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Research Article

Feto-maternal Outcome of Anemia in Pregnancy at the Gambian Tertiary Hospital

Anyanwu Matthew[1,2]* and Romaric Nyuyfoni Nsaidzeka[2]

[1]Edward Francis Small Teaching Hospital (EFSTH), Banjul, The Gambia

[2]School of Medical and Allied Health Sciences, University of The Gambia, The Gambia

***Corresponding Author:** Anyanwu Matthew, Senior Lecturer, Department of Obstetrics and Gynaecology, University of the Gambia School of Medicine and Allied Sciences, Banjul, The Gambia.

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Abstract

Background/Objective: A lot of people are affected by anaemia worldwide, with the most vulnerable group being children and pregnant women. The highest prevalence of anaemia is found in the developing nations. The objective was to determine the prevalence of stillbirth, preterm delivery, low birth weight, low Apgar score in anaemic pregnant women compare with non-anaemic pregnant women at Edward Francis Small Teaching hospital from July to September 2019.

Methodology: A prospective cross sectional study was conducted and the sample size was calculated with G-power 3.1. Recruitment occurred irrespective of gestation age. At the time of delivery, obstetric and neonatal characteristics were entered into computer database. The data was analysed with SPSS version 25. Inference was from a descriptive statistics at significant level of 0.05.

Result: A total of 210 mothers, 105 anaemic and 105 non-anaemic controls were in the study. The age range was between 19 to 35 years. The prevalence of mild and severe anaemia was 71.4% and 2.9% respectively. The measured adverse outcome includes; Low Birth Weight; 30.2% Vs 27.6%; P- 0.650. Preterm delivery; 32.4% Vs 23.8% p- value 0.169; stillbirth 10.5% Vs 7.6% p-value 0.473, low Apgar score at 5 minutes 29.5% vs 25.7% p-0.539 and NICU admission of 16.2% vs 13.3% p- 0.329; Postpartum haemorrhage 19.0% Vs 15.2% p- 0.466; Cardiac failure 0% Vs 1.5% p- 0.157 showed no statistical differences.

In secondary analysis of the data it became evident that poor pregnancy outcomes were highest in severe anaemia. That common significant risk factor and complication of anaemia was illiteracy and postpartum haemorrhage respectively.

Conclusion: There was no significant difference in the feto-maternal outcomes for the anaemic and non-anaemic women. Severe anaemia was associated with some significant adverse outcome among those with anaemia.

Keywords: Pregnancy; Anaemia; Fetal; Maternal; Outcome

Abbreviations

HB: Hemoglobin; IDA: Iron Deficiency Anemia; EFSTH: Edward Francis Small Teaching Hospital; UTI: Urinary Tract Infections; STI: Sextually Transmitted Infections; HIV: Human Immune Virus; W.H.O: World Health Organization; NICU: Neonatal Intensive Care Unit; PPH: Postpartum Hemorrhage; CF: Cardiac Failure

Introduction

Anaemia is a public health problem, affecting both developed and developing nations and has major consequences on human health and on social and economic development. At the moment it is estimated that anaemia affects about one-quarter of the world's population. With the highest burden affecting the developing nations, particularly the pre-school-age children and pregnant women [1]. Anaemia is an indicator of poor health and poor nutrition, because the prevalence of anaemia has been seen to be high in people with low socioeconomic status [2].

Anaemia is defined as a haemoglobin (HB) value, which is less than the stated value for the said age, sex and/or physiological status. This may occur as a result of low red cell mass (decrease production or increase loss of RBCs) or increase plasma volume [3]. Normal HB distribution varies with respect to age, sex and physiological status. The HB values, together with the signs and symp-

toms are used to make a diagnosis of anaemia [4]. Venous blood is used to test for the HB concentration.

Anaemia in pregnancy is generally defined as a HB concentration less than 11g/dl or a haematocrit < 33% in venous blood [5,6]. But for many years, anaemia in pregnancy has traditionally been defined in the sub-Sahara region as a HB less than 10g/dl or haematocrit < 30% [7].

Anaemia in pregnancy in sub-Saharan Africa is a major contributor of maternal mortality. Together with obstetric haemorrhage contributes up to 40% of maternal mortality and morbidity in this region [7]. In sub-Saharan Africa the prevalence of anaemia in pregnancy (HB<10.0g/dl) ranges from about 57 to 86%. Severe anaemia, (HB<7g/dl) is reported to be about 9.8% [7]. The high levels of anaemia in pregnancy have been seen not only to have a link with iron deficiency [8], but also with micro-nutrient deficiency and multiple infections, such as HIV, STI, UTI, and hook works [9]. Some of the clinical manifestations include: fatigue, dyspnoea, faintness, palpitations, headache, tinnitus and anorexia, pallor, hyper dynamic circulation (tachycardia, flow murmurs, cardiac enlargement and cardiac failure in the later stages).

Anaemia has a variety of causes; some can be isolated and others coexist. Globally the most common cause is iron deficiency [4]. It is generally assumed that 50% of anaemia cases are as a result of Iron deficiency anaemia (IDA) [10]. However, the first and physiological cause of anaemia in pregnancy is as a result of increased plasma volume. During pregnancy there is a total of 50% increase in plasma volume and 30% increase in red cell mass [6]. Pregnancy is also a state of immune-modulation, increasing the risk of malaria, hookworms, and other infections. These infections together with iron and folate deficiencies predisposes to anaemia.

Scholars working elsewhere have conducted similar study looking at pregnancy outcome among mothers with anaemia. What is very pertinent was their ability to determine the relationship of fetal outcome to severity and age of pregnancy at diagnosis of anaemia [11-16].

A study on the impact of anaemia in pregnancy was done in Kalaburagi, India, (2016) [17]. Of the pregnant women studied, 28% had mild anaemia (HB 10 -10.9g/dl), 54% had Moderate anaemia (HB 7-10g/dl) and 18% had severe anaemia (HB < 7g/dl) [17]. Anaemia in pregnancy was also found to have a higher incidence in early marriages, teenage pregnancies, decrease spacing between pregnancies and low socioeconomic status (84%). However, 84% had no complications and 16% had complications. The complications were postpartum haemorrhage 4%, postpartum fever 9%, sepsis 2%, and congestive cardiac failure 1%. With respect to the fetal outcome 20% had preterm babies, 28% intrauterine growth restriction, 25% need neonatal intensive care unit admission, and 3% were intrauterine deaths.

A cohort study was performed in rural Ghana (2006), to analyse the maternal and fetal outcome after severe anaemia in pregnancy. The women with severe anaemia had an increase risk in maternal death but fetal outcome did not significantly differ between the two groups. Although perinatal mortality was increased with HB<7g/dl and low birth weight was increased with HB<6g/dl [16]. Our work was similar to this, but we considered all the anaemic women, not only severe anaemia, and also considered first trimester anaemia as well as late pregnancy anaemia.

In another study conducted in Iran, which was a meta-analysis of over 30 studies from 1990 to 2016, about 1.1 million sample size was analysed. Maternal anaemia in the 1st trimester showed significant relationship with, low birth weight (any baby < 2500grams at the time of delivery), preterm births (any birth before 37 weeks of pregnancy) and small for gestational age (any new-born whose weight was below the 10th percentile for gestational age). The result showed that expecting mothers who had anaemia in the first trimester of pregnancy, were at risk of giving birth to a preterm baby, or a baby with low birth weight or small for age gestation baby [12]. Pregnant women who developed anaemia in the second and third trimester had no significant risk for any of the above outcomes. It was then concluded that anaemia in pregnancy, most especially in the first trimester can be considered a risk factor for low birth weights, preterm deliveries and small for gestational age babies, hence the anaemia should be prevented by taking measures in advance.

According to the World Bank statistics, the prevalence of anaemia among pregnant women in The Gambia, has reduced from 62.5% in 2006, to 61.8% in 2016 [11]. This Gambian study reported that 52 pregnant women were tested and 39 out of the 52 were anaemic, giving a percentage of about 75% of the population [11]. The Gambia data was provided at the national level, which was pretty reliable at the time [11]. However, It has been long since this research was conducted and also the study population was

very small which may have limited advantage for extrapolation. Our sample size was larger than the previous study. This study was designed to determine pregnancy outcome using obstetrics indices among pregnant women with anaemia compared with non-anaemic pregnant mothers. The frequency of stillbirth, preterm delivery, low birth weight, low Apgar score, NICU admissions, cardiac failure, and neonatal out come in relation to severity of anaemia was explored.

Methodology

Study Setting

This study was conducted at the Obstetrics and gynaecology department of Edward Francis Small Teaching Hospital, Banjul, The Gambia.

Study design

A cross sectional study, involving pregnant women.

Sample size and selection

Due to lack of data on the feto-maternal outcome of anaemia in pregnancy, the parameters for the calculation of sample were estimated to give the best possible sample size. The probability power(1-β) was taken to be 0.95 and the Type I error probability associated with this test of null hypothesis(α) placed at 0.05, the effective size character(d) was taken to be medium at 0.5 and allocation ratio N1/N2 is 1. The sample size was then calculated using G*Power 3.1.9.4. The total sample size came out as 210, the control i.e. non anaemic pregnant women were 105 and the cases i.e. the anaemic pregnant women also 105.

Data Collection tools and procedure

The data was collected directly from the patients and from their folders at the labour ward and at the postnatal ward after approval by the ethical committee.

Statistical analysis

The collected data underwent consistent check to ensure no errors have been made. The data was then entered in IBM SPSS 25 for analysis. The results were presented in tables, text, and charts. The independence sample t test was used to calculate the significance which was placed at 0.05.

Ethical considerations

The proposal was submitted to the Edward Francis Small Teaching Hospital ethical committee for approval. Consent letters were then written to the administrators of various departments, and approval was secured to conduct the study.

Results

The frequency distribution of sociodemographic variables are shown in table 1.

Variable	Anaemic		Non-anaemic	
	No	Percentage	No	Percentage
Age group(yrs)				
≤18	7	6.7%	7	6.7%
19-35	84	80.0%	81	77.1%
>35	14	13.3%	17	16.2%
Ethnicity				
Mandika	22	21.0%	25	23.8%
Wollof	24	22.9%	19	18.1%
Fula	23	21.9%	24	22.9%
Jola	4	3.8%	3	2.9%
Manjargo	0	0%	1	1.0%
Serahule	4	3.8%	9	8.6%
Aku	3	2.9%	6	5.7%
Others	25	23.8%	18	17.1%
Marital status				
Single	12	11.4%	13	12.4%
Married	93	88.6%	89	84.8%
Divorced	0	0%	2	1.9%
Widowed	0	0%	1	1%
Family status				
Monogamy	69	65.7%	64	61.0%
Polygamy	27	25.7%	26	24.8%
Single parent	9	8.6%	15	14.3%
Religion				
Muslim	99	94.3%	99	94.3%
Christian	6	5.7%	6	5.7%
Education				
Literate	56	53.3%	77	73.3%
Illiterate	49	46.7%	28	26.7%

Table 1: Sociodemographic characteristic of the study participants.

Risk factors	Anaemic women(cases)		Non-anaemic women(controls)		Sig (2-tailed)
	Number	Percentages	Number	Percentages	
Pregnancy spacing <2 yrs.	17	16.2%	15	14.3%	0.703
Multigravida	71	67.6%	71	67.6%	1.000
Low socioeconomic status	42	40%	27	25.7%	0.28
Early pregnancy (< 18 Yrs.)	7	6.7%	7	6.7%	1.000
Illiteracy	49	46.7%	28	26.7%	0.003

Table 2: Distribution of risk factors among anaemic and non-anaemic pregnant women and their significance.

A majority of the anaemic women (71.4%) had mild anaemia, while only 2.9% had severe anaemia.

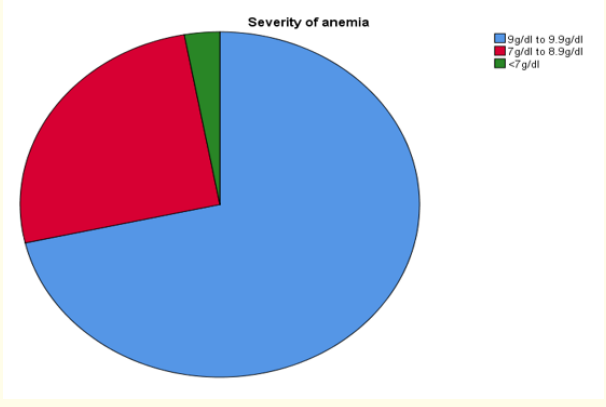

Figure 1: Distribution of anaemic cases according to the severity of anaemia.

Fetal and maternal outcomes	Mild anaemia %	Moderate anaemia %	Severe anaemia %	Sig (p value)
Still births	10.7	7.4%	33.3%	0.378
Preterm deliveries	32.0%	29.6%	66.7%	0.426
Low birth weight	29.3%	33.3%	33.3%	0.922
Low Apgar score	28.8%	25.9%	100%	0.025
NICU Admissions	10.7%	7.4%	33.3%	0.449
PPH	16.2%	25.9%	33.3%	0.432
Cardiac Failure	0%	0%	0%	1

Table 3: Frequency and significance of outcomes for mild, moderate and severe anaemia.

Low Apgar score (less than 7 at 5 minutes) had significant association (0.025) with severe anaemia.

Fetal and Maternal outcomes	Early Pregnancy anaemia %	Late Pregnancy anaemia %	Anaemia throughout Pregnancy%	Sig (p value)
Still births	6.3%	7.0%	31.3%	0.013
Preterm deliveries	34.4%	26.3%	50%	0.194
Low birth weight	31.3%	22.8%	56.3%	0.037
Low Apgar score	31.3%	22.8%	50%	0.105
NICU Admissions	25.0%	12.3%	12.5%	0.025
PPH	15.6%	21.1%	18.8%	0.822
Cardiac Failure	0%	0%	0%	1

Table 4: Frequency and outcomes of anaemia in early, late, or throughout pregnancy.

Anaemia throughout pregnancy was significantly associated with Low birth weight (birth weight <2.5 kg), stillbirth and neonatal admission into intensive care unit.

Fetal and Maternal outcomes	Number	Percentage
Still births	11	10.5%
Preterm deliveries (<37weeks)	34	32.4%
Low birth weight (<2500g)	32	30.2%
Low Apgar score (<7)	31	29.5%
NICU admissions	17	16.2%
PPH	20	19.0%
Cardiac failure	0	0%

Table 5: Fetal and Maternal outcome for anaemic women.

A third of the study population of anaemic mothers had preterm deliveries, low birth weight and low Apgar scores.

No Fetal and Maternal outcomes	Number	Percentage
Still births	8	7.6%
Preterm deliveries (<37 weeks)	25	23.8%
Low birth weight (<2500g)	29	27.6%
Low Apgar score (<7)	27	25.7%
NICU admissions	14	13.3%
PPH	16	15.2%
Cardiac failure	2	1.9%

Table 6: Fetal and Maternal outcome for non-anaemic women. Approximately a quarter of the non-anaemic mothers had preterm deliveries, low birth weight and low Apgar scores.

Complications	Cases %	Controls %	Sig (2-tailed)
Still births	10.5	7.6	0.473
Preterm deliveries (<37weeks)	32.4	23.8	0.169
Low birth weight (<2.5kg)	30.2	27.6	0.650
Low Apgar score	29.5	25.7	0.539
NICU admissions	16.2	13.3	0.329
PPH	19.0	15.2	0.466
Cardiac Failure	0	1.9	0.157

Table 7: Significance of the different feto-Maternal complications. There was no statistical significant association of the measured adverse pregnancy outcomes between the two groups (anaemic and non-anaemic mothers).

Discussion

In this study the prevalence of anaemia in the study population, showed mild anaemia (71.4%), moderate anaemia (25.7%) and severe anaemia (2.9%) respectively. This was different from the Shradha., *et al*. (2017) [18] where 28% were mild, 54% moderate and 18% were severely anaemic. In the Shradha., *et al*. study, 84% had no complications but 16% complication rate was observed. They also found, among the anaemic women, a preterm delivery rate of 20%, NICU rate of 25% and a still birth rate of 3% whilst in our study, 81% of the anaemic women had no complications, but 19% had postpartum haemorrhage which was the only complication we observed. The stillbirth rate, preterm delivery and NICU rates were not comparable as we had 32.2%, 16.2% and 10.5% respectively. Therefore, Even though they realized a higher rate of moderate and severe anaemia, their adverse pregnancy outcomes were lower than what we observed in our study. This may suggest that anaemia is not the only cause of poor pregnancy outcome. As there could be cofounders which was not excluded in this study even the published work of Shradha., *et al*.

Severe anaemia prevalent was 2.9% which is comparable to the 2.2% and 3.8% reported, by Marhatha., *et al*. (2007) [19] and Ram Hari., *et al*. (2013) [20] in Kathmandu and Nepal respectively. Anaemia was seen more among the illiterate participants, and less among the literate participants and this was statistically significant (P-0.003). This is comparable with the findings of Chintan., *et al*. (2017) [21], in India, where the illiteracy rates were statistically significant among anaemic patients.

Ndukwu G., *et al*. (2012) [22] reported that severe anaemia was not a common finding amongst the study population but it was significantly associated with educational status (p = 0.02) and socio-economic status (p = 0.03). although socio-economic class was not specifically explored in our study but by proxy using literacy level our study findings is comparable.

In the Rahmati., *et al*. (2013) [23] study, which was a systematic review and meta-analysis of available evidence, they found that first trimester anaemia had a significant relationship (P < 0.01) with low birth weights and preterm deliveries unlike late pregnancy anaemia which showed no significant relationship with poor fetal outcomes. While in our study, stillbirth had no significant difference between early and late pregnancy anaemia, but there was a significant increase (P < 0.05) when the patient had anaemia throughout pregnancy. The preterm deliveries were highest in the patients who had anaemia throughout pregnancy (50%), slightly increased in early pregnancy anaemia (34.4%) but this was not significant (p > 0.05).

Our study revealed that low birth weight was slightly increased in early pregnancy anaemia, but significantly increased, (p-0.037) when patients had anaemia throughout pregnancy. Also there was significant association of NICU admissions and stillbirth in anaemia throughout pregnancy. Scholars working elsewhere had comparable results although they conducted systematic review and meta-analysis [24,25].

In both fetal and maternal adverse outcomes that we measured there was no significant statistical difference between the anaemic and non-anaemic women. This was similar to what was recorded in Ghana by Geelhoed., *et al*. [26], as they found no statistical signifi-

cant difference between feto- maternal outcomes of severe anaemic women and non-anaemic women in all measured indicators but maternal mortality. Maternal mortality in their study showed statistical significant difference between the two groups. Both Ram Hari., *et al*. and Geelhoed., *et al*. noted statistical significant maternal mortality outcome when severe anaemic women were match with non-anaemic women, for the same age, socioeconomic status and parity [20,26].

A multilevel and propensity score regression analyses conducted by Daru J., *et al*. [27], to establish the relation between severe anaemia and maternal death in 359 health facilities in 29 countries across Latin America, Africa, the Western Pacific, eastern Mediterranean, and southeast Asia, showed significant association of severe anaemia and maternal mortality. Some other studies had varied outcome more so when disaggregation and stratification of data into early and late pregnancy anaemia or severe or mild anaemia [28,29].

Conclusion

Mild anaemia is very high in our practice and if not treated or prevented it might progress to severe anaemia which has been shown in our study to be associated with adverse pregnancy outcomes.

Recommendations

We recommend routine use of folic acid and ferrous sulphate during pregnancy, to prevent severe anaemia which has significant complications. Also further research is required to determine how anaemia causes poor pregnancy outcomes in our setting. This can be done, by performing a cohort study, where anaemic and non-anaemic women are matched for the same age group, same socioeconomic status, the same pregnancy interval, and the same parity and the outcomes compared for the two groups.

Limitations

There was no matching of the two groups so confounders were not properly excluded. The hospital (EFSTH) is a major referral centre, and some patients were brought in as emergencies and did not have their pre-delivery Hb done.

This was a prospective study and most of the variables needed were obtained by direct interviewer questionnaire. Therefore recall bias and missing documents, incomplete patients information and illegible writing were negligible which we believed was a strength of the study.

Authors' Contributions

RN conceived the study and contributed to the study design, data collection, and data analysis. MA wrote the manuscript. All authors read and approved the final manuscript.

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Competing Interests

The authors declare that they have no competing interests.

Availability of Data and Materials

The datasets generated and/or analysed during this study are available from the corresponding author on reasonable request.

Consent to Publish

Not applicable.

Ethics Approval and Consent to Participate

Ethical clearance to undertake this study was sought from the Research and Publication Committee at the School of Medicine and Allied Health Sciences, University of The Gambia and approval was granted. Participants identifiable information were carefully kept and was neither used nor shared. A written consent to participate in the study was obtained.

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