Research Article

Maternal Anemia and Risk of Small for Gestational Age

Sana Tariq[1], Basma Zia Isran[2], Sidra Nosheen Kiani[3], Rabiya Shabir[4]

[1]Public Health Scientist SZABIST; [2]Assistant Professor Obstetrics & Gyneacology, Chandka Medical College, Larkana; [3]Senior Lecturer Rawal Institute of Health Sciences, Islamabad; [4]Kharadar General Hospital, Karachi

Abstract:

Introduction: Anemia in pregnancy results in impaired oxygen transport to the fetus and may result in intrauterine growth Retardation, low birth weight, small for gestational size, and neonatal death.

Objective: This study is to assess the risk of small for gestational age in anemic pregnant females.

Methods: This is a prospective cross-sectional study, Data was gathered from April 2019- to July 2020, all pregnant females registered in the gynecology department of Life-line hospital during the study were enrolled after signing informed consent. After laboratory investigation participants were divided into two groups, Group A had non-anemic and group B had anemic females. SPSS version 20 was used to analyze the data. Continuous data is interpreted as mean and standard deviation. To assess the correlation between categorical variables chi-square test was performed, p-value < 0.05 was considered as significant.

Results: A total of 500 participants were included in the study, 21-25 years mothers were reported as non-anemic and anemic with frequency of 165 and 100 respectively, While 25-30 years were 218 and 107 respectively. Gravidity of participants indicated a higher prevalence of anemia in mothers of 1 – 3 children with 156/302 participants falling in the category of parity 1-3. To assess the odds of getting SGA as a fetal outcome in anemic mothers, the OR test was performed and the result indicated a positive ratio (1.4)

Conclusion: This study indicated a higher prevalence rate of small for gestational age in anemic mothers as compared to non-anemic, expressing the need for better nutritional and psychological assessments of reproductive-age females in Pakistan.

Corresponding Author | Sana Tariq, Public Health Scientist SZABIST Email: sanatariqrajput@gamil.com

Key words: Maternal anemia, Small for gestational age, determinants of anemia

Introduction:

The etiology and determinants of anemia in pregnant females vary with geographical and cultural variance[1]. The prevalence rate of anemia during pregnancy is spread across the world in developing countries with the concern of prevalence[2]. Asian countries especially India and Pakistan's prevalence rates are higher, with 88% incident rates in India only[3-5] a national survey of 2018 conducted in Pakistan indicated 44.3% and 40.2% prevalence of anemia in rural and urban areas respectively[6]. Study conducted in the rural area found a 77% incident rate of anemia in reproductive-aged females, further categorized within mild, moderate, and severe categories with 20.8%, 48.7%, and 7.8% of results[7]. In Pakistan maternal mortality rates and under five years of age children mortality rates are two major concerns for public health scientists, work has been done for decades to maintain better health for reproductive-aged females and children of first 1000 days of life. Anemia in pregnancy results in impaired oxygen transport to the fetus and may result in intrauterine growth Retardation, low birth weight, small for gestational size, and neonatal death[8-10]. Birth weight is an important indicator to measure population neonatal and infant health, <2500g weight or lower weight of fetus at the time of pregnancy as compared to similar gender and geographical placement healthy fetus considered as low

birth weight, these infants has increased risk of infant death in first 300 days of life[11-13]. Small for gestational age has been described by World Health Organization (WHO) in 1995 as infants below 10th centile of birth weight for gestational age, gender-specific reference population[14]. This study aims to determine the association of small for gestational age with maternal anemia.

Methods:

This is a prospective cross-sectional study, conducted in the Obstetrics and gynecology department of Life-line Hospital, a semi-private health care facility located in Karachi, the ethical approval was granted by the ethical review committee in charge. The study period was April 2019 to July 2020, a total of 500 females were registered in the department. The sample size was calculated using Rao soft sample size calculator, with a 95% confidence level and 5% margin of error, using total number of fertile females in Pakistan and the total number of childbearing female Pakistani population in 2020 with constant fertility is 107220.324; according to UN data* using this number as numerator the obtained sample size was 383. The population of concern was mothers with hemoglobin or hematocrit measured prior to delivery. Severe comorbidities such as diabetes, hypertension along with assisted conception, hematological disoprders, history of blood transfusion in the last 1 year, diagnosis of thalassemia, sickle cell disease, pregnancy-induced hypertension (PIH), gestational diabetes (GD) were excluded from the study. Normal pregnancies with proper followup were included after signing informed consent, in the last month of third-trimester laboratory investigation including complete blood count and Hgb (Hemoglobin test) reports ordered by gyneacologist as routine protocol were used for diagnosis of anemia. After the Hemoglobin concentration analysis test, females were divided into two groups, group A consisted of normal hemoglobin levels (Non-anemic) while Group B has reduced hemoglobin levels (anemic) this group was further divided into three subcategories of mild, moderate, and severe anemia. The concentration of Hemoglobin within 10.0 to 10.09 g/dl is considered as mild anemia, while 9.0 to 7.0 g/dl concentration indicates moderate anemia, and < 7.0 g/dl hemoglobin concentration is known as severe anemia (WHO). Ultrasonography measurements of fetal growth on 37th week were used for diagnosis of small for gestational age. Many babies normally weigh more than 5 pounds, 13 ounces by the 37th week of pregnancy. Babies born weighing less than 5 pounds, 8 ounces are considered low birth weight. At a gestational age of 40 weeks, boys who weigh less than about 6 pounds 9 ounces (3 kilograms) are small for gestational age. Girls who weigh less than about 6 pounds 3 ounces (2.8 kilograms) are small for gestational age. The follow-up of the patient till delivery was recorded to assess any study-related adverse outcomes, mode of delivery was recorded too. A semi-structured questionnaire was used to record all demographic detail of participants including Gravidity, education, socio-economic status, age, etc. Statistical package for social sciences (SPSS) version 20 was used for analysis, Quantitative data was interpreted as mean and standard deviation, while categorical data was interpreted in frequency and percentages. To assess the correlation between categorical variables chi-square test was performed, p-value < 0.05 was considered as significant.

Results:

A total of 500 participants were included in the study, evaluation of anemia prevalence with demographics of participants, results specified participants within the age limits of 20 till 30 years reported a higher frequency of anemia, age group of 21-25 years mothers were 165 and 100 reported anemia. While 25-30 years old mothers were 218 and 107 reports showed anemia. Similarly, mothers with no formal education and only matriculation reported comparatively higher anemia incidences than literate participants with 101/185 and 127/186 respectively. Gravidity or parity of participants indicated a higher prevalence of anemia in mothers of 1 – 3 children with 156/302 participants falling in the category of parity 1-3. For further clarification, the subcategorization of demographics with stages of anemia was analyzed. Maximum participants were within the age group of 26 – 30 years 111 (22.2%), while < 30 years mothers were only 9 (1.7%). Similarly, 84 (16.8%) mothers were illiterate, while matriculation was completed by 11.7% of participants. The maximum reported parity was between 1 to 3 (%) the significance of data was < 0.05 (Table 1)

The complications at the time of delivery such as the

Table 1: *Demographic details of Group A and Group B participants.*

Variables		Group A (n=200)	Group B			P-value
			Mild Anemia (n=100)	Mod anemia (n=100)	Severe anemia (n=100)	
Age	< 20 Years	15 (3%)	35 (7%)	26 (5.2%)	24 (4.8%)	< 0.05
	21 - 25 years	65 (13%)	22 (4.3%)	53 (10.6%)	25 (5%)	
	26 - 30 years	111 (22.2%)	41 (8.2%)	15 (3%)	51 (10.2%)	
	< 30 years	9 (1.7%)	2 (0.4%)	6 (1.2%)	0	
Education	None	84 (16.8%)	24 (4.8%)	59 (11.7%)	33 (6.6%)	< 0.05
	Middle	24 (4.8%)	13 (2.6%)	24 (4.8%)	14 (2.8%)	
	Matric	59 (11.7%)	16 (3.2%)	47 (9.4%)	12 (2.4%)	
	Graduation	33 (6.6%)	14 (2.8%)	56 (11.2%)	3 (0.6%)	
Parity	Null	5 (1%)	33 (6.6%)	56 (11.2%)	30 (6%)	< 0.05
	1 to 3	146 (29.2%)	61 (12.2%)	35 (7%)	60 (12%)	
	4 to 6	49 (9.8%)	6 (1.2%)	9 (1.7%)	10 (2%)	

need for induced labor and small for gestational age, the Group A participants indicated results for small for gestational age as 5.8%, while SGA estimation in Mild, Moderate and severe anemia categories were 1.7%, 2.8%, and 7% respectively. The results specified SGA is not frequently prevalent in mild and moderate anemic mothers, while the frequency of SGA in severely anemic mothers is alarming. To assess the odds of getting SGA as a fetal outcome in anemic mothers, the OR test was performed and the result indicated a positive ratio (1.4), interpreting that maternal anemia is 1.4% more prone to cause SGA as compared to non-anemic mothers. The need for labor induction was measured in anemic, mild anemic, moderate anemic, and severe anemic participants as 8.2%, 8%, 15.6%, and 11.4% respectively. Although the odds of induction for labor represented highly positive chances. (Table 2)

rity and small for gestational age.

Study participants specified a higher prevalence of anemia within evaluated determinants such as multiparous gravidity, lower literacy rate, and lower-income. SGA is a major complication of neonatal and its association with maternal anemia has been proved in this study.

Discussion:

Small for gestational age is the most commonly reported adverse outcome of maternal anemia during pregnancy in our study, indicating a higher prevalence rate of small for gestational age as compared to non-anemic mothers, with < 1 OR and positive correlation, similar results has been reported in a pooled study from different countries with 21% prevalence of SGA in anemic mothers within Asia, 16% in Africa and 4% in America[15]. Although a few studies showed pregnancy-

Table 2: *Small for gestational age prevalence in participants with Odds ratio.*

Complications	Group A (n=479)	Group B Mild Anemia (n=320)	Mod anemia (n=136)	Severe anemia (n=65)	Odds Ratio	95% CI	P-value
Small for gestational age	29 (5.8%)	9 (1.7%)	14 (2.8%)	35 (7%)	1.4	0.8 – 2.3	< 0.05

*Chi-square test was performed to analyze the significance of results

+Bivariate regression with CI 95% was used to analyze the strength of the relationship between anemia severity and small for gestational age.

induced hypertension is another major factor causing SGA[16], The mortality rate of SGA infants is higher

including risk for other complications such as malnutrition, delayed milestones, etc[17]. Anemia in pregnancy is a well-researched topic in Pakistan, although many studies indicated only prevalence rates of anemic disorder during different trimesters of pregnancy[18-19]. A researcher has defined the correlation between adverse pregnancy outcomes with the severity of anemia, mentioning SGA as one of the most commonly noted complications[2]. Anemia frequency measured in our data is 60% which is similar to many other studies conducted on similar populations in the past decade, the number of anemic pregnancies has been declined remarkably after 1995 till 2015[14]. The identified reasons behind higher prevalence rates of anemia and related adverse outcomes especially SGA in Pakistan are the literacy of mother[20-21]. Multiparity, maternal age[21] and education plays an important role in managing nutritional needs during pregnancy to avoid anemia, participants with multi gravidity resulted to be anemic. Although the studies have been conducted to evaluate the root cause of anemia in pregnancy many times, therefore prevalence rates are still higher and resulting complications to maternal and fetal health are enormous[22-23]. The governmental interventions are consistent to manage the health pandemic even from the very beginning of adolescence years of girls, a study conducted in Sindh province, Pakistan mentioned the alarming frequency of anemia in young girls, specifying the need for intervention at a younger age as well as pregnant females[23-24]. Another study of a rural area measured similar results in reproductive-aged females[25], to maintain the complications of SGA after delivery, neonatal and infant follow up and guidance has been evaluated in national research[26] mentioning the importance of first 1000 days of life after SGA delivery. These determinants can be managed with awareness to the population about the nutritional importance of reproductive-aged females. This study can help in understanding the grieve importance of maternal nutrition and management of anemia during pregnancy to avoid any adverse outcome such as SGA and in extreme cases maternal or neonatal mortality.

Conclusion:

In Pakistan, anemia is considerably prevalent and the risk of related adverse outcomes for mothers and neonates is higher than in developed countries. As a public health emergency, management of anemia during adolescence and pregnancy has been a major concern of officials. Small for gestational age is emerging dangerous complication of anemia during pregnancy, which can lead to not only maternal health complications but miscarriage, abortion and increases the risk of infant mortality. Additional information, supplies, and awareness are required to maintain an upsurge of SGA related to anemia.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest.

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