The Effect of High Parity on the Occurrence of Anaemia in Pregnant Women

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ABSTRACT

Objective: To compare high-para and low-para women with respect to haematological findings, determinants, and consequences secondary to anaemia.

Study Design: Descriptive cohort study.

Place and Duration of the Study: Maternity and Child Hospital, Hail, Saudi Arabia and Specialist Care Hospital (private), Islamabad, Pakistan, from April 2022 to April 2023.

Methodology: The study population comprised of pregnant women in the last trimester, with the exception of those women who had more than one fetus and history of haematological disease. Purposive non-probability sampling technique was adopted. Hospital data were retrieved retrospectively for the past obstetrical, contraception usage, and supplement history. Blood parameters, type of delivery, and maternofetal complications were noted down. For qualitative-variable and quantitative-variable comparisons, Chi-square test and t-test were applied, respectively. Significance level was kept at $p \leq 0.05$.

Results: The frequency of severe anaemia in high-para was 52%. High parity and anaemia had a significant dose-response relationship ($p < 0.05$). There was a significant difference ($p < 0.05$) in blood parameters between high-para and low-para groups. Main determinants identified for anaemia were lack of intake of iron-rich food (36%) followed by inadequate intake of oral iron (25%). Preterm birth (68%) and post-partum haemorrhage (96%) were significantly associated ($p < 0.05$) with high parity. There was a significantly high proportion (83%) of high-para women with more than 3 cesarean deliveries and admissions in ICU.

Conclusion: High parity and anaemia had a significant dose-response relationship. High parity was the main determinant of maternal and fetal admissions in ICU.

Key Words: *Parity, Comparison, Maternal anaemia, Haematological findings, Diet, Contraception, Cost-effective.*

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INTRODUCTION

The World Health Organization (WHO) defined anaemia during pregnancy as haemoglobin level of <11 g/dL.[1] Globally, anaemia affects 56% of pregnant women in low- and middle-income countries (LMICs). In Sub-Saharan Africa, the prevalence of anaemia in pregnant women is 57% while in South-East Asia, it is 48%.[2] In Saudi Arabia, the prevalence of anaemia among pregnant women is 40% as reported by WHO.[3] High parity is a strong predictor of maternal anaemia.[3]

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The WHO defined high parity (HP) as five or more pregnancies with gestation periods of ≥20 weeks while low parity (LP) as four or less pregnancies with gestation periods of ≥20 weeks.[1]

Furthermore, studies that compared the incidence of maternal anaemia among HP and LP have found that HP pregnancies carry three times higher risk of developing anaemia than LP pregnancies and the risk of anaemia increases in a dose-response pattern as parity increases.[3-5]

Iron deficiency anaemia is the most common anaemia among HP women due to inadequate intake of iron-rich foods and non-compliance to oral iron intake.[6,7] A study done in Pakistan had reported that anorexia and distaste for meat during the last trimester are contributing factors.[7]

Studies done in Asia had found a significant association of maternal anaemia with the level of maternal education and the socioeconomical status of the family.[7,8] Regular blood loss during

menstruation, improper diet pattern, and lack of intake of iron and vitamin supplements during pre-pregnancy period are also added causes of anaemia among women.[8]

Furthermore, literature revealed that as the parity increases, maternal nutritional status is compromised.[7-9]

The prevalence of maternal anaemia is 8-11% among HP women in countries where contraception is practised by more than 50% of couples.[9,10] Couples who practiced contraception between subsequent pregnancies have healthy babies in the hands of healthy mothers.

Maternal anaemia among HP women is associated with multiple maternofetal consequences such as preterm birth, low birth-weight babies, increased risk of post-partum haemorrhage (PPH), and maternofetal mortality.[6,8] Explanation for the high risk of PPH is due to increased venous drainage to the lower part of the uterus, hyalinisation of blood vessels, and decreased elasticity of the uterine wall in HP women.[6] Impaired cognitive development in newborns is also reported by Graham *et al*.[9]

During post-partum period, mothers are at high risk of having infection if they are severely anaemic.[9,10] Literature revealed that those pregnant women who had haemoglobin (Hb) level <8.9 g/dl, had a 5-fold higher risk of prolonged labour as compared to those with Hb >11 g/dl.[6] Due to prolonged labour, the risk of fetal distress increases by 2-fold.[8] Majority of cases of prolonged labour end in cesarean delivery (CD).[9,10] The incidence of CD is significantly higher in HP women.[6]

This study aimed to compare high-para and low-para women with respect to haematological findings, determinants and consequences secondary to anaemia. Further, the authors planned to recommend cost-effective strategies to address the issue publicly and locally.

METHODOLOGY

It was a retrospective, multicentric, descriptive study, performed at Maternity and Child Hospital, Hail, Saudi Arabia and Specialist Care (private) Hospital, Islamabad, Pakistan from April 2022 to April 2023.

Participants were enrolled by adopting purposive non-probability sampling technique. The study population was pregnant women who were in the last trimester, excluding those who had more than one fetus (diagnosed on ultrasound) and history of haematological disease. Sample size was 500 (250 LP and 250 HP women). Verbal consent was taken from the participants. The data were retrieved retrospectively for the past obstetrical and supplement history. Past history of contraceptive use was also noted down. Blood parameters (Hb, HCT, MCV, MCH, and MCHC) were noted from the laboratory reports. On the basis of Hb levels, study population was grouped into four categories (based on WHO cut-off criteria)[1] as non-anaemic (Hb >11 g/dl); mildly anaemic (Hb level between 10–10.9 g/dl); moderately anaemic (Hb level between 7–9.9 g/dl), and severely anaemic (Hb level <7 g/dl). Type of delivery and maternofetal complications were also registered.

SPSS version 23 was used for the data analysis. For qualitative variable and quantitative variable comparisons, Chi-square test and t-test were applied, respectively. Significance level was maintained at $p \leq 0.05$.

RESULTS

Demographic profile and frequency of anaemia in study population is shown in Table I. Most of the participants (52%) were 16-25 years of age at the time of marriage. Among all, 89% were housewives and 94% had education up to high school. Regarding the frequency of anaemia, among LP group, 28% had mild anaemia while 26% were severely anaemic. In HP group, majority (52%) were severely anaemic. Total anaemic population was 75% (376/500).

Table II shows the mean value of haemoglobin level and cumulative incidence (risk) of anaemia for each group of parity. Cumulative incidence risk is calculated by dividing the number of anaemic women in a group of para by the total number of women (anaemic + non-anaemic) in that group and multiplying the result by 100. Overall, the risk of anaemia increased with parity. Among primipara, risk of anaemia was 16.8%. As the parity increased, risk of anaemia also increased steadily. Overall, the risk of anaemia in the study population was 28/100 pregnancies.

Table III shows the results of comparison of blood parameters, consequences of anaemia, and contraception usage in the sample of anaemic women (n=376). The difference in Hb of LP (11.0±1.0 g/dl) and HP was (7.9±1.5 g/dl) highly significant (p=0.002). The haematocrit of LP was (30.5±3.5%) significantly (p=0.001) higher than the haematocrit of HP (23.5±7.8%). The Mean Corpuscular Volume (MCV) in LP was (80.0±7.5 fL) significantly (p=0.03) greater than that of HP (71.5±9.8 fL). The Mean Corpuscular Haemoglobin (MCH) in LP (26±2.5 pg) and in HP (22.7±2.9 pg) were significantly different (p=0.01). Similarly, there was a significant difference (p=0.05) in mean values of Mean Corpuscular Haemoglobin Concentration (MCHC) between the 2 groups. Overall, Table III shows that among high para, all investigated blood parameters were significantly lower ($p \leq 0.05$) than in LP women. Newborns of HP group had a significantly ($p < 0.05$) higher proportion of preterm birth, low birth weight, and admission to NICU. Ninety-six percent of HP women had post-partum haemorrhage, and 84% had CD >3 times. All the maternal complications (PPH, post-partum infection, CD >3 times, and admission to ICU) had significant association ($p < 0.05$) with HP status. Among high para, 72.8% did not practice any sort of contraception. Overall, a significantly high proportion (180+182/500=72%) of study population did not use any sort of contraception.

Figure 1 highlights different reasons reported by study participants for anaemia. Lack of intake of iron-rich foods during pregnancy was the main reason (36%), followed by inadequate intake of oral iron (25%). Folic acid was not taken regularly in 17% of cases. Thirteen percent had nausea and vomiting throughout pregnancy, which affected their diet badly.

Table I: Demographic profile and frequency of anaemia in study population (n=500).

Variable		Frequency	Percentage
Age (years)	16-25	258	52
(at the time of marriage)	26-35	190	38
	36-45	42	8
	>45	10	2
Occupation	Housewife	434	87
	Working	66	13
Educational Level	Uneducated	47	9
	Primary	38	8
	Middle	172	34
	High School	215	43
	Bachelor	20	4
	Masters	8	2
Mild Anaemia (Hb 10-10.9 g/dl)	Low Para	70/250	28
Total = 117/500 (23%)	High Para	47/250	19
Moderate Anaemia (Hb 7-9.9 g/dl)	Low Para	28/250	11
Total = 63/500 (13%)	High Para	35/250	14
Severe Anaemia (Hb <7 g/dl)	Low Para	66/250	26
Total = 196/500 (39%)	High Para	130/250	52
Total Anaemic	Low Para	164/250	65
376/500 (75%)	High Para	212/250	85
No Anaemia (Hb >11 g/dl)	Low Para	86/250	35
124/500 (25%)	High Para	38/250	15

Table II: Mean haemoglobin level and cumulative incidence (Risk) of anaemia for each group of parity.

Para	Cases of Anaemia	Hb (Mean ± S.D)	Risk/100 pregnancies
1	70	10.8±0.8	16.8
2-3	30	10.7±0.7	16.9
4	34	9.9±0.8	17.0
5-6	110	10.1±0.8	20.7
6-7	87	9.0±0.8	21.5
7-8	35	6.9±0.8	27.3
8-9	10	6.8±0.3	33.5
Total	376	7.9±0.6	28.0

Table III: Comparison of blood parameters, consequences of anaemia, and contraception usage in a sample of anaemic women (n=376/500).

Variable		Low-para	High-para	p-value
Blood Parameters	Hb, g/dl	10.0±1.0	7.90±1.50	0.002
(Mean ± SD)	HCT, %	30.50±3.5	23.5±7.8	0.001
	MCV, fl	80.0±7.5	71.5±9.8	0.03
	MCH, pg	26.0±2.5	22.70±2.9	0.01
	MCHC, g/dl	30.0±2.0	31.9±2.3	0.05
Consequences of	Preterm Birth	17/250 (6%)	170/250 (68%)	0.02
Anaemia	LBW	10/250 (4%)	130/250 (52%)	0.01
	Admission in NICU	15/250 (6%)	68/250 (27%)	0.04
	PPH	10/250 (4%)	229/250 (96%)	0.001
	Post-Partum Infection	11/250 (4%)	105/250 (42%)	0.03
	Cesarean Delivery >3	37/250 (15%)	210/250 (84%)	0.01
	Admission to ICU	10/250 (4%)	207/250 (83%)	0.001
Contraceptive Usage	Yes	70/250 (28%)	68/250 (27%)	0.06
	No	180/250 (72%)	182/250 (72.8%)	0.06

Hb: Haemoglobin, HCT: Haematocrit, MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Haemoglobin, MCHC: Mean Corpuscular Haemoglobin Concentration, LBW: Low-Birth Weight, NICU: Neonatal Intensive Care Unit, PPH: Post-Partum Haemorrhage, ICU: Intensive Care Unit, SD: Standard deviation.

DISCUSSION

According to WHO estimates, HP women are 3-4 times more likely to suffer from iron deficiency anaemia than LP women.[11,12] In the present study, the frequency of severe anaemia was 52% among high para, which is alarming. Almost the same frequency was reported in studies done in Qatar and Pakistan.[11,13] Furthermore, it was found that as parity increases, risk of anaemia also increases steadily. Increased parity is independently associated with anaemia in pregnant women.[5,12] For every increase in parity by 1, there is 10% more risk of anaemia in high para women (OR = 1.10, 95% CI: 1.1.01-1.98), as frequent pregnancies give no chance to restore the depleted iron stores.[11,13]

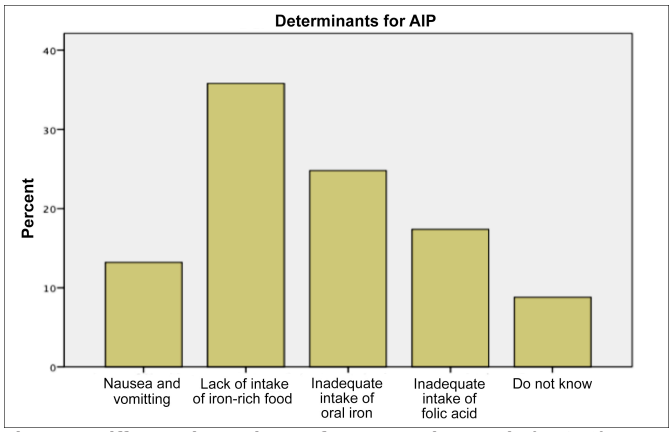

Figure 1: Different determinants for maternal anaemia (n=376).

Early marriage is a trend in certain Asian communities.[10,11,13] Literature had reported an increased prevalence of HP in communities where age at the time of marriage is below 25 years.[13] Another demographic variable associated with HP is low educational level of the mother.[14,15] These findings were consistent with the present study where 52% of women got married before 25 years of age and had education (94%) up to high school. Among the mothers, who were young and had education up to school level only, majority (76%) were not aware of healthy diet and family planning.[15] The decision maker in such families was usually the male partner.[16,17] Female literacy is globally recognised as the key factor that leads to lower birth rate.[18] Female literacy is a powerful social determinant of reproductive health of women in high--income as well as in low-income nations.[19-21]

The aetiology of anaemia during pregnancy is multi-factorial.[13,17] In 85% of pregnant women, iron deficiency is the primary reason of anaemia which is secondary to inadequate dietary intake of iron-rich foods and supplements.[12,17] Other determinants reported by Taha *et al.*, are distaste for meat and anorexia.[17] Bleeding during pregnancy, infrequent intake of meat, past history of anaemia, and closely spaced pregnancies were found to be significantly associated ($p < 0.05$) with anaemia in HP women.[19,20] These findings gave insight about the importance of early detection and management of anaemia before pregnancy.[20] These findings were consistent with the results of the present study. Furthermore, it was revealed that women did not know the dose pattern of iron and folic acid which further aggravated the issue.[18,21]

Anaemia in pregnancy is significantly associated with poor maternal and fetal outcomes.[8,13,17] The fetal complications of preterm birth and low birth weight have a significant association with HP.[17] As a consequence, babies of HP women are twice as likely to get admitted in NICU.[4,13] Majority of HP women (67%) are at risk of having a CD and PPH.[6,15,19] PPH is usually precipitated by uterine atony as reported.[4,6] This life-threatening complication is the major cause of admission in ICU and could lead to maternal death.[6,22]

The present study had found low usage of contraceptives (27.5%) by all study participants, compared with the user rates of other countries.[23,24] The significant determinants of contraceptives use include women's age, educational level, parity, and spouse' willingness.[10,24,25]

Following cost-effective strategies are recommended to lower the incidence of maternal anaemia among HP women. The causes of anaemia need further research; in particular, a focus on spouse's role. In antenatal clinics, couples should be invited and given awareness on significance of balanced nutrition before and during pregnancy, and merits of contraception. At the national level, public health awareness programmes should be designed focusing on female literacy, proper diet during childbearing age, family planning, contraceptive use, and the significance of maternal nutrition before and during pregnancy. These programmes should be equally conducted in female and male institutions. Pre-pregnancy screening is one of the best interventions to minimise maternal anaemia. WHO recommends that supplemental iron should be given to female adolescents and women, 2 to 4 months per year during the pre-pregnancy period, hence the focus needs to be shifted from diet during pregnancy to diet for the childbearing year.

CONCLUSION

The HP and anaemia have a dose-response relationship and are significantly associated. There was a significant difference in blood parameters between low- and high-para women. HP is the main determinant of maternal and fetal admissions in ICU.

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ETHICAL APPROVAL:
The study was conducted following the Declaration of Helsinki and approved by the Research Ethics Standing Committee (REC) of the University of Ha'il (H-2022-010).

PATIENTS' CONSENT:
Informed consent was obtained from the patients and/or their families/legal guardians to publish the data concerning their cases prior to publishing the data, the confidentiality of the patients was maintained by using the coding system.

COMPETING INTEREST:
The authors declared no competing interest.

AUTHORS' CONTRIBUTION:
FH: Drafted the introduction and discussion, conducted the related literature search, and conducted the statistical analysis.
AAK: Contributed to the material and methods section, interpreted the data, and conducted the statistical analysis.

HA: Contributed to the conception and study design, provided critical evaluation, and contributed to the conclusion.
RA: Contributed to the conception and design of the work.
FA: Contributed to the discussion section.
KA: Provided critical evaluation of the work.
ES: Edited and cleaned the data.
AB: Collected data from the hospital.
All authors approved the final version of the manuscript to be published.

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