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Research Article

Anaemia in Pregnancy; An Underdeveloped Country's Perspective (The First Ever Multicentre Trial in Pakistan from all Four Provinces)

Muhammad Irfan Khattak[1], Samina Naseem khattak[1*], Shumaila Hadi[2], Samina Rehan Khan[1], Muhammad Numan Khattak[2], Adeela Yasmeen[1]

[1]PNS Shifa Hospital, Karachi, Pakistan

[2]Mawson Lakes Medical Centre, Adelaide, Australia

[*]**Corresponding Author:** Samina Naseem khattak, PNS Shifa Hospital, Karachi, Pakistan

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Abstract

Objective: To determine the true prevalence of anaemia in Pakistani mothers from all four provinces and compare the haematological parameters.

Location: Multicentre study at PNS Shifa Karachi (Sind), CMH Kharian (Punjab), CMH Mardan (KPK), CMH Quetta (Balochistan).

Duration: Apr-Sep 2021 for 6 months.

Study design: prospective observational study.

Methods: Four centres were established to collect data on a representative sample of each province. Along with haematological measures, sociodemographic data were obtained and placed into a predefined online proforma. SPSS v 20 was used to analyse the data. Frequencies and percentages were calculated for categorical variables, whereas means and standard deviations were used to represent scales. Results of all four provinces were analysed and compared for similarities and differences.

Results: A total of 2060 female patients fulfilling our inclusion criteria from all four provinces were

included in the study. Four hundred and sixty (22%) of the total population were in the first trimester, 785 (38%) were in the second, and 815 (40%) were in the third trimester of pregnancy. The study population's mean age was 28 ± 5.033 years. The mean haemoglobin concentration was 10.78 ± 1.49 g/dl. The mean MCV was in the lower limits of normal, 79.73 ± 7.95 3FL. At a cut off haemoglobin concentration of 10.8 g/dl, 50% of the population had Haemoglobin concentrations lower than this value. In terms of mean Haemoglobin levels across Pakistan's provinces, the lowest haemoglobin level was recorded in Sind, at 10.34 ± 1.469 g/dl. It was followed by Punjab, with a mean Haemoglobin concentration of 10.8 g/dl + 1.89. However, the mean Haemoglobin concentration in KPK was significantly high with mean Hb of 11.01 ± 1.330 g/dl. Additionally, comparable Haemoglobin levels were seen in Baloch people, with a mean Hb of 10.95 ± 1.048 g/dl. So according to international standard anaemia was less prevalent in KPK and Balochistan.

Conclusion: Anaemia during pregnancy is very common in Pakistani mothers, according to worldwide standards. However, Severe anaemia Hb<8g/dl, on the other hand, is uncommon. Interprovincial variation in haematological parameters is also notable in Pakistan. We may need to formulate local guidelines for diagnosing and managing anaemia.

Keywords: Anaemia; Pregnancy; Pakistani Mothers; Gestation; Haemoglobin

1. Introduction

The haematological profile of an individual reflects their overall health to a considerable extent, and various studies have identified the pregnant woman's haematological profile as a factor affecting pregnancy and its outcome [1]. The most often used haematological indices are those that measure Corpuscular haemoglobin concentration, and low haemoglobin (anaemia). It is the most frequently diagnosed haematological anomaly and is associated with poor pregnancy outcomes [2]. Anaemia is defined differently in women, with the two most common being a haemoglobin concentration less than 11.0 g/dl or a haematocrit concentration less than the 5th percentile of the dispersal of haemoglobin level or Haematocrit in a healthy standard population, and is determined by age, sex, and stage of pregnancy (in pregnant women) [3]. The World Health Organization states that "anaemia is a common and significant issue during pregnancy" that must be handled [4, 5].

Given that haematological status can be determined using a battery of tests evaluating many factors, it is beneficial to define criteria for haematological indices. While parameters are widely available in the published literature as established standards, there is no evidence that any studies/research have been conducted to determine their relevance and application across populations, particularly to the underdeveloped nations in general and Pakistani community in particular [6, 7]. This work is crucial since antenatal treatment and pregnancy outcome are partially dependent on monitoring and responding to these haematological indices. There has been no study conducted on this subject with representative samples from all regions of Pakistan. Almost all trials conducted thus far have been single-center and used data from a single province. Due to the wide and diversified population sample size, our findings paint a more accurate picture of anaemia trends in the Pakistani community. This data will aid in future

health planning and will aid in directing and focusing resources on areas most in need. These findings may also be indicative of trends in South Asia's poor countries.

2. Methodology

The Ethical committee of PNS Shifa hospital gave approval of the study via letter no ERC/Medicine/65 Data was collected and filled in online proforma from four provinces by treating doctors. Two thousand and 60 (2060) pregnant women of all ages and ethnicities were recruited during their initial visit to the Hospital. Five millilitres of venous blood was obtained and anticoagulated with EDTA with a dilution of 2 mg/ml upon enrolment in the trial. Blood samples were analysed using an automated Seamaty SD1 chemistry analyser for Haemoglobin, Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobin concentration (MCHC), Mean corpuscular volume (MCV), Platelets (Plt), and White blood cells (WBC). Moreover, Serum Ferritin was also measured where facilities were available. Each measurement was taken within two hours of Venepuncture. SPSS for Windows (Version 20) was used to analyse the data, and the results were expressed as percentages , frequencies,quartiles and means. The one-way ANOVA was applied to compare means of variables from four provinces. The study group's 5^{th} and 50^{th} percentiles were compared to international reference levels.

3. Results

Each provincial capital contributed nearly equal number of patients. Around 500 patients from each center were included in the study, which equates to ¼ of total participants from each province Ref Table 2. A total of 2060 female patients fulfilling our inclusion criteria from all four provinces were included in the study. The research population's mean age was 28 ± 5.033 years, however it varied greatly between 13 and 54 years. The mean Parity was 2 but fluctuated significantly between 0 and 13. Four hundred and sixty (22%) of the total population were in the first trimester, 785 (38%) were in the second trimester, and 815 (40%) were in the third trimester of pregnancy. Majority of the study population was in the second and third trimesters, with just under 80% of patients from this group.

Regarding haematological parameters the mean Haemoglobin concentration was 10.78 ± 1.49 g/dl. The mean MCV was in the lower limits of normal, 79.73 ± 7.95 3FL, with a range of 57 to 119FL. The mean TLC concentration was 8.83 + 2.404 /mm3. The mean platelet count was 281.29 + 78.599/cmm, ranging from 88 to 518. The mean serum ferritin concentration was 26.01 ng/mL, ranged widely between 4 and 284 + 36.9 ng/mL. When Hb was divided into quartiles, it was discovered that two-thirds (75%) of the study population had a mean Hb level less than 11.9g/dl. Similarly, at the 25th centile, the mean haemoglobin concentration was just 9.8 g/dl. At a cut off haemoglobin concentration of 10.8 g/dl, half (50%)of the population had Haemoglobin concentrations lower than this. In terms of mean Haemoglobin levels comparison across Pakistan's provinces, the lowest number was recorded in Sind, where the mean Haemoglobin level was just 10.34 ± 1.469 g/dl. Sind was followed by Punjab, with a mean Haemoglobin concentration of 10.8 + 1.89 g/dl. However, the mean Haemoglobin concentration in KPK was 11.01 ± 1.330 g/dl. Additionally, comparable Haemoglobin levels were seen in Baloch people, with a mean Hb of 10.95 ± 1.048 g/dl.

According to the income levels, the study population was classified as lower (<Rs 50,000/month), medium (Rs 51000-100,000) or upper socioeconomic (Rs> 100,000) background. Notably, most mothers, 1381 (67 %), were in the lower social economic class, while 540 (26 percent) were all from the middle class. Only 120 (6%) of the patients belonged to the upper class. In nutshell, more than 90% of the study population was low- and middle-income category. Quite noticeably, Ferritin levels in the mean serum increased steadily from 16ng/ml in the first trimester to 25ng/ml in the second and 31ng/ml in the third trimester of pregnancy.

Trimester	**Frequency Percent**	**HB g/dl**
1st	460 (22.3%)	11.20
2nd	785 (38.1%)	10.67
3rd	815 (39.6%)	10.68

Tabl 1: Hb comparison across in three trimesters.

N	**Valid**	**2060**
	Missing	**0**
Mean		10.78
Minimum		6
Maximum		13
Quartiles based on Hb concentration	25	9.8 g/dl
	50	10.8 g/dl
	75	11.9 g/dl
	95	13 g/dl

Table 2: Quartiles based on Hb concentration g/dl.

Parameter	**Balochistan**	**KPK**	**P value**
Hb g/dl	10.95 ± 1.048	11.01 ± 1.330	.000
Platelet/mcl	278 ± 76.091	280 ± 67.531	0.00
TLC/mm^3	8.24 ± 1.963	8.84 ± 2.087	0.13

Table 3: Inter-Provincial comparison of haematological parameters.

4. Discussion

As indicated in the introduction, haematological abnormalities, especially anaemia, may have an adverse impact on maternal and foetal well-being and pregnancy outcome. Significant effort is therefore given to monitoring and responding to haematological parameters [8]. So far in most underdeveloped populations like Pakistan this is based on international norms. From an exploration of the available literature this study appears to be the first attempt to compare haematological indices for anaemia in a Pakistani population with international norms and to determine their suitability as a standard for our population. Haemoglobin concentrations generally remain stable until about the 16th week of gestation after which there is a steady fall until it reaches its lowest point in the second trimester because of the expansion of the plasma volume. It is then expected that the haemoglobin concentration will remain constant or rise slightly during the third trimester when sufficient iron is available [9]. The findings of this study too are consistent with expected trends, demonstrating a drop in haemoglobin levels from the first to second trimester, followed by a minor increase in the third trimester. In the first, second, and third trimesters, our study population had mean haemoglobin concentrations of 11.2, 10.67, and 10.68 g/dl, respectively. James et al. reported similar trends. They assumed that the fall in the second trimester was due to the accumulation of excessive fluid. The third trimester increase has been related to the use of iron supplements to treat anaemia during the third trimester [2, 8].

Additionally, the data indicate that the women maintained a healthy haemoglobin concentration throughout pregnancy, since mean values did not fall below the critical 8 g/dl cut-off mark in any of the three trimesters. Indeed, only 60 (3%) of our study participants had haemoglobin levels less than 8g/dl during all trimester. Much higher prevalence of severe anaemia has been reported in world literature. However, they defined severe anaemia as <6gdl, this low value was rarity in our study [10, 11]. Regarding local literature, a study conducted by Naila et al. state, "the prevalence of anaemia (defined by world Health Organization as haemoglobin less than 11.0 g/dL) was 90.5 percent in these subjects; 75.0 percent had mild anaemia (haemoglobin between 9.0 and 10.9 g/dL) and 14.8 percent had moderate anaemia (haemoglobin between 7.0 and 8.9 g/dL). Only 0.7 percent were anaemic to severe levels (haemoglobin 7.0 g/dL). Women who were not anaemic were much taller, heavier, and had a higher body mass index." [12]. BMI and other associated characteristics were not measured in this study. Again, the prevalence of anaemia is extremely high (>90%) in comparison to our studies. Moreover, prevalence of severe anaemia was low in Naila et al. study, also. However, our study population was comparatively bigger, with participants hailing from every region of Pakistan.

As a result, our study's design and methods outperformed the aforementioned study. Naturally, our findings are more likely to reflect Pakistan's genuine demographics and number of pregnancy related anaemia in Pakistan and other less developed countries. Hoque et al. also found a relatively high prevalence of anaemia during pregnancy and discussed the problems associated with identifying/defining anaemia using multiple international and national criteria. They concluded that each community should have its own definition of anaemia, as each community has its own distinct demographics [13]. It is debatable whether to check for ferritin deficiency

during pregnancy to detect anaemia. "While the ideal diagnostic method for anaemia during pregnancy is unknown, systematic screening with serum ferritin in the absence of study is not currently suggested ". "Serum ferritin should be tested in women who have a known haemoglobinopathy to rule out concurrent iron deficiency and iron loading states (1D)" [14]. "In pregnancy, a serum ferritin level of 30 ug/l indicates iron shortage. Increased levels do not exclude the possibility of iron shortage or exhaustion. The mean serum ferritin levels in our study were 16 +11.176, 25 +39.902, and 30 +38.194 in the first, second, and third trimesters, respectively. This value climbed significantly throughout pregnancy, reaching its peak in the third trimester, with a p value of 0.18. However, our result Hb other blood parameters are far less than the standards established by the Canadian medicine and treatment regulatory authority and other international guidelines such as nice and Australian guidelines for maternal nutrition and anaemia [11, 13, 15].

5. Conclusion

In nutshell, first thorough exploration of the haematological profile of Pakistani mothers indicate that the Pakistani woman's haematological profile is significantly different from international standards. This indicates that the international guidelines for anaemia in pregnancy do not apply to pregnant women in Pakistan. This finding may serve as a springboard for developing new standards and norms for diagnosing and treating anaemia in Pakistani pregnant women.

Competing Interests

The author(s) declare that they have no competing interests.

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