

# Study of Prevalence of Anaemia among Pregnant Women and Its Correlation with Different Risk Factors

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## Abstract

In current study the prevalence of anaemia among pregnant females and its correlation with foetal mortality was studied in Punjab, Pakistan. Overall 65.4% females were anaemic. On basis of Hb level 6.4% females were severely anaemic, 19.2% were moderately and 39.8% were mild anaemic. The values of PCV in 86.6% while MCV in 46.4% and MCH in 41.8% females were less than normal values. Significant correlation was observed in Prevalence of anaemia and daily intake of three or more cups of tea. A similar significant correlation was also found between anaemia, vegetarian diet and poor diet. Age group of pregnant females was also observed significantly correlated with prevalence of anaemia and maximum anaemic females were in the age group of 35>40. Overall 17.7% foetal mortality was recorded with significantly highest among anaemic group which gradually decreased with increase in Hb among moderately and mild anaemic groups. The TLC in 13.6% pregnant females showed higher than normal. Significant differences in neutrophils, monocytes, lymphocytes and eosinophils were observed among pregnant females.

Keywords: Anaemia; Prevalence; MCV; PCV; MCH; TLC

### Introduction

Anaemia is considered as most frequently observed dietary disease that affects half of the children, pregnant women and 20-25% of nonpregnant women in developing countries. Its prevalence is seen especially in women of reproductive age, having inadequate intake of food particularly during pregnancy, poor absorption of iron, suffering from malaria with hookworm infestation, diarrhoea, facing blood loss during labour, delivery, loss of blood during their menstrual periods and from repeated pregnancies [1,2].

Anaemia is pathological condition characterized by the reduction in the levels of haemoglobin (Hb) and decrease in healthy red blood cells (RBCs) [3-5]. Some short and long term complications of malaria are breathlessness, faintness, paler and change of skin colour. Many other factors has been attributed to anaemia such as low blood pressure, rapid heart rate, depression, nausea, anorexia, mal-absorption of food, personality or memory change, decrease metabolic and energy competence during physical activity [6-8].

Most of the cases are seen during pregnancy, which result in an increased demand of nutrients, and at later stage lactation are also reported to cause anaemia [9,10]. Another leading cause of anaemia is deficiency of micro and macronutrients [11]. Maternal anaemia is common problem during pregnancy in developing countries like Pakistan [12].

Anaemia is most prevalence in women as compared to the men, most prominently in young, pregnant and members of low socioeconomic unity [12]. In the developing countries due to financial, public and other unenthusiastic consequences, anaemia is a most important considered crisis [13,14]. Malnutrition and lack of the micronutrients are the major health problems that cause death of hundreds of thousands of pregnant women and young children in developing countries [15]. In 88% cases, important nutritional stress on mother is breast feeding. Mother and baby both face problems due to deficiency of stored micronutrients that affects the mother in first trimester of her next pregnancy [16,17]. Due to anaemia the consequences of maternal and child mortality become more and it also affects the child cognitive and physical abilities while in adults it effects on work productivity [18]. It has been observed that during each pregnancy women loss 500 mg iron, compared with 4-100 mg during each menstrual period. In past partum period anaemic women face many problems include cardiovascular symptoms, reduced mental capability as well as need of blood transfusion [19].

Rizwan et al. [20] reported that prevalence of anaemia on Mirpur khas Pakistan was very high (75%). Majority females were moderately anaemic; while 36% were mild anaemic and 12% were severely anaemic. Prevalence of foetal mortality was 2.1%. Ansari et al. studied prevalence of anaemia among pregnant in Urban area of Pakistan (Hyderabad) and found that 75% were mild anaemic, 14.8% were moderate anaemic and 0.7% were severe anaemic. In Rawalpindi prevalence of anaemia among pregnant females were further investigated. Among 860 samples, 402 were anaemic.

The risk of preterm was more in anaemic women as compared to non-anaemic. Among anaemic pregnant females the chance of foetal death was 2.2 times greater than non-anaemic. Awan et al. [21] studied prevalence of anaemia among pregnant women in Multan and therefore 8% women were severely anaemic, while 48% were mild and 44% were severely anaemic. In Sargodha prevalence of anaemia among pregnant women was investigated by Nawaz and Khan and found that 81.4% pregnant women were anaemic.

## Materials and Methods

## Study area

DHQ, Afzal hospital and Khan Hospital of Jhelum, Ahmad Lab and diagnostic centre of Jada, Jhelum. Allied and Aziz Fatima hospitals of Faisalabad, Civil hospital and Zafar hospital of Malakwal and DHQ, Shaista hospital of Gojra were selected for present study. All hospitals are situated in Punjab province. Majority of patients in Malakwal, Jhelum and Gojra belongs to rural areas with poor socioeconomic condition. Patients of Faisalabad have good socioeconomic condition. These hospitals also serve a large number of patients from adjoining areas. Anaemia in both in-door and out-door pregnant females are studied.

#### **Preliminary measures**

Following preliminary measures are followed while selecting pregnant females for blood sampling:

- Only those females were selected who were aged from 20-45.
- All individuals were non-smokers.
- All individuals selected were not suffering from any infection

• A care was also made that females under consideration have not taken any antibiotic as medicine.

### **Blood sampling**

Blood samples were collected from the sub-clavian vein of 500 pregnant women.

The site of puncture was cleaned properly with spirit, to avoid any contamination.

Sterile disposable syringes were used for blood sampling.

3 ml of blood was collected.

### **Complete blood count**

The Sysmex pocH-100i automated haematology analyser permitted by FDA was used for complete blood count. The parameters studied were Haemoglobin concentration (Hb), Red cell count, Total leukocyte count (TLC), Packed cell volume, mean corpuscular volume (MCV), Mean corpuscular Haemoglobin (MCH) and mean corpuscular Haemoglobin Concentration (MCHC). The loading and unloading of blood sample was done with the help of "pop-out" door. It took more or less than 148 seconds per sample.

## Principle

Whole blood (15  $\mu$ L) both blood samples are used for testing in this equipment. Whole blood was used during present study. Two reagents were era used in pocH-100i, i.e., lysate and dilutions. It is used for testing in a closed-tube environment. The analyser holds 2 L dilutions and 250 ml lysate. It utilizes 40 ml dilutions and 0.5 ml lysate per cycle. Two dilutions are prepared by analyser one lysed and other unlysed. The WBC and Hb values are appeared on screen after the calculation of first dilution. The second dilution is used to measure the RBC, HCT and MVC.

#### **Differential Leukocyte Count**

#### Staining of blood sample

A thin blood film was prepared. Giemsa's stain was used to stain the film after fixation of blood with methyl alcohol. The blood smear slide was flooded with the stain diluted in buffered water for 15-20 min. After that, slide was washed with distilled water having the pH of 7.

#### Procedure

The study of DLC was done on stained slide. A minimum of 100 cells were counted in one complete strip of thin film. Begun et al the bottom end of smear, smear was scan from lower border to upper boarder and then move slowly into thicker part of smear; then again smear was scanned from upper to lower edge. Scanning and counting in this way was continued until 100 clear fields for WBC identification was studied [22]. The following types of leukocytes were identified; these are Lymphocytes, Neutrophils, Monocytes, Eosinophils and Basophils.

#### Data about pregnant women

Data regarding dietary habits (deprived of meat, iron and vitamins containing food); intake of tea, socioeconomic status and age was collected through a questionnaire.

#### Foetal mortality

In order to collect data about foetal mortality, each pregnancy was followed till the final outcome, in consultation with gynaecologist of health facilitation.

#### **Statistical Analysis**

The data was statistically analysed through "chi square test" and Minitab 13.3 software. The values less than 0.05 were considered as significant [23].

#### **Results and Discussion**

Millennium summit in 2000 set a goal to reduce the maternal mortality, with help of this goal international community is committed to reduce the maternal mortality by three quarters between 1990 and 2015 [24]. Blood loss is one of the major reasons of mortality and anaemia is world leading cause of blood loss and is the serious global health issue [25]. Due to differences in socioeconomic status, living style, different living conditions, mother's health, different environmental factors, food intake, depression and anxiety; prevalence of anaemia vary in pregnant females [26]. According to WHO in developing world 52% pregnant women were anaemic. The major reasons that are associated with anaemia included inadequate supply of food, parasitic infection, season, spacing b/w child, age, educational level, alcohol and caffeine intake, gravidity and gestational age [27-37]. With the early exposure of the anaemia, antenatal care should be done because anaemia is the most common problem during pregnancy. It has been estimated that due to deficiency of folic acid one third pregnant females had megaloblastic anaemia and two third had hookworm. Anaemia cause the maternal death in mostly cases but it was not only the single cause of death, many others factors were also included [8].

It has been estimated that 50% pregnant females and 25-50% world population facing the anaemia, the major health issue. Anaemia caused complications during pregnancy and delivery, maternal and prenatal mortality, still birth, low birth weight and abortion [38]. A pregnant mother provides the favourable environment to the developing foetus but many factors cause complication during pregnancy and delivery. These complications mainly occur due to poor dietary habit, poor maternal health and anaemia leading to still birth, abortion and preterm delivery. In case of major severity it also cause maternal mortality [12,39,40]. All these adverse effects and complications are also observed in Pakistan. In present study prevalence of anaemia in pregnant women and its correlation to foetal mortality in four cities of Pakistan was studied from April 2012 to October 2012.

Total erythrocyte count of 37.4% females was less than the normal while 86.6% females had PCV less than the normal value. MCV (46.4%) and MCH (41.8%) was also less than their normal value in present study that indicates microcytic anaemia. Microcytic anaemia is mainly caused by some factors like tea (caffeine) which causes iron deficiency in body, because either stored iron (ferritin) becomes depleted due to its usage in making RBCs or its absorption is interfered. In this case replacement of iron is not possible. Perry et al. reported that PCV is lower among pregnant females with low socioeconomic background. Certain researchers reported decrease in erythrocyte count and other blood indices among pregnant women. They also observed that the positive correlation of prevalence of anaemia with low socioeconomic background.

The anaemic women were also being categorizing according to WHO in three categories on basis of Hb level, i.e., severely, moderately, and mild anaemic. During present study the prevalence of anaemia among pregnant women was 65.4%. The number of pregnant females suffering from severe anaemia was 6.4% while moderately anaemic was 19.2% and mild anaemic was 39.8%. During pregnancy the prevalence of anaemia differs from one area to another and also from country to country. On the basis of haemoglobin estimation the prevalence of anaemia in Puente Alto, Chile (South America) was 13%. Researchers reported the high prevalence of anaemia (72%) in north eastern Nigeria. Prevalence of anaemia in Thailand was 20.1% [41] and in Korea was 30.2% [26]. In Bangladesh prevalence was 49%. Rizwan et al. [20] reported that in Pakistan Mirpur khas (Sindh) 75% pregnant females were anaemic. Mostly females were moderately anaemic (52%) while mild anaemic were 36% and severely anaemic were only 12%. Khalil et al. reported that in Rawalpindi prevalence was 48.2%. Mild anaemia was 39.8% while moderate anaemia was 0.8%. In Railway colony Multan high prevalence (96%) of anaemia was found [21]. In Gilgit prevalence was 43.17% [42] while in district Sargodha prevalence of anaemia was 81.4% [43] among pregnant women.

The prevalence of anaemia in Jhelum and Malakwal was lower than Sargodha, Multan and Mirpurkhas, while higher than Gilgit and Rawalpindi. Moreover it is also higher than the parts of world. This could be mainly due to variation in socioeconomic background and dietary habits of inter country and intracountry regions. Significant correlation between anaemia and vegetarian diet was found (p-value<0.05,  $\times$  224.047). Among severely anaemic women 43.75 were vegetarian, while in moderate and mild anaemic they were 39.1% and 6.0% respectively. A similar significant correlation was also found between anaemia and poor diet, i.e., 28.1%, 12.2% and 6% women were among severely, moderately and mild anaemic group with poor dietary habit (deprived of meat, milk, iron and vitamins containing food). These findings suggest that low socioeconomic background and poorly

dietary intake was positively correlated with prevalence of anaemia among pregnant females.

A significant correlation was found in anaemia and age group  $(p=0.001, \times 2\ 22.974)$ . The prevalence was increased with increase in mother age (20-40%). This may be due to decrease in erythropoiesis and metabolism which is affected with age. In contrast Ahmad et al. [8] reported the prevalence of anaemia among pregnant females of younger age group i.e., <20. Our findings are also in contrast to Mahfouz et al. [44] who reported the high prevalence of anaemia among pregnant females under age 20 and they also reported that dietary intake was poor. However Dim and Onah [45] reported that maternal age had no association with prevalence of anaemia.

Another significant correlation was found between anaemia and daily intake of tea. Daily intake of three or more cups (approximately 150 mg caffeine/day) was directly correlated with prevalence of anaemia. Weng et al. [46] also observed the effect of caffeine and its outcome in pregnant females. This caffeine may interfere with iron absorption. Tea contains phenolic compounds which inhibit the absorption of iron containing compounds in the body. The findings during present study are in contrast with Savitz et al. [47] from Jordan, who did not found any significant correlation between anaemia and moderate intake of tea per day.

Foetus mortality ratio was significantly high (17.7%) in anaemic pregnant females. In severe anaemia it was 84.37% while in moderate and in mild anaemia it was 28.13% and 2% respectively. Mainly these mortalities were in the form of abortion, preterm delivery and still birth. Similar results were found by Bakhtiar et al. [48] in Rawalpindi, who reported that maternal anaemia was associated with still birth and foetal death. Rizwan et al. [20] also reported (Sindh) preterm delivery in 9% cases, with anaemia and having mortality ratio of 2.1% which is lower than foetal mortality during present studies. No association between still birth and Hb level was found. During present study the higher proportion foetal mortality was in severely anaemic, which decreased with increase in Hb in moderately anaemic and mild anaemic group, showing a direct correlation. Moreover the severely anaemic groups also have poor diet mainly vegetables and taking more caffeine through tea, contributing factor to severe anaemia, which may lead to foetal mortality.

During present study 13.6% females showed TLC above than normal range Nawaz and Khan [43] also reported an increase in TLC in pregnant women from Sargodha Pakistan. This increase could be due to increase in immune response during pregnancy. A significant decrease in neutrophils was found among 27.4% sampled population in comparison to 63% population with normal number of neutrophils. It was contrary to Pramanik et al. [49] who observed an increase in number of neutrophils during pregnancy. On the other hand a significant increase in monocytes was observed among 26.5% population in comparison to 73.2% individual who were in normal. This increase of monocyte may be due to decrease in number of neutrophils as the deficiency in this group of cell may have been compensated with the other to generate proper immune response.

Similarly in lymphocytes and eosinophils variation was significant. In lymphocytes 76.4% were in normal range, 12.2% above than and 13.2% was below normal. In eosinophils 89.6% were in normal range, 10.4% was above normal. Our findings are in contrast to Nasu et al. [50], who reported the number of monocytes increased during pregnancy, while lymphocytes and eosinophils decreased during pregnancy.

## Conclusion

Results during present study revealed that prevalence of anaemia among pregnant females in Punjab, Pakistan is though lower in comparison to other areas of the country but still higher in global scenario when compared with other countries. The major contributing risk factors for all three categories were low socioeconomic background, low protein diet, poor diet and age of mother and higher daily intake of caffeine in form of tea. Foetal mortality ratio was significantly correlated with low Hb or the category of anaemia to which a pregnant mother belong.

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