

# Strengthening Education to Bridge the Thalassemia Care Gap

Thalassemia is a common inherited autosomal recessive disorder which is characterized by reduced or absent hemoglobin chain synthesis, resulting in various severities of anemia<sup>1</sup>. These are the commonest among single-gene disorders<sup>2</sup>. The vast majority of Beta thalassemia mutations are point mutations and small insertions or deletions of one or two bases<sup>2</sup>. There are two main types of thalassemia: Alpha thalassemia occurs when a gene or genes related to the alpha globin protein are absent or mutated. When similar gene defects affect production of the beta globin protein, it is called  $\beta$  thalassemia.  $\beta$  thalassemia include groups of disorders showing marked variation ranging from mild anemia to severe life-threatening condition.

Beta thalassemia affected newborns are not anemic. Within few weeks to months pallor becomes severe. Then failure to thrive, anorexia, diarrhea, loss of body fat and recurrent fever becomes evident and growth and development is retarded if no therapeutic intervention is there<sup>3</sup>. Splenomegaly with moderate to marked hepatomegaly is obvious by the age of 3 years. Mongoloid facies, short stature and underdevelopment of secondary sex characters are common<sup>3</sup>.

The life of patients with thalassemia has improved both in duration and in quality in industrialized countries<sup>4</sup>. But complications are still common and include heart disease (heart failure and arrhythmias), chronic liver diseases, which can evolve in cirrhosis and, rarely, in hepatocellular carcinoma, endocrine problems mainly due to hemochromatosis (hypogonadism, hypothyroidism, diabetes, hypoparathyroidism), stunted growth, osteoporosis, gall stones, thrombophilia and pseudoxanthoma elasticum. Even patient may present with paraparesis and cauda equina syndrome due to extramedullary erythropoiesis<sup>3</sup>.

Diagnosis of thalassemia should be considered in all those who have hypochromic microcytic anemia<sup>5</sup>. Iron deficiency should be excluded first. Hb electrophoresis can identify  $\alpha$  thalassemia and different hemoglobinopathies like Hb E, Hb S, Hb H, Hb C etc<sup>6</sup>.

Based on phenotype, thalassemia syndromes are divided into two groups: Transfusion-Dependent Thalassemias (TDTs) and Non-Transfusion-Dependent Thalassemias (NTDTs). Patients with TDTs require regular blood transfusions to survive, and if they do not receive adequate transfusion support, they usually suffer from a variety of complications which may shorten their life span. TDT patients include  $\alpha$  thalassemia major, severe Hb E/ $\alpha$  thalassemia, transfusion - dependent Hb H disease and surviving Hb Bart's hydrops fetalis. NTDT group patients include  $\alpha$  thalassemia intermedia, Hb E/ $\alpha$  thalassemia, and Hb H disease.<sup>7</sup>

Management includes: blood transfusion, iron chelation, pharmacological agents for induction of Hb F, splenectomy, bone marrow transplantation (Stem Cell Therapy), treatment of complications and psychosocial support<sup>6</sup>.

The goal of blood transfusion in thalassemia is to deliver an effective and safe transfusion regimen with minimum burden of transfusion therapy on everyday life<sup>6</sup>.

Patients need to be evaluated annually by anthropometry by the care giver regarding adequate dietary intake of calcium, vitamin D, folate, trace minerals (copper, zinc, and selenium) and antioxidant vitamins (E and C)<sup>6</sup>.

Three percent of the population (3.6 million) carries  $\alpha$ -thalassemia and 4% (4.8 million) carries haemoglobin E (Hb E) gene in Bangladesh approximately. It is assumed that over 7000 children are born with thalassemia each year in Bangladesh<sup>8</sup>.

Depending on age, frequency of transfusions, and dosage, it costs Tk 5,000 to 10,000 per month. As treatment is expensive and lifelong, most patients of Bangladesh cannot afford it and develop complications and die young. Government of Bangladesh has set a goal to eradicate thalassemia from Bangladesh by the year 2028. Marriage between two thalassemia carriers is the only reason for the birth of a thalassemia patient.

The steps planned are, to create awareness, population screening, genetic counselling, prevention of birth of new thalassaemic baby. Creating awareness among general population by holding seminars, workshops, writing articles in the daily newspapers, and broadcasting in television and radio is of prime importance.

Genetic counseling and premarital screening detect the risk of carriers of both parents and risk in offspring. Prenatal diagnosis can be carried out by genetic analysis of fetus at 11 to 14 weeks of pregnancy by chorionic villus sampling or at 15 to 18 weeks by amniocentesis. Examination of fetal DNA in the serum of mother and investigation of fetal cells in maternal blood might be useful to detect mutations<sup>9</sup>.

Thalassemia is becoming an increasing concern for public health in Bangladesh. One study has recommended that public education about thalassemia should be emphasized for successful prevention of thalassemia. It has already been proven in several countries worldwide that implementation of mandatory national premarital screening programs could drastically reduce the incidence of infants born with thalassemia major<sup>10</sup>.

A cross-sectional study was conducted at a dedicated thalassemia hospital located in Dhaka, and out of 365 respondents, nearly all respondents (97%) had not heard about the term, 'thalassemia' before the disease was diagnosed in their children; all (100%) were unscreened for carrier status prior to marriage. Respondents with higher income and education showed significantly higher knowledge. Most respondents (~91%) had a guilty feeling for not undergoing premarital screening. Only around 36% of them had heard about prenatal diagnosis<sup>11</sup>.

Another cross-sectional study was conducted among randomly selected 1,248 peoples (18–75 years old) from January to October 2020 in eight divisional regions (Dhaka, Chittagong, Barisal, Khulna, Rajshahi, Rangpur, Mymensingh and Sylhet) of Bangladesh. Only 47.4% had heard of thalassemia and 50% of whom had no idea that thalassemia was not a transfusion transmitted disease. Only 49.8% of participant correctly identified consanguineous marriages as an important risk factor. Majority of them knew that marriage between two carriers can lead to a child with thalassemia major. The level of education of the respondents was identified as an independent predictor for knowledge<sup>12</sup>.

Similar study in Indonesia revealed that most of the participants 73% were unaware about the role of consanguinity thalassemia and 55% of them reported that they are not aware that thalassemia can be treated with blood transfusion. Awareness about Thalassemia was inadequate among the participants and a study from Malaysia on public perceptions and attitudes toward thalassemia found similar results<sup>13</sup>.

To disseminate the information on thalassemia is highly recommended since the knowledge gap is huge among people. These findings will strengthen the implementation of thalassemia major awareness through educational programs, health counseling, premarital screening and campaigning. In case of predominantly illiterate society/community, a specific strategy is required to improve the health-literacy among the public.

In some of the Muslim countries including Lebanon, Iran, Saudi Arabia, Tunisia, United Arab Emirates, Bahrain, Qatar, and Gaza Strip, the national premarital screenings are mandatory and aimed at limiting carrier marriage<sup>14</sup>. In developing countries, it has been suggested that the ideal place where these preventive measures could be organized is through existing health care services. Intensive education of health professionals as well as the population at large in the field of preventive genetics is needed and major health organizations and funding agencies must support these initiatives<sup>15,16</sup>.

Prevention of thalassemia is practical, feasible and answer to the agony of so many children, families and nations. Organization of national preventive programs in populations to control thalassemsias is the biggest challenge now. To face the challenge, comprehensive thalassemia prevention programs should be taken including health education and awareness, premarital screening and thalassemia carrier detection, vulnerable couple counseling, fetal DNA analysis and family screening.

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