

## FREQUENCY OF CARRIER RATE OF BETA ( $\beta$ ) THALASSEMIA TRAIT IN FEMALES OF CHILD BEARING AGE

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### ABSTRACT

**Background and Objectives:** Thalassaemia are genetic disorders characterized reduced synthesis of with  $\beta$  of Q chains of haemoglobin. All over the world including Pakistan, it is a common problem and its magnitude is increasing. In Pakistan the cussin for  $\beta$  thalassaemia is reported between 4.5 – 13% in some major cities. The life expectancy with this disease is about 10 years. The ovarian label data is very patchy and incomplete. This study was designed to find out the frequency of beta ( $\beta$ ) thalassaemia trait in females of child bearing age.

**Methods:** This descriptive study females of child bearing age visiting FMH OPD presenting with hypochromic microcytic anemia were selected by non-probability purposive sampling and screened for beta thalassaemia trait. Hemoglobin electrophoresis was performed and a raised Hb A<sub>2</sub> between 3.5%-7% was considered diagnostic for betathalassaemia trait. The data was analysed by SPSS 19.

**Results:** Three hundred and fifteen females between 16- 45 years were included in the study. Female cohort of child bearing age was mostly young with a mean  $\pm$  SD age of 26.4  $\pm$  4.8 years. Diagnosis of beta-thalassaemia trait was made in 58 out of 315 (18.41%) females of child bearing age. Mean age of females with beta-thalassaemia trait was 27.4 SD  $\pm$  6.7 years. Fifty one percent of beta thalassaemia trait patients had coexistent iron deficiency.

**Conclusion:**  $\beta$  thalassaemia trait was seen in 18.51% females of child bearing age at our Centre. Coexistent iron deficiency was seen in 51% of beta thalassaemia patients.

**Keywords:** Beta ( $\beta$ ) thalassaemia trait, females.

### INTRODUCTION

Pakistan has a population of over 170 million and it contains a huge burden of hereditary hemoglobin disorders.<sup>1</sup> Thalassaemia syndromes are the most common single gene disorder throughout the world and have a carrier rate of 3%. It is estimated that there are 200 million carriers of beta thalassaemia gene all over the world, nine million are estimated in Pakistan.<sup>2,3</sup> Thalassaemias are genetic disorders characterized by reduced synthesis of either beta ( $\beta$ ) or alpha ( $\alpha$ ) globin chains of hemoglobin.  $\beta$  -thalassaemia major is a lifelong transfusion dependent disease which requires regular iron chelation and blood transfusions.<sup>4</sup> There is quantitative deficiency of functional  $\beta$ -globin chains and based on  $\beta$  globin chain synthesis  $\beta$  thalassaemia are either  $\beta^0$  or  $\beta^+$ . In  $\beta^0$ thalassaemia no  $\beta$  globin chain is synthesized as the gene is unable to encode for any functional mRNA. In  $\beta^+$  thalassaemia the mutated gene encodes from a small amount of normal mRNA and some amount of chain is still synthesized.<sup>5</sup> In Pakistan the carrier rate for  $\beta$  thalassaemia gene is reported between 4.5 – 13% in some major populated cities like

Karachi, Rawalpindi, Lahore and highest in Khyber Pakhtunkhwa.<sup>6,7</sup> Life expectancy with  $\beta$  thalassaemia major is around 10 years in Pakistan and 5000 children are diagnosed each year with  $\beta$  thalassaemia. The current disease burden is between 90,000 – 100,000 living patients and actual figure would be much higher due to non-availability of registered cases from villages.<sup>8,9</sup> The data from Pakistan is mostly patchy and incomplete. Most of the studies about disease frequency have been carried out on small population groups and some have been based on hospital patients. There is also variation in the prevalence of haemoglobinopathies in different regions and population groups in the country. We have reported the frequency of  $\beta$  thalassaemia carrier status in the females of child bearing age. This can highlight the high frequency of disease in a population which will be passing it on the next generation.

### MATERIALS AND METHODS

This descriptive study was carried out in the department of Pathology, Haematology Division, Fatima

**Table 1:** The CBC findings in cases of beta thalassemia trait.

| Cohort                               |             | Hb            | MCV            | RDW            | Red cell Count |
|--------------------------------------|-------------|---------------|----------------|----------------|----------------|
| Total Females screened (no 315)      | Mean +/- SD | 8.68 +/-1.65  | 73.42 +/-11.65 | 18.04 +/- 3.79 | 3.97 +/- 0.72  |
|                                      | Minimum     | 3.4           | 46.5           |                | 1.8            |
|                                      | Maximum     | 15.3          | 105.7          |                | 7.12           |
|                                      | Range       | 11.9          | 59.2           |                | 5.32           |
| Females with beta thal trait (no 58) | Mean +/- SD | 9.03 +/- 1.69 | 68.23 +/- 8.84 | 18.48 +/-3.59  | 4.34 +/- 0.97  |
|                                      | Minimum     | 4.6           | 54.8           |                | 0.8            |
|                                      | Maximum     | 12.6          | 93.8           |                | 6.88           |
|                                      | Range       | 8             | 39.0           |                | 5.08           |

Memorial Hospital College of Medicine & Dentistry, Lahore, from March 2012 to February 2016. Females of child bearing age (16 – 45 years) who presented with hypochromic microcytic anaemia were included in the study. Detailed history was taken from the patients regarding any known hereditary haemoglobin disorders in the family. Complete blood counts were done on SysmexK21 and hemoglobin level, Red blood cell count, Mean corpuscular hemoglobin (MCH), Mean Corpuscular volume (MCV) and peripheral blood smear findings were noted. Haemoglobin electrophoresis was carried out on cellulose acetate agar on blood samples of the patients with hypochromic microcytic anaemia. Densitometer was used to determine Hb A<sub>2</sub> levels. The diagnosis of beta thalassemia trait was made if Hb A<sub>2</sub> was 3.5% – 7%. Forty five patients found positive for beta thalassemia trait had serum ferritin levels done on ELISA.

## RESULTS

Female patients between 16 – 45 years were 315 in number and mostly young with a mean  $\pm$  SD age of 26.4  $\pm$  4.8 years. Diagnosis of beta-thalassemia trait was made in 58 out of 315 (18.41%) females of child bearing age. The mean age for females with beta thalassemia trait was 27.4 +/- 6.74 years. In patients detected with beta thalassemia trait HbA<sub>2</sub> was more than 3.5%. Peripheral blood films in these cases revealed hypochromia and microcytosis, target cells and schistocytes and pencil cells in those with iron deficiency complicating beta thalassemia trait. Table 1 shows the CBC findings of all females screened for beta thalassemia. Serum ferritin level were carried out in 45 of the 58 cases of beta thalassemia trait and was found to be less than 12 microgram/l in 23 cases (51.1%).

## DISCUSSION

There are estimated 200 million carriers of beta thalassemia gene all over the world and nine million being in Pakistan.<sup>2,3</sup> Thalassemia is the commonest inherited haemoglobinopathy and in Pakistan the carrier rate for  $\beta$  thalassemia gene is reported between 4.5 – 13% in some major populated cities like Lahore, Rawalpindi,

Karachi and highest in Khyber Pakhtunkhwa.<sup>6,7</sup> The present study showed a frequency of 18.41% in women of child bearing age.

It is important to differentiate between iron deficiency and beta thalassemia trait. Hypochromic microcytic red cell in proportion to degree of anaemia, with poikilocytosis anisocytosis, pencil cells, red cell count less than 5 million/mm<sup>3</sup> and MCV less than 75fl usually favors iron deficiency. Whereas a uniformly hypochromic microcytic peripheral blood smear more pronounced as compared to haemoglobin levels, absence or minimal anisocytosis, target cells, red cell count more than 5 million/mm<sup>3</sup> with a decreased MCV goes more in favor of Beta thalassaemia trait.<sup>10-12</sup> We found coexistent iron deficiency and beta thalassemia trait in 51% of our patients which means that these women required iron therapy despite being carriers of beta thalassemia.

In a study conducted by Hussain at Gomal Medical College in Dera Ismail Khan, Pakistan frequency of beta thalassemia trait was also 18.5% and affected female patients were 34%.<sup>13</sup> Study conducted by Balgir<sup>14</sup> in Indian state of Orissa Beta thalassemia trait was 18.2% with a female population of 47.7%. Frequency of beta thalassemia trait in female cohort was 19.5%. Majority of the females were of child bearing age in the study group and the frequency of beta thalassemia trait is comparable to our study results. Study by Nisa<sup>15</sup> at Liaquat University National Hospital, Hyderabad on pregnant women showed a frequency of 8.5% for beta thalassemia trait. These women will transmit this trait to their progeny and the likelihood of passing this trait to the offspring will be 50% for each pregnancy. As family and same caste marriages are very common in Pakistan, without screening it can be considered that any married couple who are closely or distantly related to a thalassemia patient can be carriers of thalassaemic gene. Study by Nadeem<sup>16</sup> at Children Hospital, Lahore showed a 10.3% frequency of beta thalassemia trait in children which is higher than any previous studies have reported. Study conducted at Fatima Jinnah Medical College Lahore by Majeed<sup>17</sup> on family members of Thalassemia Major patients showed a frequency of

52% for beta thalassemia trait with female population of 51.6% and females of child bearing age was about 26.3%. Frequency of beta thalassemia trait in females was 24.3%. Any marriage between two thalassemia carriers will have a 25% possibility of producing a child suffering from thalassemia major in every pregnancy. Individual screening is very essential in order to evaluate the exact risk and to do genetic counseling. Frequency of beta thalassemia trait is very high and no population based country-wide study has been conducted so far. Exact data about the prevalence of haemoglobin disorders in not available in Pakistan, however the birth of thalassemia major infants can be prevented by proper screening and counseling like it has been done in our neighboring country Iran.

It is **concluded** the percentage of beta thalassemia trait in females of child bearing age coming to FMH hospital was 18.41%. Coexistent iron deficiency was seen in 51% of beta thalassemia patients. High frequency of  $\beta$  thalassaemia trait in females of child bearing age at our centre calls for a policy to screen for beta thalassemia in population of child bearing age to reduce the burden of thalassemia major in our country. Coexistent iron deficiency in patients of beta thalassemia should be sought and treated to improve Hb levels in these patients.

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#### Author's Contribution

AL: Designed the study and developed study. AE: Worked on methodology and results. DSL: Literature research and discussion writing. SR: Overall supervision of the project.

**Conflict of Interest:** None.

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