2*MRI and serum ferritin level.[25]

Vehapoglu A *et al.* (2014) studied hematological indices for differential diagnosis of beta thalassemia trait and iron deficiency anemia (IDA). The Mentzer index was the most reliable index, as it had the highest sensitivity (98.7%), specificity (82.3%), and Youden's index (81%) for detecting β-TT; this was followed by the Ehsani index (94.8%, 73.5%, and 68.3%, resp.) and RBC count (94.8%, 70.5%, and 65.3%).[26]

Belsare V *et al.* (2015) assessed the impairment in renal function in children with beta thalassemia major by basic biochemical parameters with effect of chelation therapy on it from June 2004 to June 2006.[27]

CONCLUSION

Health care personnel in general and society in particular need to do much hard work especially reaching to patients residence and convincing them about regular follow up at the thalassemia day care centre. At the same time screening camps at school level is recommended to identify cases especially thalassemia trait and further counselling as desired should be initiated. Civil society can also contribute in coming out openly and offer financial and other support of these patients as it is not possible only at government level.

References

1. Mahadik C, Kapadia C, Yagnik H, Sukumaran PK, Merchant S. One tube osmotic fragility as a useful screening test for thalassemia carriers- A field experience. *Indian J Hematol* 1986; 4: 62-64.
2. El-Hazmi MA, Warsy AS, Al-Fawaz l. Iron-endocrine pattern in patients with beta-thalassaemia. *J Trop Pediatr* 1994; 40(4): 219-24
3. Balgir RS, Mishra RK, Murmu B. Clinical and hematological profile of hemoglobinopathies in two tribal communities of Sundargarh district in Orissa, India. *Int J Hum Genet* 2003*;* 3(4): 209-16
4. Laksmitawati DR, Handayani S, Udyaningsih-Freisleben SK, Kurniati V, Adhiyanto C, Hidayat J, *et al.* Iron status and oxidative stress in beta-thalassemia patients in Jakarta. *Biofactors* 2003; 19: 53-62
5. Wirawan R, Setiawan S, Gatot D. Peripheral blood and hemoglobin electrophoresis pattern in beta thalassemia major patients receiving repeated blood transfusion. *Med J Indones* 2004; 13(1): 8-16.
6. Khan JA, Qari MH, Al-Sharif NH. Hematological parameters and elements level in three different groups of thalassemia major. *Bahrain Med Bull* 2004; 26(2): 17
7. Napoli N, Carmina E, Bucchieri S, Sferrazza C, Rini GB, Di Fede G. Low serum levels of 25-hydroxy vitamin D in adults affected by thalassemia major or intermedia. *Bone* 2006; 38(6): 888-92
8. Ali D, Mehran K, Moghaddam AG. Comparative evaluation of renal findings in beta-thalassemia major and intermedia. *Saudi J Kidney Dis Transpl* 2008; 19(2): 206-09
9. Tritipsombut J, Sanchaisuriya K, Fucharoen S, Fucharoen G, Siriratmanawong N, Pinmuangngam C*, et al*. Hemoglobin profiles and hematological features of thalassemic newborns- Application to screening of α-thalassemia 1 and hemoglobin E. *Arch Pathol Lab Med* 2008; 132: 1739-45
10. Al-Kataan MA, Al-Rasheed SM, Ahmed FA. Serum iron status in beta-thalassemic patients with clinical signs of iron overload. *Tikrit Med J* 2009; 15(1): 9-12

11. Bharat V, Gupta S, Gupta R. Detection of carriers for β-thalassemia: A case study of Jammu (J&K). *Orient J Chem* 2010*;* 26(1): 199-06
12. Hamed EA, ElMelegy NT. Renal functions in pediatric patients with beta-thalassemia major: relation to chelation therapy: original prospective study. *Ital J Pediatr* 2010; 36: 39
13. Niazi M,Tahir M, e Raziq F, Hameed A. Usefulness of red cell indices in differentiating microcytic hypochromic anemias. *Gomal J Med Sci* 2010; 8(2): 125-29
14. Patil VW, Mujawar SA. Defeciency of folic acid, vitamin B12 and their correlation with ferritin in childhood β thalassemia major. *Curr Pediatr Res* 2010; 14(2): 111-14
15. Yousafzai YM, Khan S, Raziq F. β-thalassemia trait: Hematological parameters. *J Ayub Med Coll Abbottabad* 2010; 22(4): 84-86.
16. Attia MMA, Sayed AM, Ibrahim FA, Mohammed AS, El-Alfy MS. Effects of antioxidant vitamins on the oxidant/antioxidant status and liver function in homozygous beta thalassemia. *Romanian J Biophys* 2011; 21(2): 93-106
17. Sadeghi-Bojd S, Hashemi M, Naderi M, Shikhani S. Kidney function tests in children with beta-thalassemia minor in Zahedan, southeast of Iran. *Iran J Kidney Dis* 2011; 5(3): 201-03
18. Aminianfar M, Saidi AA, Fallah A, Barghi A. Prevalence of hepatitis B and C among hemodialysis and thalassemic patients in a special medical center in east Tehran in 2011. *Afr J Microbiol Res* 2012; 6(24): 5285-87
19. Hashemizadeh H, Noori R, Kolagari SH. Assessment hepatomegaly and liver enzymes in 100 patients with beta thalassemia major in Mashhad, Iran. *Iran J Ped Hematol Oncol* 2012; 2(4): 171-77
20. Younus ZM, Alhially YAH, Bashi AYD. Evaluation of conventional renal function tests in β-thalassemia major patients in Nineveh province. *Tikrit J Pharmaceutical Sci* 2012; 8(1): 6-14.
21. Bastawy SA, Abd El Wahab MB, Fahmy MA. Antioxidant and hematological study among Egyptian thalassemic children. *JMSCR* 2013; 1(4): 165-71
22. Bhukhanvala D, Seliya V, Shah A, Gupte S. Study of parents of β-thalassemia major children to determine cutoff values of hematological parameters for diagnosis of β-thalassemia trait and assessment of anemia in them. *Ind J Med Sci* 2013; 67: 117-22
23. Mirbehbahani NB, Rashidbaghan A, Mazji M, Behnampour N. National approach to premarital diagnosis of trait thalassemia and silent carriers. *Int J Clin Med* 2013; 4(2): 91-95
24. Munir B, Iqbal T, Jamil A, Muhammad F. Effect of β thalassemia on hematological and biochemical profiles of female Patients. *Pak J life Soc Sci 2013*; 11(1): 25-28
25. Eghbali A, Taherahmadi H, Shahbazi M, Bagheri B , Ebrahimi L Association between serum ferritin level, cardiac and hepatic T2-star MRI in patients with major β-thalassemia. *Iran J Ped Hematol Oncol* 2014; 4(1): 17-21
26. Vehapoglu A, Ozgurhan G, Demir AD, Uzuner S, Nursoy MA, Turkmeen S, *et al*. Hematological indices for differential diagnosis of β thalassemia trait and iron deficiency anemia. Available at: http://dx.doi.org/10-1155/2014/576738 Accessed on: January, 2016
27. Belsare V, Belsare H, Lambe S. Study of biochemical parameters in beta thalassemia major patients. *IJRTSAT* 2015; 13(3): 526-3

How to cite this article:

Dr. Suby Singh *et al* (2020) 'Thalassemia: A Brief Study', *International Journal of Current Advanced Research,* 09(10), pp. 23172-23175. DOI: http://dx.doi.org/10.24327/ijcar.2020.23175.4588

****