|  |  |  |
| --- | --- | --- |
|  | **ORIGINAL ARTICLE** | ***ANNALS OF PUNJAB MEDICAL COLLEGE*** |

**Prevalence of Beta Thalassemia Trait Among Anemic Pregnant Patients**

**Fauzia Khan1, Najma Bibi2, Aamir Khan3, Atyya Bibi Khan4, Sadia Anwar5, Saima Umar6**

|  |  |  |
| --- | --- | --- |
| 1.
 | ***Medical Officer, Police Service Hospital, Peshawar Pakistan****Manuscript writing and data collection* | ***CORRESPONDING AUTHOR******Dr. Atyya Bibi Khan****Assistant Professor, Department of Gynecology & Obstetrics, Ayub Teaching Hospital, Abbottabad Pakistan**Email: atyyamir@yahoo.com****Submitted for Publication: 23-10-2022******Accepted for Publication 19-06-2023*** |
|  | ***Assistant Professor, Department of Gynecology & Obstetrics, Women Children Hospital, Dera Ismail Khan Pakistan*** *Proof reading and data analysis* |
|  | ***Medical Officer, Police Service Hospital, Peshawar Pakistan****Reference writing* |
|  | ***Assistant Professor, Department of Gynecology & Obstetrics, Ayub Teaching Hospital, Abbottabad Pakistan****Result interpretation* |
|  | ***Associate Professor, Department of Gynecology & Obstetrics, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan Pakistan****Paper writing and proof reading* |  |
|  | ***Assistant Professor, Department of Gynecology & Obstetrics, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan Pakistan****Statistical analysis* |  |
| **How to Cite:** Khan F, Bibi N, Khan A, Khan AB, Anwar S, Umar S.Prevalence of Beta Thalassemia Trait Among Anemic Pregnant Patients. APMC 2023;17(3):398-401. **DOI: 10.29054/APMC/2023.1235** |

**ABSTRACT**

**Background:** Anemia is the most common health problem during a woman life span. It has serious threats to pregnant women all over the world. Its prevalence in Pakistan is 75%. Thalassemia trait a common cause of anemia is usually diagnosed in pregnancy after workup of anemia. **Objective:** To find out the frequency of beta thalassemia trait in pregnant anemic women. **Study Design:** Cross-sectional study. **Settings:** Gynecology Unit, Hayatabad Medical Complex, Peshawar Pakistan. **Duration:** 6 months from 9th September 2020 to 8th March 2021. **Methods:** A total of 193 pregnant anemic women of age 17-40 years with a gestational age of 8-28 weeks were included in the study through a non-probability sampling technique. Those with known liver, and kidney diseases and hypothyroidism and those with pregnancy-related bleeding were excluded. Blood samples were sent for peripheral smear and Hb-electrophoresis and all the parameters were noted in the proforma. **Results:** Means ±SD for age was 28.35 ± 6.713 years, for gestational age was 17.08 ± 4.620 weeks and for Hb level was 7.71 ± 1.425 g/dl. 25.9% of patients were observed in 21-25 years of age. Cousin marriages were recorded in 71.5% of patients. 60.6% of patients were having a family history of thalassemia while the Beta thalassemia trait was recorded in 58.5% of patients. **Conclusion:** 58.5% prevalence of Beta thalassemia trait in pregnant women was observed. It was more common in age group 21-25 years. Cousin marriages and family history are the major causes of thalassemia.

***Keywords:*** *Anemia, Pregnancy, Beta thalassemia trait.*

**INTRODUCTION**

A

nemia is the most common health problem during a woman life span. It has serious threats to pregnant women all over the world. Being a major public health problem, it is responsible for many high-risk pregnancies. There is mounting evidence that anemia accounts for neurodevelopmental delay in children born to anemic mothers.1

Anemia is prevalent in pregnant population in many parts of the world. The lowest is in the USA (5.7%) and the highest in Gambia (75%). India accounts for 65-75% cases.2,3 In Ethiopian women the overall prevalence among pregnant women was 36.1%.4 Pakistan has largest figures of 75% in pregnant population.5

Beta thalassemia’s are a group of inherited genetic disorders resulting in defective hemoglobin synthesis. The heterozygous state is called the Thalassemia trait while the homozygous state is called Thalassemia major. Thalassemia trait is one of the causes of anemia which is usually diagnosed in pregnancy. In Thailand's population, Thalassemia carriers were very high with 54.9% of pregnant anemic patients.6 However, this rate was lower in Indonesian and UAE pregnant anemic women which were 5.7% and 8% respectively.7,8 A study carried out on the Pakistani Pathan women found beta thalassemia trait in 56.7% of pregnancies.9

 Another study in Punjab found 4.9% pregnant women having Thalassemia trait.10 One study by Khan, et al. reported the prevalence of 3.2% of B Thalassemia trait in pregnant women. 11 Family history (24%) and cousin marriages (59%) was the most prevalent risk factor for beta thalassemia trait.12

This study was conducted to estimate the prevalence of beta thalassemic trait in a pregnant anemic patient presenting to Hayatabad Medical Complex, Peshawar, to find out the exact prevalence because different studies showed different results in our population. Also, there was no study in the last 5 years in our institute regarding the subject. So, this study is recent evidence of the population caught by our hospital. The results of my study can be used to formulate strategies for decreasing such events, proper counselling and handling all events related to them.

**METHODS**

This Cross-sectional study was conducted in Gynecology Unit, Hayatabad Medical Complex, Peshawar. The study duration was 6 months from 9th September 2020 to 8th march 2021. The total Sample Size was 193 pregnant anemic women, using the WHO sample size formula taking a 95% Confidence level and Anticipated Population Proportion (P) of beta-thalassemia in pregnant anemic women 56.7%9 and considering the absolute precision of 7%.

The approval was taken from hospital ethical committee. All patients gave informed consent and sample was collected using a non-probability consecutive sampling technique. All pregnant patients with anemia, gestational age of 8-28 weeks and ages 17 to 40 years and who consented to participate were included. Patients with chronic and known renal disease, chronic hepatic disorders or hypothyroidism and those with pregnancy-related bleeding were excluded from study.

After recording the demographic like name, age of the patient, the number of gravidas, parity and duration of pregnancy (gestational age), Socioeconomic status, cousin marriage history, a sample of blood for HB-electrophoresis and Peripheral smear was collected and sent to the hospital laboratory and the results were recorded on a proforma. The patients were managed antenatally according to the hospital’s protocol.

The data were analyzed in a statistical analysis program (SPSS version 23). Means ± Standard Deviations were calculated for quantitative variables like age of patients, gestational age, gravida, parity, level of Hb and MCV. Frequency and percentages were calculated for qualitative variables like address (urban/rural), socioeconomic state, presence of cousin marriage, family history of thalassemia and beta thalassemia trait (known documented medical history). Effect modifiers like age, gestational age, parity, address, socioeconomic state, cousin marriage and family history of thalassemia were controlled through stratification and were compared with the frequency of beta thalassemia trait. Post-stratification chi-square test was applied by taking P-value < 0.05 as significant. All the data have been presented by using tables.

**RESULTS**

Among 193 patients Means and Standard Deviations calculated for age were 28.35 ± 6.713 years, for gestational age was 17.08 ± 4.620 weeks, for gravida was 2.40 ± 1.378, for parity was 1.21 ± 1.282, for Hb level was 7.71 ± 1.425 g/dl and for MCV it was 61.02 ± 7.929 fL (Table - 1).

These patients were divided in five groups as per age. Most patients were observed in the 21-25 years age group i.e. 25.9%, followed by 21.2% patients in the 31-35 years age group, 19.7% patients in the 36-40 years age group, 18.7% patients in the 26-30 years age group and in last 14.5% patients in 17- 20 years age group. Most patients recorded were belonging to urban areas i.e. 57.5% followed by 42.5% living in rural areas (Table - 3). According to socioeconomic status, majority were in the poor class i.e. 36.8%, followed by 35.2% patients in the middle class and 28% patients in the rich class. Cousin marriages were recorded in 71.5% and 28.5% having not cousin marriages. 60.6% of patients had family history of thalassemia while 39.4% were without family history. Beta thalassemia trait recorded in 58.5% of patients while it was absent in 41.5% of patients (Table 2).

Beta thalassemia trait had non-significant association with age stratification of patients. Beta thalassemia trait was recorded in 7.8% of patients in the 17-20 years, 15% in the 21-25 years, 10.4% in the 26-30 years, 13% in 31-35 years and 12.4% in 36-40 years age groups. Beta thalassemia trait was also non-significant stratified for the gestational age of patients. It was recorded in 19.7% of patients in the 8-14 weeks group, 27.5% of patients in the 15-21 weeks group and 11.4% of patients in the 22-2 weeks group. Beta thalassemia trait was stratified for the parity of patients. It was recorded in 39.9% of patients in the 0-1 parity, 14.5% of patients in the 2-3 parity and 4.1% in the 4-5 parity group. Beta thalassemia trait was recorded in 23.8% of patients of rural and 34.7% of patients of urban areas (p=0.552).

Insignificant beta thalassemia trait was recorded in 22.3% of patients in the poor class, 19.7% of patients in the middle class and 16.6% of patients in the rich class (p=0.848). Beta thalassemia trait was recorded in 39.4% of patients who were married to their cousins and 19.2% of patients who were not married to their cousins. Beta thalassemia trait was stratified for the family history of thalassemia of patients. This trait recorded in 36.8% of patients with family history and 21.8% of patients without family history of thalassemia (p=0.455; table 3).

**Table 1: Mean and standard deviation of quantitative variables**

|  |  |
| --- | --- |
| **Variables** | **Mean ± SD** |
| Age | 28.35 ± 6.71 |
| Gestational age | 17.08 ± 4.62 |
| Gravida | 2.40 ± 1.38 |
| Parity | 1.21 ± 1.28 |
| Hb | 7.71 ± 1.43 |
| MCV | 61.02 ± 7.93 |

**Table 2: Stratification of study variables**

|  |  |
| --- | --- |
| **Characteristics** | **n (%)** |
| **Age group** | 17-20 | 28 (14.5%) |
| 21-25 | 50 (25.9%) |
| 26-30 | 36 (18.7%) |
| 31-35 | 41 (21.2%) |
| 36-40 | 38 (19.7%) |
| **Address** | Rural | 82 (42.5%) |
| Urban | 111 (57.5%) |
| **SocioeconomicStatus** | Poor | 71 (36.8%) |
| Middle | 68 (35.2%) |
| Rich | 54 (28.0%) |
| **Cousin Marriage** | Yes | 138 (71.5%) |
| No | 55 (28.5%) |
| **Family Historyof Thalassemia** | Yes | 117 (60.6%) |
| No | 76 (39.4%) |
| **Beta Thalassemia Trait** | Yes | 113 (58.5%) |
| No | 80 (41.5%) |

**Table 3: Association between Beta Thalassemia with study parameters**

|  |  |  |
| --- | --- | --- |
| **Stratification** | **Beta Thalassemia Trait** | **p-value** |
| **Yes** | **No** |
| **AgeGroup(years)** | 17-20 | 15 (7.8%) | 13 (6.7%) | 0.931 |
| 21-25 | 29 (15.0%) | 21(10.9%) |
| 26-30 | 20 (10.4%) | 16 (8.3%) |
| 31-35 | 25 (13.0%) | 16 (8.3%) |
| 36-40 | 24 (12.4%) | 14 (7.3%) |
| **Gestational Age(years)** | 8 – 14 | 38 (19.7%) | 24 (12.4%) | 0.637 |
| 15-21 | 53 (27.5%) | 43 (22.3%) |
| 22-28 | 22 (11.4%) | 13 (6.7%) |
| **Parity** | 0-1 | 77 (39.9%) | 52 (26.9%) | 0.898 |
| 2-3 | 28 (14.5%) | 22 (11.4%) |
| 4-5 | 8 (4.1%) | 6 (3.1%) |
| **Address** | Rural | 46 (23.8%) | 36 (18.7%) | 0.552 |
| Urban | 67 (34.7%) | 44 (22.8%) |
| **SocioeconomicStatus** | Poor | 43 (22.3%) | 28 (14.5%) | 0.848 |
| Middle | 38 (19.7%) | 30 (15.5%) |
| Rich | 32 (16.6%) | 22 (11.4%) |
| **Cousin Marriage** | Yes | 76 (39.4%) | 62 (32.1%) | 0.121 |
| No | 37 (19.2%) | 18 (9.3%) |
| **FamilyHistory ofThalassemia** | Yes | 71 (36.8%) | 46 (23.8%) | 0.455 |
| No | 42 (21.8%) | 34 (17.6%) |

*P-value was calculated by Chi-square / Fisher's Exact test and significant if ≤ 0.05*

**DISCUSSION**

Thalassemia is a type of hemoglobinopathies in which there is one or two types of polypeptide chains (α or β) suppressed either partially or completely due to mutations of the globin. This leads to defective synthesis of hemoglobin causing anemia. genes. There are several types of thalassemia, the most common clinical types are alpha (α), β/δ-, and β-thalassemia. 14

Thalassemia is one of the commonest inherited diseases affecting more than 400000 pregnancies annually.15 They are classified according to the type of globin chain affected. The Hemoglobin should be structured in such a way that the number of α-chains and β-chains should be in adequate amount. The normal adult hemoglobin comprise of 98% HbA , less than 3% HbA2 , and traces of HbF .16

Thalassemia is characterized by decreased or absent production of one or more globin chains. The severity of the disease depends upon affected globin chains. Beta Thalassemia is considered to be one of the most common single-gene disorders in the world. The majority of thalassemia major children are born in underdeveloped countries due to a lack of national preventive programs.17 Beta-thalassemia is a heterogenous genetic disorder caused by mutations in genes responsible for beta chain production causing diminished or absent beta chains leading to decreased hemoglobin in erythrocytes, reduced erythropoiesis and anaemia.18

In thalassemia, the inheritance pattern is mostly autosomal recessive. Thalassemia has equal gender distribution in males and females and incidence is reported to be 4.4 out of 10,000 live births worldwide. 19,20 Iron deficiency anemia is the most prevalent type of anemia in pregnant women in Pakistan.21,22 In Iron deficiency anemia, the production of Hb-A2 is also affected causing a reduction in Hb-A2 levels in patients with the thalassemia trait.23

 Although maternal thalassemia has its own health risks for mother but generally it is not associated with increased fetal complications. However when both parents having carrier status, carriers, there is a 50% chance of a child being born as beta thalassemia minor, a 25% chance of a child having beta Thalassemia major and a 25% chance of unaffected child. Hemoglobin Electrophoresis is the gold standard diagnostic test.24

The frequencies of thalassemia traits in pregnant women varies in Pakistan. In our study, 58.5% of pregnant anemic women were diagnosed with beta thalassemia trait. A study conducted by Hafeez M et al. in Lahore among pregnant women found 53.1% beta thalassemia trait.25 In another study Sarda H et al, observed 51.6% thalassemia trait in pregnant anemic women. 26

On another hand, in a study by Kiran Iqbal et al.27 7.5% of pregnant anemic patients were diagnosed as beta-thalassemia trait with a mean hemoglobin concentration of 9.43±0.40 g/dl, while the mean haemoglobin concentration in the current study was 7.71±1.425 g/dl which is quite a difference. Kulkarni P et al, screened 210 pregnant women and observed 8.5% thalassemia carriers in studied sample.28 Another study by Qamar-ur-Nisa et al on pregnant population had the same carrier rate.29 A genetic disorder like Thalassemia has long lasting health consequences in society. Effective premarital screeing can reduce its transmission to subsequent generations.

**CONCLUSION**

This study observed 58.5% prevalence of Beta thalassemia trait in pregnant women of our region. It was more common in age group 21-25 years. Cousin marriages and family history are the major causes of thalassemia.

**LIMITATIONS**

There were few limitations to our study. The sample size was small as patients were non affording for expensive investigations like Hb electrophoresis.

**SUGGESTIONS / RECOMMENDATIONS**

Screening should be done before marriage or early in the pregnancy to prevent beta thalassemia trait and related diseases in successive generations.

**CONFLICT OF INTEREST / DISCLOSURE**

None.

**ACKNOWLEDGEMENTS**

None.

**REFERENCES**

1. Ramakrishnan U, Goldenberg T, Allen LH. Do multiple micronutrient interventions improve child health, growth, and development? J Nutr. 2011;141(11):2066-75.
2. Goonewardene M, Shehata M, Hamad A. Anaemia in pregnancy. Best Pract Res Clin Obstet Gynaecol. 2012;26(1):3-24.
3. Bora R, Sable C, Wolfson J, Boro K, Rao R. Prevalence of anemia in pregnant women and its effect on neonatal outcomes in northeast india. J Matern Fetal Neonatal Med. 2014;27(9):887-91.
4. Gebre A, Mulugeta A. Prevalence of anemia and associated factors among pregnant women in north western zone of tigray, northern ethiopia: a cross-sectional study. J Nutr Metab. 2015; 2015:7.
5. Anjum A, Manzoor M, Manzoor N, Shakir HA. Prevalence of anemia during pregnancy in district faisalabad, pakistan. Punjab Univ J Zool. 2015;30(1):15-20.
6. Sukrat B, Sirichotiyakul S. The prevalence and causes of anemia during pregnancy in maharaj nakorn chiang mai hospital. J Med Assoc Thai. 2006;89(Suppl 4): S142-46.
7. Fareh O, Rizk D, Thomas L, Berg B. Obstetric impact of anaemia in pregnant women in united arab emirates. J Obstet Gynaecol. 2005;25(5):440-44.
8. Susanti AI, Sahiratmadja E, Winarno G, Sugianli AK, Susanto H, Panigoro R. Low hemoglobin among pregnant women in midwives’ practice of primary health care, jatinangor, indonesia: iron deficiency anemia or β-thalassemia trait? Anemia. 2017;2017.
9. Qadir M, Amir S. Frequency of beta thalassemia trait in pregnant anemic patients attending Khyber teaching hospital, Peshawar pakistan. Khyber Med Univ J. 2017;9(4).
10. Mustafa A, Zulfiqar M, Ali BA, Naseem L. Frequency of ßthalassemia trait among pregnant women presenting at Pakistan institute of medical sciences. Natl J (Wash). 2018;3(4):119.
11. Khan H, Shah F, Khan K. Frequency of beta-thallassemia trait among pregnant women in their last trimester with hypochromic microcytic anemia. Pak J Public Health. 2017;7(2):79-81.
12. Rizwan F, Memon F, Memon A. Frequency of thalassemia trait in pregnant women. Medical Channel. 2011;17(1).
13. Candio F, Hofmeyr G. Treatments for iron-deficiency anaemia in pregnancy: Rhl commentary. The WHO Reproductive Health Library. 2007.
14. Petrakos G, Andriopoulos P, Tsironi M. Pregnancy in women with thalassemia: challenges and solutions. Int J Womens Health. 2016;8:441-51.
15. Weatherall DJ. The inherited diseases of hemoglobin are an emerging global health burden. Blood. 2010; 115:4331–4336.
16. Iqbal K, Iqbal I, Shami N. Frequency of Betathalassemia Trait in Pregnant Females. PJMHS. 2018;12(3):1200-02.
17. Galanello R. Origa R. Beta-thalassemia. Orphanet J Rare 2^2010 May21; 5:11.
18. Ahmed S, Petrou M, Saleem M. Molecular genetics of betathalassaemia in Pakistan: a basis for prenatal diagnosis. Br J Haematol. 1996; 94:476-482.
19. Alsaeed AH. Prevalence of Hemoglobinopathy Disorders in Adult Patients Sent for Diagnosis of Anemia in Saudi Arabia. Genet Test Mol Biomarkers. 2011 Aug 23.
20. Sirdah M, Tarazi I, Al Najjar E, Al Haddad R. Evaluation of the diagnostic reliability of different RBC indices and formulas in the differentiation of the beta-thalassaemia minor from iron deficiency in Palestinian population. Int J Lab Hematol. 2008; 30:324-330.
21. AlFadhli SM, Al-Awadhi AM, AlKhaldi D. Validity assessment of nine discriminant functions used for the differentiation between iron deficiency anemia and thalassemia minor. J Trop Pediatr. 2007; 53:93-97.
22. Usman M, Moinuddin M and Ahmed SA. Role of iron deficiency anemia in the propagation of beta thalssemia gene. Korean J Hematol. 2011 March; 46(1): 41-44.
23. White JM, Richards R, Byrne M, Buchanan T, White YS, Jelenski G. Thalassaemia trait and pregnancy. J Clin Pathol. 1985 Jul;38(7):810-7.
24. Giambona A, Passarello C, Renda D, Maggio A; The significance of the hemoglobin A (2) value in screening for hemoglobinopathies [Review]. 2009; Clin Biochem 42:1786-1796.
25. Hafeez M, Aslam M, Ali A, Rashid Y, Jafri H Regional and ethnic distribution of beta thalassemia mutations and effect of consanguinity in patients referred for prenatal diagnosis. J Coll Physicians Surg Pak 2007 Mar;17(3):144-7.
26. Sarda H, Niveditha SR, Shivlingaiah N. Screening of b-thalassemia trait among pregnant women with NESTROFT. Thalassemia Reports 2015;5(1),4430.
27. Iqbal K, Iqbal I, Shami N. Frequency of Beta thalassemia Trait in Pregnant female patients PJMHS 2018 ; 12( 3) : 1200-2
28. Kulkarni P, N R Ramesh Masthi, Niveditha SR, Suvarna R.The Prevalence of the Beta Thalassemia Trait among the Pregnant Women who attended the ANC Clinic in a PHC, by using the NESTROF Test in Bangalore, Karnataka; J Clin Diagn Res. 2013 July; 7(7): 1414-1417.
29. Qamar-ur-Nisa et al. Frequency of Thalassemia Trait in Pregnant Women ; MC 2011; .17(.1) : 56-59.