

Multigravidity a Major Risk Factor of Anaemia in Pregnancy and its Comparison in Primigravida Women in Raichur

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ABSTRACT

Introduction: Among etiological factors, multiparity remains inconclusive with various conflicting studies. Considering that multiparity is a common norm in the reproductive life of women in developing countries it is important to find a clear relationship between anaemia and multiparity.

Aim: To ascertain the exclusive role of multigravidity as a risk factor for anaemia in pregnancy as well as to bring to light the incidence of anaemia in pregnancy in the women of Raichur.

Materials and Methods: A cross-sectional study was conducted on a focus group of female patients attending Civil Hospital Raichur over a period of six months. Total 300 pregnant women (150 primigravida women and 150 multigravida women) of similar socioeconomic standing within the age group of 18-40 years were selected. Medical history was collected from the participants. Complete blood count, inclusive of Hb, PCV, MCV, MCH and MCHC was estimated using automated haematological Analyzer Sysmexkx 21. Peripheral smear were done using Leishman's stain. Statistical analysis of the data collected was done by percentage, proportion, mean \pm SD and p-value <0.05 was taken as significant.

Results: The incidence of anaemia in pregnancy was found to be 58.33% (175). primigravida women showed an incidence of 46% (69 out of 150) while multigravida women showed an incidence of 70.67% (106 out of 150). Average haemoglobin levels of primigravida women were 10.63 ± 1.41 and that of multigravida women were 9.58 ± 1.68 ($p=0.03$) In primigravida women a higher percentage of women had moderate anaemia 47.82 % (33 out of 69) as compared to mild anaemia 46.38% (32 out of 69) and severe anaemia 5.8% (4 out of 69). A higher percentage of multigravida women were found to have moderate anaemia 52.83% (56 out of 106), followed by mild anaemia 33.96% (36 out of 106) and then severe anaemia 13.2% (14 out of 106). RBC indices were found to be below normal with average MCV values of primigravida and multigravida women being 78.10 fL and 75.88 fL respectively.

Conclusion: Incidence of anaemia is high in Raichur with there being a higher incidence of anaemia in multigravida women. Gravidity increases the incidence of anaemia in pregnancy. Multigravidity is therefore a risk factor of anaemia in pregnancy.

Keywords: Hemoglobin level, Mean corpuscular hemoglobin, Mean corpuscular hemoglobin concentration, Mean corpuscular volume, Red blood cells indices

INTRODUCTION

Anaemia in pregnancy is a global health problem affecting early half of all pregnant women. Its prevalence varying from 53.8%-90.2% in developing countries, while in developed countries it is estimated to be about 8.3%, according to the WHO [1].

According to World Health Organization (WHO), if the prevalence of anaemia in pregnancy is 4.9% or less, it is considered as no health problem for that country. The prevalence of anaemia between 5.0% and 19% indicates a mild health problem. The prevalence between 20.0% and 39.9% is considered moderate health problem and 40.0% or more being a severe public health problem [2]. In India alone

the incidence of anaemia in pregnancy is 40%-60% [3] and thus poses as a serious health problem which needs to be dealt with swiftly. One tenth of total hospital population is constituted by incidence of multigravidity and in developing countries it accounts for one third of maternal deaths [4].

Anaemia in pregnancy is deleterious to both, the mother and the foetus and is associated with a myriad of ante partum and intrapartum complications.

Some studies have found that increasing parity was associated with an increase in risk of anaemia in pregnancy, others have reported no evidence of such an association. A third group of studies reported a reduction in the risk of anaemia in pregnancy [1].

In a place like Raichur, a backward district in North Karnataka, multiparity is a common norm in the reproductive life of women. Illiteracy, with the average literacy rate being 59.56% according to a 2011 census study [5].

Unfortunately, prevalence data for anaemia in pregnancy, in Raichur is inadequate and little has been done to rectify the situation. Therefore, This study serves to ascertain the exclusive role of multigravidity as a risk factor for anaemia in pregnancy as well as to bring to light the incidence of anaemia in pregnancy in multigravida women of Raichur and its comparison with the incidence of anaemia in pregnancy in primigravida women of the same socio economic standing (in Raichur).

MATERIALS AND METHODS

This cross-sectional comparative study was conducted on a focus group of female patients attending Civil Hospital, Raichur in the year 2015, duration of the study was six months (from June to November). Ethical committee approval was obtained by Institutional Ethical Committee. Total 300 pregnant women (150 primigravida women and 150 multigravida women) of similar socioeconomic standing within the age group of 18-40 years were selected. The selection was made at random, among the pregnant women attending the OPD for their ANC check-up in six months duration. Blood examination and previous obstetric history was taken into account. Study was conducted in central lab of Pathology Department and OBG Departments.

Women having twin pregnancies, previous history of miscarriages or abortion were not considered for the study. Moreover, the pregnant women with haemoglobinopathies, malaria, hookworm infestation, women infected with HIV virus or the one who tested positive for HbSAg were also excluded.

The participants were made to fill out a maternal health card and their medical history was obtained which included details of social demographics, previous history of pregnancies, miscarriages, abortions and diet. VCTC tests and test for HbSAg ruled out women who were positive for HIV and hepatitis B.

About 2.5 mL of venous blood was collected from each pregnant woman under sterile condition and drained into EDTA container. Haemoglobin levels and Complete blood count, inclusive of PCV, MCV, MCH and MCHC was estimated using automated haematological Analyzer Sysmexkx 21. Peripheral smear studies were done using Leishman's stain.

The women were divided into groups based on their gravidity: Primigravida (1); Gravida 2 (2); Gravida 3 (3); Gravida 4 (4); Gravida 5 and above (5).

According to the WHO criteria anaemia in pregnancy was established as haemoglobin level <11 gm/dL in a study conducted in 1969. Currently, there are no WHO recommendations on the use of different haemoglobin cut-off points for anaemia by trimester, but it is recognized that

during the second trimester of pregnancy, haemoglobin concentrations diminish approximately 0.5 gm/dL [6,7].

Taking this into consideration the below haemoglobin cut-off for anaemia in pregnancy were followed-

First trimester: 11 gm/dL

Second trimester: 10.5 gm/dL

Third trimester: 11 gm/dL.

The grading of severity of anaemia in pregnancy was done as of that defined by the WHO [8].

Severe (Grade 3): <7 gm/dL

Moderate (Grade 2): 7-9.9 gm/dL

Mild (Grade 1): 10-10.9 gm/dL.

STATISTICAL ANALYSIS

Statistical analysis of the data collected was done by percentage, proportion, mean, Standard Deviation (SD). The p-value <0.05 was taken as significant. The calculation of cumulative incidence and the average haemoglobin level of occurrence in anaemia in pregnancy were made as a whole as well as for each level of gravidity. Data is depicted with the use of tables.

The reason for the prospective study was explained to all participants and informed consent was taken before participation.

RESULTS

[Table/Fig-1] shows the percentage of patients having anaemia in pregnancy inclusive of the whole study population, irrespective of their gravida status.

Out of 300 pregnant women about 58.33% (175) were anaemic while the remaining 41.67% (125) had haemoglobin levels above the cut-off. A higher incidence of moderate anaemia was observed.

In [Table/Fig-2], the total study population of 300 cases were divided into primigravida and multigravida, each having a total of 150 cases. Total 46% (69 out of 150) of primigravida were diagnosed with anaemia while 70.67% (106 out of 150) of multigravida women were found to be anaemic.

Out of primigravida women, more than half, i.e., 54% (81 out of 150) of the women showed no signs of anaemia while only 29.33% (44 out of 150) of multigravida women were found to be non anaemic.

[Table/Fig-3] shows Out of the total population of 69 anaemic primigravida women, 46.38% (32) had Grade 1 or mild anaemia, 47.82% (33) had Grade 2 or moderate anaemia and only 5.8% (4) had Grade 3 or severe anaemia.

| Total Cases | Frequency of Anaemia | Anaemia (%) | Mild n(%) | Moderate n(%) | Severe n(%) |
|-------------|----------------------|-------------|------------|---------------|-------------|
| 300 | 175 | 58.33 | 68 (38.86) | 89 (50.86) | 18 (10.28) |

[Table/Fig-1]: Total cases of anaemia in study population.

| | Total Cases | Frequency of Anaemia | Percentage of Anaemia |
|--------------|-------------|----------------------|-----------------------|
| Primigravida | 150 | 69 | 46.00 |
| Multigravida | 150 | 106 | 70.67 |

[Table/Fig-2]: Cases of anaemia in primigravida and multigravida population.

| | Number of Cases | Grade of Severity | Frequency of Anaemic Cases | Percentage (%) |
|--------------|-----------------|-------------------|----------------------------|----------------|
| Primigravida | 69 | Grade 1 | 32 | 46.38 |
| | | Grade 2 | 33 | 47.82 |
| | | Grade 3 | 4 | 5.8 |
| Multigravida | 106 | Grade 1 | 36 | 33.96 |
| | | Grade 2 | 56 | 52.83 |
| | | Grade 3 | 14 | 13.2 |

[Table/Fig-3]: Divides the primigravida women having anaemia in pregnancy on bases of the severity of grade of anaemia.

Out of the total population of 106 anaemic multigravida women about 33.96% (36) had Grade 1 or mild anaemia, a higher percentage of multigravida women, i.e., 52.83 % (56) had Grade 2 or moderate anaemia in pregnancy while a low percentage of women, i.e., 13.2% (14) had Grade 3 or severe anaemia.

[Table/Fig-4] divide multigravida patients based on their gravidity. The percentage of women in each grade of gravidity having anaemia in pregnancy as well as the severity of anaemia is depicted.

Total 66% (99 out of the 150) multigravida women were of Gravidity 2, out of which 63.63% (63 out of 99) were anaemic. About 36.5% (23 out of 63) showed Grade 1 or mild anaemia, 50.79% (32 out of 63) of gravidity 2 women showed Grade 2 or a moderate degree of anaemia and 12.7% (8 out of 63) of gravidity women had Grade 3 or severe anaemia.

About 24% (36 out of 150) of the total population multigravida women were of gravidity 3. Out of this, 86.11% (31 out of 36) had anaemia in pregnancy. 35.48 % (11 out of 31) had Grade 1 or mild anaemia, a higher percentage of women, i.e., 48.39% (15 out of 31) showed Grade 2 or a moderate degree of anaemia, while only 16.13% (5 out of 31) of gravidity 3 women had Grade 3 or severe grade of anaemia.

Total 8.7% (13 out of 150) of the multigravida women were of gravidity 4. Out of this 76.92% (10 out of 13) of the women were anaemic. 10% (1 out of 10) of this population had Grade

| Gravidity | Total Cases | % | Total Anaemic Cases | % | Grade 1 Anaemia | % | Grade 2 Anaemia | % | Grade 3 Anaemia | % |
|-------------|-------------|-----|---------------------|-------|-----------------|-------|-----------------|-------|-----------------|-------|
| 2 | 99 | 66 | 63 | 63.63 | 23 | 36.5 | 32 | 50.79 | 8 | 12.7 |
| 3 | 36 | 24 | 31 | 86.11 | 11 | 35.48 | 15 | 48.39 | 5 | 16.13 |
| 4 | 13 | 8.7 | 10 | 76.92 | 1 | 10 | 8 | 80 | 1 | 10 |
| 5 and Above | 2 | 1.3 | 2 | 100 | 1 | 50 | 1 | 50 | 0 | 0 |

[Table/Fig-4]: Severity of anaemia in different gravidity groups with percentages.

1 or a mild degree of anaemia. A much higher percentage of women, 80% (8 out of 10) of them had Grade 2 or a moderate degree of anaemia in pregnancy and 10% (1 out of 10) of gravidity 4 women showed Grade 3 or a severe degree of anaemia.

Only 1.3% (2 out of 150) of the multigravida women were of gravidity 5 and above (grand multipara). Out of this population 100% (2 out of 2) of the women had anaemia in pregnancy. 50% (1 out of 2) of them had Grade 1 or mild anaemia in pregnancy while the remaining 50 % (1 out of 2) had Grade 2 or moderate degree of anaemia.

[Table/Fig-5] shows the average haemoglobin levels between primigravida and multigravida women, with primigravida women having a haemoglobin level of 10.63±1.40 g/dl and multigravida women having an average haemoglobin level of 9.58±1.68 g/dL. The p-value of 0.003 was considered to be significant.

[Table/Fig-6] gives the mean haemoglobin levels for each level of gravidity. Haemoglobin concentration decreases as gravidity increases.

[Table/Fig-7,8] shows RBC indices inclusive of PCV, MCV, and MCH and MCHC are lower than normal in both primigravida and multigravida in anaemic women [Table/Fig-7] compared to total population studied [Table/Fig-8].

Peripheral smear studies showed predominately microcytic hypochromic anaemia followed by normocytic normochromic anaemia.

| Gravidity | Haemoglobin Levels (gm/dL) Mean±SD | p-value |
|--------------|------------------------------------|---------|
| Primigravida | 10.63±1.41 | 0.003 |
| Multigravida | 9.58±1.68 | |

[Table/Fig-5]: Average haemoglobin levels (gm/dL) of primigravida and multigravida women.

| Gravidity | Haemoglobin Levels (gm/dL) Mean±SD |
|-------------|------------------------------------|
| 1 | 10.63±1.40 |
| 2 | 9.8±1.66 |
| 3 | 9.1±1.58 |
| 4 | 8.98±1.67 |
| 5 and Above | 9.2±1.13 |

[Table/Fig-6]: Haemoglobin concentration (gm/dL) as per gravidity group.

| | PCV (%) | MCV (fL) | MCH (pgs) | MCHC (%) |
|--------------|---------|----------|-----------|----------|
| Primigravida | 32.73 | 81.20 | 26.33 | 32.61 |
| Multigravida | 30.27 | 78.07 | 25.03 | 31.51 |

[Table/Fig-7]: Average RBC indices of Total Population.

*N=300

| | PCV (%) | MCV (fL) | MCH (pgs) | MCHC (%) |
|--------------|---------|----------|-----------|----------|
| Primigravida | 30.73 | 78.10 | 24.14 | 31.86 |
| Multigravida | 28.44 | 75.88 | 23.95 | 30.87 |
| P Value | 1.55 | 0.09 | 0.781 | 0.025 |

[Table/Fig-8]: Average RBC indices of anaemic women.

DISCUSSION

This prospective study was conducted in order to explore whether parity has a harmful effect on the occurrence of anaemia in pregnancy. According to this study the incidence of anaemia in pregnancy in the women attending Civil hospital, Raichur, a Government Hospital which caters to the health of the rural population of Raichur which is 75.98% of the population of 1,928,812 [5] is 58.33%. The rate of anaemia in pregnancy in this study is approaching to the WHO estimation for developing countries and far behind from economically developed countries such as in Europe where their prevalence is 25.1% [2]. This high figure might be surprising considering the practice of all primary health centres to provide pregnant women with prophylactic elemental iron and folate therapy under the national nutritional anaemia prophylaxis programme, 1970 [9]. However, when asked a majority of the patients admitted to not taking the oral haematinics prescribed or discontinuing it before the full course. Reasons given pointed to a lack of motivation and misconceptions on the benefits of haematinics. Surprisingly, similar studies conducted in Delhi, Belgaum and in a rural population in Ahmednagar showed a much higher rate of incidence of anaemia in pregnancy [7,10,11]. While a study conducted in an underdeveloped area of southern Punjab showed a lower incidence. The higher incidence of anaemia may be explained by a decline of haemoglobin levels due to haemodilution during the second trimester [7,12,13], which have not been taken into consideration in the above mentioned studies.

Incidence of anaemia in pregnancy in Delhi (Gautam VP et al.), Belgaum (Viveki RG et al.), Ahmednagar (Ahmad N et al.) and Southern Punjab (Taseer I et al.) along with results from this study are tabulated in [Table/Fig-9].

The incidence of anaemia in pregnancy was seen to increase as the parity level of the women increased, with primigravida women showing an incidence of only 46.00% while multigravida women showed a much higher incidence of 70.67%. In multigravida women as parity level shifted higher the incidence of anaemia in pregnancy increased with 63.63% of gravida 2 women, 86.11 % of the gravida 3 women, 76.92% of gravida 4 women and 100% of women of gravida 5 and above being anaemic. The discrepancy of fall by approximately 10% in the incidence of anaemia in pregnancy

| Study | Incidence of AIP* (%) |
|--|-----------------------|
| Taseer I et al., (Southern Punjab) [6] | 55.2 |
| Viveki RG et al., (Belgaum) [7] | 82.9 |
| Gautam VP et al., (Delhi) [10] | 96.5 |
| Ahmad N et al., (Ahmednagar) [11] | 74.8 |
| Current Study (Raichur) | 58.33 |

[Table/Fig-9]: Incidence of anaemia in pregnancy by several studies.

*AIP refers to Anaemia in Pregnancy

between gravida 3 and gravida 4 might be due to the small sample size of 13 cases of gravida 4 women as compared to the 36 cases of gravida 3 women, and therefore did not represent the true prevalence of this population. Initially, a total of 25 gravida 4 women were included in the study with over 22 (88%) of them showing anaemia in pregnancy. However, 7 of them had a previous history of abortion, 2 of them had twin pregnancies and the 3 of them tested positive for HIV virus. Therefore, a total of 12 gravida 4 women were dropped out of the study in accordance to the exclusion criteria. The association between the incidence of anaemia in pregnancy and gravidity found in this study are contrary to the findings of a 2005, Nigerian study conducted by Idowu OA et al., [14] as well as studies conducted in 2010 by Gautam VP et al., [10] and Ahmad N et al., [11] in which there was no association between the incidence of anaemia and parity.

However, studies conducted by Taseer I et al., [6], Chang F et al., [15] and Mirzaie F et al., [12] reported findings similar to this study.

The average haemoglobin concentration of primigravida women (10.631 ± 1.41) was considerably higher than that of multigravida women (9.58 ± 1.63) and the difference was statistically significant (p -value=0.003). The average haemoglobin levels of the women in the current study is woefully low when compared to a study in Bidbid city, Muscat conducted in 2011, in which multigravida women had an average haemoglobin concentration of 11.4 [1]. A 2010 Kerman, Iran study also showed a much higher haemoglobin level [16]. The average haemoglobin concentrations of primigravida women in this study coincided to a similar study in Benin, a country in West Africa. However, the haemoglobin concentration of multigravida women in this study was lower. Unlike this study there was no significant difference in haemoglobin levels between multigravida and primigravida women in Benin and Kerman [Table/Fig-10] [12,16].

The average haemoglobin levels of primi and multigravida women in this study was considerably higher than that of the primigravida women in a study conducted by Farzana et al., in Interior Sindh [Table/Fig-10] [15].

In primigravida women only 5.8 % showed a severe degree of anaemia while the percentage of mild to moderate cases of anaemia in pregnancy were almost equal with moderate cases showing a 1.44% increase in incidence. In comparison, a majority of the multigravida women had a moderate degree

| Haemoglobin Concentrations (gm/dL) Mean±SD | | | | |
|--|---------------------------------|---------------------------------|------------------------------|-------------------------|
| | Mirzaie F et al., (Kerman) [12] | Livinec FB et al., (Benin) [16] | Chang F et al., (Sindh) [15] | Current Study (Raichur) |
| Primigravida | 13.6±1.4 | 10.32±1.4 | 7.89±1.33 | 10.63±1.41 |
| Multigravida | 13.5±1.5 | 10.5±1.3 | 6.62±1.65 | 9.58±1.68 |

[Table/Fig-10]: Comparison of average haemoglobin concentrations.

of anaemia in pregnancy which was 18.87% higher than that of the women with a mild degree of anaemia and 39.63% higher than that of the women with a severe degree of anaemia. Gravida 4 women showed the highest incidence of a moderate degree of anaemia in pregnancy, with it being 80%. Study by Taseer I et al., also showed a higher rate of moderate degree of anaemia as compared to a mild degree of anaemia with severe cases of anaemia showing the least incidence [6]. A study by Ahmad N et al., observed an increased incidence of moderate degree of anaemia in lower parity levels but as parity increased severe anaemia was seen [11]. Similarly, the present study observed the highest number of cases (50.86%) with moderate degree of anaemia. Results of the current study is contradictory to a study conducted by Gautam VP et al., in the rural population of Delhi where it was found that women of gravida 2 or higher gravida more often developed severe anaemia than compared to mild or moderate anaemia [10]. Study by Livinec FB et al., and Mirzaie F et al., showed a higher percentage of mild anaemia [12,17]. Prior births with insufficient birth interval may deplete maternal iron stores due to the increased nutritional demands of pregnancy and puerperal blood loss which can cause a moderate degree of anaemia in the subsequent pregnancies [18]. Average values of blood cell indices of anaemic women were lowered. Red blood cell indices were slightly higher in primigravida women than multigravida women but were statistically insignificant. ($p>0.05$). MCV values in this study though lowered were much higher than that of in a study by Chang F et al., [15].

Peripheral smear studies pointed predominately to microcytic hypochromic anaemia followed by normocytic hypochromic anaemia. This points to a probable depletion of iron stores. A study by Viveki RG et al., also reported the predominance of microcytic hypochromic and normocytic hypochromic anaemia [7].

The greater risk of anaemia in pregnancy associated with high parity may be explained by women having high parity pregnancies having an increased susceptibility to haemorrhage. Compared to the non-pregnant state, every pregnancy carries an increased risk of haemorrhage before, during and after delivery. Therefore, higher parity exposes women more frequently to periods of haemorrhage risk. Although, there is no consensus with regard to the exact mechanisms by which high parity increases risk of haemorrhage, some reports have suggested intermediaries such as increased venous drainage to the lower part of the uterus, hyalinization of blood vessels and decreased elasticity of the uterine wall [17]. None of these proposed mechanisms have been confirmed.

Nutritional deficiencies on account of decreasing per capita

as household members increase may also augment the risk of anaemia in pregnancy with increasing parity especially in rural populations.

The results of the present study are not without assumptions. Haemoglobin levels before onset of pregnancy was not taken into account. Therefore pre-existing cases of anaemia complicated by pregnancy might have been included in cases of anaemia caused by pregnancy (incident cases). Any antenatal low haemoglobin measurement throughout the course of pregnancy was considered as an occurrence of anaemia in this study due to time constraint. A few authors have followed this method while others based incidence levels in all three trimesters of pregnancy.

LIMITATION

Since, it's a cross-sectional study, interventional approaches to measure hemoglobin levels before pregnancy were not recorded. Effect of dietary habits on hemoglobin levels during pregnancy was not measured.

CONCLUSION

The incidence of anaemia in pregnancy in Raichur is very high to other area with a majority of the women having nutritional anaemia of predominantly microcytic hypochromic type suggesting iron deficiency anaemia. This is an indicator of the failure of National and WHO programmes to address this problem. A significant association between incidence of anaemia and gravidity/parity was found with there being a higher risk of anaemia in pregnancy with increasing gravidity. Therefore, multigravidity can be considered as a risk factor for anaemia in pregnancy.

The study also brought to notice that the average haemoglobin level of pregnant women in Raichur is not at a satisfactory level and should be further improved.

Women need to be made aware of the complications of multiparity to the health of the mother and foetus as well as its relationship to anaemia. Interventional approaches before onset of anaemia need to be made and special antenatal care of multigravida women needs to be emphasized.

ACKNOWLEDGEMENTS

I am very much thankful to the patients participated in the study. I thank ICMR for funding the project. I would like to extend my regards to the teaching and technical staff members of Department of Obstetrics and Gynaecology and Department of Pathology, RIMS Raichur for their support in collecting and processing the samples.

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FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Publishing: Oct 01, 2017