

A study to assess the effect of maternal hemoglobin level on foetal outcome among antenatal mothers in selected maternity hospitals at Mangalore

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World Journal of Biology Pharmacy and Health Sciences, 2023, 14(01), 199–209

Publication history: Received on 08 March 2023; revised on 20 April 2023; accepted on 23 April 2023

Article DOI: <https://doi.org/10.30574/wjbphs.2023.14.1.0179>

Abstract

In developing countries maternal anemia during pregnancy has been reported to increase the risk of unfavorable foetal outcome. According to the standard laid down by WHO, anemia in pregnancy is present when the hemoglobin concentration in the peripheral blood is 11gm\100ml or less. In India its prevalence has been found to be in the range of 50-90% in 3rd trimester of pregnancy according to different studies conducted in rural areas. Maternal anemia in pregnancy is commonly considered as risk factor for poor pregnancy outcome and can threaten the life of mother and foetus. However, the extent to which the maternal hemoglobin concentration affects the foetal weight and foetal outcome is still uncertain. In the present study the researcher will investigate the possible effects of abnormal maternal hemoglobin level on foetal outcome. Interpretation and Conclusion: The findings of the present study revealed that there is a relationship between maternal hemoglobin level and fetal outcome such as birth weight, color of the new born, muscle tone, pre term birth and gestational age of the new born. A review of previous studies done showed that the risks of preterm delivery and LBW increased in proportion to the severity of maternal anemia. A comprehensive community based intervention with iron supplementation, helminthes treatment and increase in knowledge regarding information, education and communication through effective strategies, to improve the hematological status of pregnant women in each trimester, is needed and there by reduces maternal and fetal mortality and morbidity

Keyword: Hemoglobin level; Anemia; LBW; Pre term; Gestational age

1. Introduction

In developing countries, maternal anemia during pregnancy has been reported to increase the risk of unfavorable foetal outcome¹. According to the standard laid down by WHO anemia in pregnancy is present when the hemoglobin concentration in the peripheral blood is 11gm\100ml or less³. Hemoglobin concentration less than 50gm\L significantly increase the risk of maternal and foetal mortality because of the effect of hypoxia and anemia on the cardio vascular system, which is known as high-output heart failure. Medical evidence shows that very severe anemia is a direct cause of maternal and child mortality². Once hemoglobin concentration reaches greater than 180gm\L, the blood viscosity reaches a level that impairs micro circulation so that an inadequate amount of oxygen is transported to tissues, similar to the situation with severe anemia¹. Several epidemiologic studies showed that both low and high hemoglobin concentration are associated with increased adverse birth outcomes including foetal death, IUGR, pre term delivery and low birth weight.⁴ the relationship between maternal hematological parameters and pregnancy outcome has been a source of continuing controversy. In developed countries, not only maternal anemia but also high hemoglobin concentration during pregnancy has been reported to increase the risk of unfavorable foetal outcome.⁵ In India its prevalence has been found to be in the range of 50-90% in 3rd trimester of pregnancy according to different studies conducted in rural areas. It has got a severe impact on maternal and perinatal outcome, contributing directly and indirectly to maternal and perinatal mortality and morbidity⁶.

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It is regrettable because most of the cases of severe anemia in our country are preventable as they are due to deficiency of iron, folic acid, essential amino acids etc. caused by inadequate intake of these essential ingredients in food. It is further aggravated by factors like repeated pregnancy at too short intervals, worm infestation, recurrent hemorrhage etc. Most of which are associated with illiteracy and poor hygiene.⁷ In the developing world, current strategies, to prevent and correct anemia and iron deficiency in pregnant women has met with little success. Two large studies in the industrial world, involving over one million pregnancies clearly indicated that favorable pregnancy outcomes are less frequent among anemic mothers.⁸ Maternal anemia in pregnancy is commonly considered as high risk factor for poor pregnancy outcome and can threaten the life of mother and foetus. ⁹ Amount of iron transferred to the foetus is unaffected even if the mothers suffer from iron deficiency anemia but the incidence of low birth weight babies and premature births are common. Regular antenatal care from first trimester has a vital role in assessing and managing maternal anemia timely and it directly affects the perinatal outcome.¹⁰

2. Material and methods

2.1. Research approach

The research approach adopted for this study was descriptive research approach as the researcher aimed at determining the effect of maternal hemoglobin level on foetal outcome.

2.2. Research design

The research design selected for the present study was non experimental descriptive design. The study was planned to find out the effect of maternal haemoglobin level on foetal outcome

2.3. Setting of the study

The study was conducted in the antenatal and labour ward of Govt. Lady Goschen hospital, Mangalore.

2.4. Sample and sample size

The sample for the present study consisted of 50 antenatal mothers who are in 1st stage of labour in the month of September 2009

2.5. Sampling technique

The antenatal mothers were selected using non probability purposive sampling technique. Non probability purposive sampling technique is selected based on the judgment of the researcher to achieve particular objective of the research.

2.6. Development of the tool

In this study the investigator has used, demographic proforma for mother and baby and Dubowitz maturity assessment scale which was prepared based on the review of literature and in consultation with experts in the field of pediatric nursing and obstetrics and gynecological nursing.

3. Results and discussion

3.1. Data collection procedure

Data was collected from 1-9-2019 to 30-9-2019(30 days). The articles required to carry out the procedure were collected. The steps of haemoglobin level assessment by Sahli's method were strictly followed and foetal outcome was assessed by attending the labour and maturity of the new born was assessed by Dubowitz maturity assessment scale. The study population consisted of 50 antenatal mothers who are in 1st stage of labour. The data was collected and recorded systematically on each subject and was organized in a way that facilitates computer entry.

3.2. Plan for analysis of data

Descriptive statistics are useful for summarizing empirical information. Inferential statistics, which are based on laws of probability, provide a means for drawing conclusions about the population from which the data is obtained for sample.⁴⁴

Data would be analyzed by following steps:

- Organizing the data in master sheet
- Frequency & % of data will be calculated for describing demographic variables.
- Mean, and standard deviation will be used to present hemoglobin level.
- Chi square test will be used to find the association between maternal hemoglobin level with selected demographic variables
- Chi square test will be used to find the relationship between maternal hemoglobin level with foetal outcome.

3.3. Organization of the findings

The results have been organized and presented in four parts.

- PART 1 – description about demographic characteristics
 - PART I -A - demographic proforma for mother
 - PART I- B- demographic proforma for baby
- PART II – hemoglobin level among antenatal mothers
- PART III – relationship between maternal hemoglobin level and foetal outcome
- PART IV – association between maternal hemoglobin level and selected demographic variables

3.3.1. PART I: Description about demographic characteristics

PART I -A - Demographic proforma of mother

Table 1 Demographic characteristics of mothers in terms of age and religion N=50

Sl.No	Variables	Frequency(f)	Percentage (%)
1.	Age in years		
	18 – 23	20	40
	24 – 29	28	56
	30 – 35	2	4
	> 35	0	0
2.	Religion		
	Christian	0	0
	Hindu	40	80
	Muslim	10	20
	Any other	0	0

Table 2 Demographic characteristics of mothers in terms of education N = 50

Sl no	Education	Frequency (f)	Percentage (%)
1	No formal education	0	0
2	Primary	10	20
3	High school	32	64
4	Pre university	8	16
5	Graduation and above	0	0

The data presented in table 2 indicates that maximum (64%) of the samples were educated up to high school. 20% had primary school education and only 16% had pre university education.

Data presented in table 1 shows that highest percentage(56%) of the sample belonged to the age group of 24 -29 years, 40% belonged to 18-23years and only 4% belonged to the age group of 30-35years. This table also depicts that highest percentage (80%) of the sample belonged to Hindu religion. Only 20% belonged to Muslim religion.

Table 3 Demographic characteristics of mothers in terms of age at marriage and place of residenceN = 50

Sl.No	Variables	Frequency(f)	Percentage (%)
1.	Age at marriage in years		
	18	6	12
	19 - 24	36	72
	25 - 30	8	16
	>31	0	0
2.	Place of residence		
	Urban	0	0
	Rural	50	100

The table number 3 shows that the demographic characteristics of mothers in terms of age at marriage and place of residence. The findings related to age at the time of marriage revealed that out of 50 subjects highest percentage (72%) were married between 19-24years, 16% married between 25-30 years, while those married less than18 years of age comprised only 12% and no one got married in the age group of morethan31years. With regard to the place of residence 100% of the samples were from rural community.

Table 4 Demographic characteristics of mothers in terms of type of family N = 50

Sl no	Type of family	Frequency (f)	Percentage (%)
a	Nuclear	11	22
b	Joint	39	78
c	Extended	0	0

Table No.4 shows that majority (78%) of the mothers comes from joint family background and only 22% lived to nuclear family.

Table 5 Demographic characteristics of mothers in terms of gravida, parity, abortion and living child N = 50

Sl.No	Variables	Frequency(f)	Percentage (%)
1.	Gravida		
	G1	35	70
	G2	9	18
	>G3	6	12
2.	Parity		
	P1	35	70
	P2	9	18
	>P3	6	12
3.	Abortion		
	A0	50	100

	A1	0	0
	≥A2	0	0
4.	Living child		
	L1	35	70
	L2	9	18
	> L3	6	12

Table number 5 depicts that demographic characteristics of mother in terms of gravida, highest percentage (70%) of the sample were in G1, 18% of the sample were in G2 and remaining 12% were in G3 .In case of parity highest percentage (70%) of the sample were in P1 , 18% of the sample were in P2 and remaining 12% were in P3 But in case of abortion, 100% of the samples had no history of abortion. The sample distribution according to living children shows that majority (70%) of the sample had 1 child, 18 % of the sample had 2 children and remaining 12% of the sample had 3 children.

PART 1 B - Demographic proforma for baby

The data obtained to describe the sample characteristics of the babies are sex of the new born, birth order, birth weight, colour of the new born, muscle tone, pre term birth, IUGR, gestational age in weeks, intra uterine death, still birth and any other related complications,

Table 6 Demographic characteristics of babies in terms of sex and birth orderN= 50

Sl.No	Variables	Frequency(f)	Percentage (%)
1.	Sex		
	Male	27	54
	Female	23	46
2.	Birth order		
	First	35	70
	Second	9	18
	Third and above	6	12

Data presented in table no.6 shows that highest percentages (54%) of the samples were male and only 46% were female. This table also reveals that majorities (70%) of the new born were first babies, 18% were second babies and only12% were third babies.

Table 7 Demographic characteristics of babies in terms of birth weight N = 50

Slno	Birthweight	Frequency(f)	Percentage(%)
1.	<2.5	21	42
2.	2.5-3.5	29	58
3.	>3.5	0	0

This part deals with the demographic characteristics of babies in terms of birthweight as shown in table 7. This depicts that highest percentage (58%) of the samples were between 2.5-3.5kg and42% were <2.5 kg. No one is included in the group ofgreaterthan3.5 kg.

Table 8 Demographic characteristics of the babies in terms of colour of the new born and muscle tone N = 50

Sl.No	Variables	Frequency(f)	Percentage (%)
1.	Colour of the new born		
	Blue , pale	0	0
	Body pink, extremities blue	8	16
	Complete pink	42	84
2.	Muscle tone		
	Flaccid	0	0
	Flexion of extremities	8	16
	Active body movements	42	84

The demographic characteristics of the babies in terms of colour of the new born and muscle tone are shown in table number 8. The findings revealed that majority (84%) of the new born were completely pink at birth and only 16% had body pink and extremities blue. It also reveals that highest percentage (84%) of the new born had active body movements at birth and only 16% had flexion of extremities.

Table 9 Demographic characteristics of the babies in terms of pre term birth N = 50

Sl.No	Pre term birth	Frequency(f)	Percentage (%)
1	Yes	18	36
2	No	32	64

The demographic characteristics of the babies in terms of pre term birth are shown in table number 9. It reveals that 36% of the samples were pre term babies and 64% were term babies.

Table 10 Demographic characteristics of the babies in terms of IUGR N = 50

Sl.No	IUGR	Frequency(f)	Percentage (%)
1	Yes	2	4
2	No	48	96

The demographic characteristic of the babies in terms of intra uterine growth restriction is shown in table number 10. It reveals that 96% of the samples had no history of intra uterine growth retardation and only 4% had intra uterine growth retardation.

Table 11 Demographic characteristics of the new born in terms of gestational age N = 50

Sl.No	Gestational age in weeks	Frequency(f)	Percentage (%)
1.	≤37	18	36
2.	38 -42	32	64
3.	>42	0	0

The table number 11 shows that the demographic characteristics of the new born in terms of gestational age. The findings related to the gestational age of the newborn reveal that 64% of the subjects had 38 -42 weeks of gestational age and 36% of the subjects had ≤37 weeks of gestational age.

3.3.2. PART II – Hemoglobin level among antenatal mothers

in data, highest percentage (48%) of the samples belonged to 9 – 10.9 gm/dl blood hemoglobin level and 26% belonged to ≥ 11 gm/dl and 24% belonged to 7-8.9gm/dl only 2% were belonged to < 7 gm/dl. The data is also presented in bar diagram shown in figure 9.

Table 12 Blood haemoglobin level among antenatal mothers who are in 1st stage of labour N = 50

Sl no	Blood haemoglobin level	Frequency (f)	Percentage (%)
1	< 7 gm/dl	1	2
2	7-8.9gm/dl	12	24
3	9-10.9gm/dl	24	48
4	≥ 11 gm/dl	13	26

Table 13 Mean and SD of blood haemoglobin level among antenatal mothers N = 50

Sl. No	Blood haemoglobin level	Mean	SD
1.	< 7 gm/dl	10.09	1.64
2.	7-8.9gm/dl		
3.	9-10.9gm/dl		
4.	≥ 11 gm/dl		

Table 13 shows that the mean and standard deviation of blood haemoglobin level among antenatal mothers. Data depicts that mean score is 10.09 and standard deviation is 1.6.

3.3.3. PART III – relationship between maternal hemoglobin level and foetal outcome

Table 14 Chi square computed between maternal haemoglobin level and low birth weight of the new born N = 50

Maternal Haemoglobin level	Low birth weight	Normal	χ^2	df	Remarks
< 7 gm/dl	1	0	25.01	3	S P<0.05
7-8.9gm/dl	11	1			
9-10.9gm/dl	7	17			
≥ 11 gm/dl	0	13			

Table 15 Chi square computed between maternal haemoglobin level and colour of the new born N = 50

Maternal Haemoglobin level	Body pink, extremities blue	Complete pink	χ^2	df	Remarks
< 7 gm/dl	0	1	13.95	3	S P<0.05
7-8.9 gm/dl	6	6			
9-10.9 gm/dl	0	22			
≥ 11 gm/dl	2	13			

Table 16 Chi square computed between maternal hemoglobin level and muscle tone of the new born N = 50

Sl. No.	Maternal haemoglobin level	Flexion of extremities	Active movements of body	χ^2	df	Remarks
1.	<7gm/dl	0	1	13.95	3	S P<0.05
2.	7-8.9gm/dl	6	6			
3.	9-10.9gm/dl	2	22			
4.	≥11gm/dl	0	13			

Table 17 Chi square computed between maternal hemoglobin level and IUGRN = 50

Sl. No.	Maternal haemoglobin level	IUGR		χ^2	df	Remarks
		Yes	No.			
1.	<7gm/dl	0	1	1.13	3	NS P<0.05
2.	7-8.9gm/dl	1	11			
3.	9-10.9gm/dl	1	23			
4.	≥11gm/dl	0	3			

Table 18 Chi square computed between maternal haemoglobin level and preterm N = 50

Sl. No.	Maternal haemoglobin level	Pre term birth		χ^2	df	Remarks
		Yes	No.			
1.	<7gm/dl	0	1	32.29	3	S P<0.05
2.	7-8.9gm/dl	12	0			
3.	9-10.9gm/dl	5	19			
4.	≥11gm/dl	0	13			

Table 19 Chi square computed between maternal haemoglobin level and gestational age N = 50

Sl. No.	Maternal haemoglobin level	Gestational age		χ^2	df	Remarks
		<37weeks	38-42weeks			
1.	<7gm/dl	0	1	32.29	3	S P<0.05
2.	7-8.9gm/dl	12	0			
3.	9-10.9gm/dl	5	19			
4.	≥11gm/dl	0	13			

$\chi^2_{23} = 7.82$, NS – Not significant, S - Significant

The Chi square presented in the tables 14, 15, 16, 17, 18, 19 shows that birth weight ($\chi^2 = 25.01$ P<0.05), colour of the new born ($\chi^2 = 13.95$ P<0.05), muscle tone ($\chi^2 = 13.95$ P<0.05), pre term birth ($\chi^2 = 32.29$ P<0.05) and gestational age ($\chi^2 = 32.29$ P<0.05) were significant at 0.05 level. The Chi-square values were greater than that of table value at 0.05 level of significance. Thus the null hypothesis H01 was rejected and research hypothesis was accepted. But IUGR is not significant because the calculated value is less than table value. The remaining foetal outcome such as still birth, intra uterine death and any other related complications were not found in any of the sample so the relationship between these variables and maternal haemoglobin level was not tested.

3.3.4. PART IV- Association between maternal haemoglobin level and selected demographic variables

Table 20 Chi square computed between maternal haemoglobin level and selected demographic variables

Sl.No.	Sample characteristics	Median <10	Median >10	χ^2	df	Remarks
1.	Age in years					
	18 – 23	10	10	0.05	1	NS P>0.05
	24 – 29	16	12			
	30 – 35	0	2			
2.	Religion					
	Hindu	17	23	5.45	1	S P<0.05
	Muslim	9	1			
3.	Educational status					
	Primary	6	4	0.12	1	NS P>0.05
	High school	14	18			
	Pre university	5	3			
4.	Occupation					
	Employed	23	17	1.44	1	NS P>0.05
	Unemployed	3	7			
5.	Monthly income					
	< 2000	24	18	1.64	1	NS P>0.05
	2001 – 4000	2	6			
6.	Type of family					
	Nuclear	8	3	1.47	1	NS P>0.05
	Joint	18	21			
7.	Age at marriage					
	< 18	5	0	0.06	1	NS P>0.05
	19 -24	17	20			
	25 – 30	4	4			
8.	Gravida					
	G1	17	18	0.54	1	NS P>0.05
	G2	4	5			
	G3 and above	5	1			
9.	Parity					
	P1	17	18	0.54	1	NS P>0.05
	P2	4	5			
	P3 and above	5	1			
10.	Living Child					
	L1	17	18			NS

	L2	4	5	0.54	1	P>0.05
	L3andabove	5	1			
11.	Sexofthe newborn					
	Male	14	13	0.005	1	NS P>0.05
	Female	12	11			
12.	Birth order					
	First	17	18	0.54	1	NS P>0.05
	Second	4	5			
	Thirddandabove	5	1			
	$\chi^2_1 = 3.84$					

NS - Not significant, S - Significant

The Chi square presented in table 20 shows that religion ($\chi^2=5.45$ $P<0.05$) was significant at 0.05 level. The Chi-square values were greater than that of table value at 0.05 level of significance. Thus the null hypothesis H₀₂ was rejected for this variable but accepted for age, education, occupation, and monthly income, type of family, place of residence, age at marriage, gravida, parity, abortion, living child, sex, and birth order

4. Conclusion

On the basis of the findings of the study, the following conclusions have been drawn:

- The samples were taken only from government hospital
- In the sample characteristics of mothers the highest percentage (56%) of the sample belonged to the age group of 24 -29 years. Highest percentage (80%) of the sample belonged to Hindu religion and highest percentages (80%) of the samples were employed. No one got married in the age group of more than 31 years. Majority of them that is 70 % were primi gravida mothers.
- The sample characteristics of babies are highest percentage (54%) of the samples were male babies , highest percentage (58%) of the samples were between 2.5-3.5 kg birth weight. 36% of the samples were pre term babies and 64% were term babies and 36% of the subjects had ≤ 37 weeks of gestational age that 96% of the samples had no history of intra uterine growth retardation .
- The blood hemoglobin level of 50 antenatal mothers who are in 1st stage of labor depicts that highest percentage (48%) of the samples belonged to the group of 9-10.9 gm/dl blood hemoglobin level and 26% belonged to the group of ≥ 11 gm/dl and 24% belonged to 7-8.9gm/dl only 2% were in the group of <7gm/dl.
- A significant relation was found between maternal hemoglobin level and fetal outcome
- A significant association was found between maternal hemoglobin level and demographic variable only religion at 0.05 level of significance

Compliance with ethical standards

Acknowledgments

We are grateful to **Dr.Priya Ballal**, Managing Trustee, K.Pandjarajah Ballal Nursing Institute, College of Nursing for providing us an opportunity to do our basic degree in K.Pandjarajah Ballal Nursing Institute, College of nursing and for all the facilities extended to us for this study. Our heartfelt thanks to **Prof.(Ms) Kaini Cecilia**, Principal, K.Pandjarajah Ballal Nursing Institute College of Nursing for her inspiration , encouragement, constant support as well as for providing all the facilities for the successful completion of the study. we express our sincere gratitude to our guide, **Mrs. Sonia Sebastian**, Head of the Department, Obstetrics and Gynaecological Nursing, K Pandjarajah Ballal College of Nursing for her inspiring guidance, sustained patience ,valuable suggestions, continued support and constant encouragement throughout the research study. Her guidance and keen interest has helped us a great deal during this research work. We extend our heartfelt thanks to **Mrs.Lolita Pinto**, Assistant Lecturer and our co guide for her helpful in making constant support, encouragement ,personal interest , timely advice and comments which were this study a rewarding one.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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