

**Prevalence of Anaemia and Haemoglobinopathies
in Pregnant Women Living in Bago Region of Myanmar**

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A cross-sectional descriptive study was carried out in randomly selected 478 pregnant women with the age of 18-43 years and 12-40 weeks of gestation living in different villages of Bago Region, Myanmar. The mean Hb concentration was 10.76 g% in pregnant mother with anaemia. Anaemia was detected in 268 pregnant mothers (56%) by using Hemocue test. Red blood cell parameters, blood film examination and iso-electric focusing (IEF) were done on these pregnant women. The most common age group of anaemic subjects was 20-30 years (63.6%). Most of them were dependants (56%) with primary school level of education (38.1%) and their family income was one hundred to two hundred thousand kyats monthly (71.8%). The commonest gestation of pregnancy was more than 24 weeks (68%) and number of family members was mostly less than 5(70.7%). The commonest hemoglobin A type (normal Hb) was detected in 208(77.6%) and other abnormal Hb types (Hb EA, EE and AH) were found in 60 subjects (20.5%, 1.5% and 0.4%, respectively). The mean Hb concentration was 10.28 g% in Hb A, 10.22 g% in Hb EA, 9.27 g% in Hb EE and 8.2 g% in Hb HA in this study. Hb concentration was significantly different in types of hemoglobin variants ($p=0.008$). There were no significant differences between Hb concentration and gestation of pregnancy ($p=0.316$), education ($p=0.711$) and family income ($p=0.282$). Prevention and proper treatment of anaemia are important requirements to be included in future health planning for reduction of maternal, child mortality and morbidity.

Key words: Anaemia, Haemoglobinopathies, Hemocue test

INTRODUCTION

Anaemia in pregnancy is one of the main health problems in maternal and child health functions of developing countries and is related to bad outcomes such as increased rates of maternal and child mortality, premature delivery, low birth weight baby, etc.^{1,2}

The prevalence of anaemia in pregnancy is relatively high (33%-75%) in developing countries and low (15%) in developed countries.³ In pregnancy, anaemia is defined as a hemoglobin (Hb) concentration below 11 g/dl (11 g%) according to reference of World Health Organization (WHO).⁴ The commonest cause of anaemia in pregnancy is iron deficiency and others are thalassaemia,

haemoglobinopathies and megaloblastic anaemia (vitamin B12 and folate deficiency).⁵ The predisposing factors are grand multi parity, low socioeconomic status, malaria infestation, late antenatal booking, inadequate child spacing and chronic infections.^{6, 7} In Myanmar, iron deficiency anaemia was observed 13-24% in pregnant women⁸ and the prevalence of anaemia was 72% in pregnant women.⁹ The prevalence of iron deficiency anaemia in pregnant women was 37.2% in Yangon Division and 51% in the hilly region.^{10, 11} The prevalence rate of beta thalassaemia trait and Hb E carrier was

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1.18% and 19.9%, respectively among the couples of pregnant women.¹² The highest prevalence of alpha thalassaemia in general population is 13% in Chin State and the lowest (5.5%) in Kayin State. The highest prevalence of beta thalassaemia in general population is 6.9% in Kayin State and the lowest (1%) in Rakhine State. It depends mainly on different ethnic groups of Myanmar.¹³

The strengthening of maternal and child health care services should therefore be concerned with screening of anaemia and early detection of iron deficiency and haemoglobinopathies in pregnant women who are attending the antenatal care unit of different regions in our country. It may provide the reduction of morbidity and mortality in maternal and child health that is one of the main strategies of National Health Plan in Myanmar. Haemoglobinopathies (haemoglobin disorders) are conditions of abnormal hemoglobins and anaemia that are produced by defected genes to control the hemoglobin (Hb) synthesis. Abnormal hemoglobins are Hb S, Hb C, Hb E, Hb H, Hb D, Hb G, Hb Barts and, etc.¹⁴ Hb E is one of the commonest haemoglobinopathies in the world and variant hemoglobin with a mutation in the beta globin gene substitution of glutamic acid for lysine at position 26 of beta globin chain.¹⁵

The study was conducted to screen out the anaemia (Hb<11g/dl) and identify different types of haemoglobin variants in pregnant women who were attending the Antenatal Care Clinic in Rural Health Center in Bago Region, Myanmar.

MATERIALS AND METHODS

A cross-sectional, descriptive study was carried out in randomly selected (478) new subjects of apparently healthy pregnant women with any gestation living in different villages of Bago Region who attended the Antenatal (AN) Clinic in Rural Health Center of Bago Region in Myanmar for one year

period (2014-2015). The pregnant women with other haematological diseases, chronic diseases including diabetes mellitus, malignancies, chronic infections and renal disease were excluded in this study.

After approval by the Ethical Review Committee of Department of Medical Research, informed consent was obtained from the subjects. The family history, personal history, obstetrics history, surgical and medical history of these pregnant women were recorded according to the proforma. Before history taking, principal investigator explained the causes, risk, outcomes, early prevention of anaemia and procedure of sampling to all subjects on every visit of conduct in antenatal clinic.

Anaemia was screened in one drop of blood from the finger tip by using rapid haemoglobin analyzer (Haemocue) method and anaemia was identified by <11 g/dl of hemoglobin concentration according to WHO reference. Pregnant mothers with anaemia were subjected to red blood cell parameters (Hb%, total red blood cells count, mean corpuscular volume, and red cell width), blood film examination and the Hb variants were identified by using iso-electric focusing (IEF) gel electrophoresis. Three milliliters (ml) of whole blood from ante-cubital vein were collected, mixed with ethylenediamine tetra-acetic acid (EDTA) in tube and stored at 4°C until the blood cells analysis by Automatic Blood Analyzer (Pentra-60). The whole blood (10 µl) was mixed with 10 µl of 1% Saponin solution for at least 3 hours at room temperature before running gel electrophoresis at pH 6.0-6.2 that identified different types of Hb in the sample blood by separation of globin chain.

All whole blood samples were stained with Leishman and observed the morphology of red cells in blood film by high power of light microscope. The results obtained throughout the study were recorded according to proforma and ANOVA test was used for reflection the results of this study.

RESULTS

Prevalence of anemia

Anaemia is defined as reduction in concentration of hemoglobin level in whole blood below the lower limit of normal range for pregnant women according to WHO reference (<11g/dl). In this study, anaemia was detected in 268 pregnant mothers (56%) out of total 478 subjects of apparently healthy pregnant mothers with the age of 18-43 years and 12-40 weeks of gestation by using rapid haemoglobin analyzer (Haemocue) method. The mean age of pregnant women was 28±6.14 years (Table 1).

Table 1. Prevalence of anaemia in pregnant women attending Antenatal Clinic by age group

Age (year)	No. of pregnant women	Number of anemic pregnant women	Prevalence of anaemia (%)
<20	23	10	3.7
20-30	304	169	6.3
31-40	138	85	31.7
>40	13	4	1.6
Total	478	268	56.1

Anaemia was detected in 3.7% of youngest age group (<20 years), 63% of 20-30 years age group, 31.7% of 31-40 years age group and 1.6% of >40 years age group.

Education status of subjects were 5.3% in illiterate, 38.1% in primary school level, 16.6% in middle school level, 23.9% in high school level and 16.1% in graduate level. Occupations of these subjects were dependants (56%), workers (12.5%), odd job workers (18.5%), dress makers (9.7%) and traders or shop keepers (3.3%). Their monthly family incomes were 5.2% in less than hundred thousand kyats, 71.8% in less than two hundred thousand kyats, 15.3% in less than three hundred thousand kyats and 4.8% in less than four hundred thousand kyats and 2.8% in less than five hundred thousand kyats. Regarding the gestation of pregnancy of these subjects, 1.2% were in 12 weeks, 30.6% in 12-24 weeks and 68.1% in 25-40 weeks of gestation. Their family

numbers less than five persons was 70.7% in that study.

Most of the anemic pregnant women (25%) had history of shortness of breath on exertion and fatigue during physical activities. Most of the anemic pregnant mothers had no diet restriction in gestation period and they had no typical signs of anaemia (75%) except pallor and koilonychia (brittle, ridges nails) in hands (25%). Most of the anemic women had no history of past medical (99.6%) and surgical history (98%). The mean value of Hb concentration was 10.76±1.25 g% in pregnant women with anaemia by using Hemocue method at Antenatal unit and 10.3±1.8 g% by using automatic blood cell analyzer (Pentra 60) in laboratory.

In the present study, severe anaemia (4-7 g/dl) was found in one pregnant woman (0.37%) and moderate degree of anaemia (7-10 g/dl) was detected in 120 cases (44.7%). The commonest grade of mild anaemia was seen in 148 cases (55.2%) according to WHO criteria (Table 2).

Table 2. Different grades of anaemia in pregnant women

Grade of anemia	Haemoglobin concentration (g%)	No. of anaemia cases (%)
Severe	4-7	1(0.37)
Moderate	7.1-9	119(44.7)
Mild	9.1-11	148(55.2)

There were no significant differences between Hb concentration and gestation of pregnancy ($p=0.316$), education ($p=0.711$) and family income ($p=0.282$). The mean corpuscular volume (MCV) was 77.28±9.4 μm^3 in anemic pregnant women (normal reference value <80 μm^3).

Detection of haemoglobin variants (haemoglobinopathies)

The commonest hemoglobin A type (normal Hb) was detected in 208 (77.6%) out of 268 anemic subjects and other abnormal Hb types (Hb EA, EE and AH) were found in 55 subjects (20.5%), 4 subjects (1.5%) and one subject (0.4%), respectively (Fig. 1).

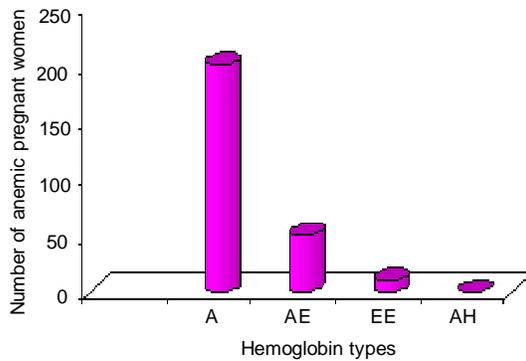


Fig. 1. Distribution of hemoglobin types in anemic pregnant women

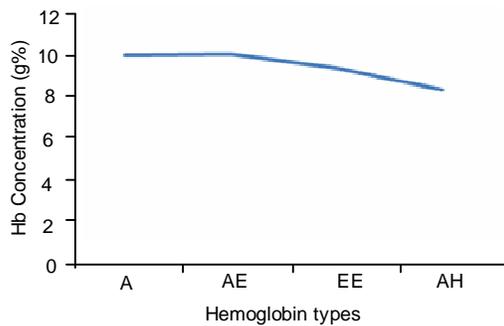


Fig. 2. Distribution of mean Hb concentration in anemic pregnant women

Other Hb variants such as Hb C, Hb D, Hb G and Hb S were not detected. The mean Hb concentration was 10.28 g% in Hb A, 10.22 g% in Hb EA, 9.27 g% in Hb EE and 8.2 g% in Hb HA in this study (Fig. 2).

Hb concentration was significantly different in types of hemoglobin variants ($p=0.008$). The morphology of red cells showed features of haemolysis especially nucleated red blood cell, fragmented red blood cells, larger red cell diameter and a few target cells in Hb EA samples in blood film examination by high power of light microscope. The mean value of total red cell count was higher in Hb variants groups than normal Hb group in this study.

DISCUSSION

In this study, the prevalence of anaemia was 268 (56%) pregnant women living in different villages of Bago Region in Myanmar. Previous research studies of Myanmar observed that the prevalence of

anaemia was 76% among pregnant women in Leway Township and 58% in Yangon Region.^{16, 10} A prevalence study of anaemia at Central Women's General Hospital in Yangon showed that 52% of pregnant mothers had anaemia with 15 to 40 weeks of gestation in 1992.¹⁷ A rapid hemoglobin analyzer (Haemocue) has ability to find out the anaemia by determination of Hb concentration in pregnant mother attending to antenatal clinic in this study.

The most common age group was 20-30 years (63%) and the less common age group was >40 years (1.6%). Most of them (56%) were dependant and their commonest family income was one hundred to two hundred thousand kyats monthly in 71.8% of subjects. The less common family income was five hundred thousand kyats monthly in 2.8% of subjects.

The commonest gestation of pregnancy was more than 24 weeks (68%) and number of family members was mostly less than 5(70.7%). The commonest clinical type of anaemia, mild anaemia (Hb 9.1-11 g/dl) was observed in 55% of anemic cases.

Therefore, the method of device was easy for screening of anaemia in survey area or clinical units. The duration of the test procedure is very short and the value of Hb concentration can be determined quantitatively. The cost of this test device is cheaper than other tests (800 kyats per test).

It can be used in determination of Hb concentration or screening of anaemia in Maternal and Child Health care center and public health care services that is far away from laboratory in Myanmar. This study recommends to find out early stage of anaemia in pregnant women living in rural area and provide the effective management for anaemia and reduce the bad outcomes of delivery such as low birth weight baby, preterm baby, post-partum haemorrhage and unhealthy baby. There were no significant differences between Hb concentration and gestation of pregnancy ($p=0.316$), education ($p=0.711$) and family income ($p=0.282$).

In present study, anaemia is one of the main problems in pregnant women living in rural areas in Bago Region. Prevention and proper treatment of anaemia are important requirements to be included in future health planning for reduction of maternal, child mortality and morbidity. Haemoglobinopathies or Hb variants were identified in 22.4% of total anemic populations in pregnant women in Bago Region. They should be tested for thalassaemia by using osmotic fragility test, determination of Hb F%, Hb A₂% and Hb H inclusion test. Prenatal screening and family counselling of beta and alpha thalassaemia carriers in pregnant women is important for prevention of thalassaemia major in maternal child health care units in our country.

Finally, this study highlighted to reduce the morbidity and mortality rate of maternal and child health in rural community that is one of the main strategies of National Health Plan in Myanmar.

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