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Incidence and Factors Associated with Postpartum Anemia at Mbarara Regional Referral Hospital

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Abstract
Background: The World Health organization defines postpartum anemia as hemoglobin <11g/dl at 1 week postpartum and <12g/dl at 8 weeks postpartum. Postpartum anemia can also be defined as less than 11.8 g/dl for women aged 12–15 years and less than 12g/dl for women at least age 15 years. In Uganda, 23% of women age 15-49 are anemic, with 18 percent having mild anemia, 5 percent having moderate anemia, and less than 1 percent having severe anemia. ***Objective*:** To determine the incidence and factors associated with the new cases of post natal anemia in Mbarara Regional Referral Hospital. **Methods**: A prospective cohort study of 271 postpartum mothers without anemia enrolled on discharge after delivery. Participants were followed up to determine development of anemia at 10 weeks postpartum and associated factors on the subsequent postnatal visits. Incidence of postpartum anemia in MRRH was 29.9%, 95% CI (24 - 35). Helminthes infestations AOR95%CI; 12.88(5.25- 31.64, P<0.000), malaria infections AOR95%CI 4.74(1.50-14.94, P=0.008), poor hematinic adherence AOR95%CI, 6.81(3.17-14.62, P<0.000), high parity AOR95%CI, 2.48(1.11- 5.54, P=0.026), and husband unemployment AOR 3.92(1.14 – 13.39, P=0.030) were found to be statistically associated with post-partum anemia. **Conclusion**: The incidence of postpartum anemia in Mbarara Regional Referral Hospital is very high. Hematinics non adherence, husband unemployment, increased parity; malaria infection and helminthes infestation were found to be associated with post-partum anemia at MRRH.

Introduction

Postpartum anemia, defined as less than 11.8 g/dl for women aged 12–15 years and less than 12g/dl for women at least age 15 years(Bodnar et al., 2002) .It is estimated that 41.8% of pregnant women are anemic worldwide (WHO, 2008). Anaemia during pregnancy is diagnosed if a woman's hemoglobin (Hb) concentration at sea level is lower than 11.0 g/dl, although it is recognized that during the second trimester of pregnancy, Hb concentrations diminish by approximately 0.5 g/dl (Yip et al., 1998) and this predisposes many women to postpartum anemia. The prevalence rates for pregnant women and non- pregnant women are 41.8% and 30.2%, respectively; however, among different population groups, the greatest number of individuals affected by anemia belongs to non-pregnant women, totaling about 468.4 million women (Petraro et al., 2013). The World Health Organization estimates that 55.8% of pregnant women in Africa are anemic; in addition, 41% of women of childbearing age in Africa are anemic. Even though iron supplementation reduces anemia and is standard prenatal care in most countries, anemia continues to persist at relatively high rates among postpartum African women, including those receiving iron and folate supplements. In developing countries, the prevalence of postpartum anemia is in the range of 50-80%(Milman, 2011). Postpartum anemia is associated with an impaired quality of life, reduced cognitive abilities, emotional instability, and depression and constitutes a significant health problem in women of reproductive age (Milman, 2011).

In Uganda, Twenty-three percent of Ugandan women age 15-49 are anaemic, with 18 percent having mild anaemia, 5 percent having moderate anaemia, and less than 1 percent having severe anaemia. Prevalence of anaemia is higher among older women age 40-49 (27 percent), those with six or more children (28 percent), pregnant women (31 percent), and women who smoke (31 percent). Anaemia prevalence also varies by urban and rural residence; a higher proportion of women in rural areas are anaemic (24 percent) than those in urban areas (20 percent)(UDHS, 2011) Anaemia is defined as a decrease in the number of circulating red blood cells, haemoglobin and hematocrit levels below the lower limit of normal. The normal value is specified for gender, age, and also for the period of pregnancy. According to the World Health Organization, during pregnancy anaemia is defined as the value of haemoglobin level (Hb) <11g/dl in the first and third trimesters, whereas <10.5g/dl in the second trimester (Milman, 2011). Anaemia is an indicator of both inadequate nutrition and poor health status. It is considered as a factor contributing to unfavorable pregnancy outcomes, causes an increased

mortality of mothers and babies, increased risk of pre-term delivery and delivering a baby with a low birth weight. There are many causes of anaemia, including loss of blood, which is the most frequent cause of death among newborns, hemolysis, and disorders of bone marrow function, parasitic infestations, as well as acute and chronic infections. The most important cause of anaemia is that resulting from nutritional deficits, with iron deficiency occupying the first position. It is assumed that a half of all cases of anaemia are caused by iron deficiency; however, this percentage may vary among various populations and in various regions according to local conditions(Wojtyla et al., 2011).

While anemia has been studied extensively in pregnant women, the extent and impact of anemia during the postpartum period has more recently become an area of interest. The mother's health status during the postpartum period affects the potential for breastfeeding, and consequently the risks of anemia in infancy. This is more apparent in mothers below the poverty level, including those from developing countries. A study in the United States showed that recovery from anemia after delivery was slower for low-income women relative to those with family income above the poverty line. Other predictors that need to be considered in relation to the risk of developing anemia or recovery from it include nutritional deficiencies, infection, blood loss and delivery complications(Petraro et al., 2013). The prevalence of anemia among breastfeeding women i.e. postpartum mothers is 25.9 % (UDHS 2011). This is high though much lower than the prevalence of anemia among women in the post natal period found in 2003 at 64.4 % among the same group in Eastern Uganda (Sserunjogi et al., 2003). Postpartum Anemia is one of the causes of mortality and morbidity requiring constant follow up. In Mbarara Regional Referral Hospital, there are no documented studies on postpartum anemia. However, postpartum women attending postnatal clinics are routinely put on iron supplementation on discharge after delivery but the burden of disease remains high as determined by anemia related fetal and maternal mortality and morbidity. A review of records for three months in MRRH from December 2014 to February 2015, of the 433 obstetric related admissions on gynecology ward, 65 of them had postpartum anemia requiring blood transfusion which contributed 15% of the admissions but contributed 81.25% of postpartum related (Gynecology admissions (log, 2015).Therefore this study will seek to determine the magnitude of postpartum anemia in Mbarara Regional Referral Hospital as well as associated etiological factors. The results will help in drafting possible interventions and further evaluation.

Methods

Study Design; It was a quantitative prospective cohort study where mothers delivering at Mbarara Regional Referral Hospital without anaemia at discharge were followed up to 10 weeks postpartum to assess the development of anaemia in puerperium and associated factors.

Study Setting; The study was carried out on the post natal ward of MRRH, where mothers were recruited before discharge and follow up review was done in the MCH clinic.

Study Population; All postpartum mothers from Mbarara district who had delivered at Mbarara Regional Referral Hospital during the study period with heamoglobin levels of 11g/dl or more at the time of discharge were recruited and followed up to determine the new cases of anemia in the puerperium. The postpartum mothers with anaemia (Hb <12g/dl) at 10 weeks were the cases and were assessed for associated factors of the anemia.

Study Site; This study was conducted in the postnatal ward and post natal clinic of Mbarara Regional Referral Hospital, a publically funded hospital in South Western Uganda serving ten districts of Mbarara, Buhweju, Bushenyi, Sheema, Mitooma, Ibanda,Kiruhura, Rubirizi, Isingiro, Ntungamo with a population of over 5 million people. The hospital offers specialized services, employs eleven obstetricians and 32 midwives who perform over 10,000 deliveries annually (Atukunda et al., 2014). There is a daily postnatal clinic where mothers and their infants were assessed postpartum.

Sampling, Recruitment And Study Procedure; All mothers who had delivered were consecutively approached for participation in the study prior to discharge. A written informed consent was then obtained in either English or Runyankore depending on the patient's preference. A screening tool was then filled and a blood sample for instant Hb estimation 24 –72hours after delivery using Haemocue was collected and analyzed. All those with Hb less than 11g/dl were managed as per MoH protocols (Ministry Of Health Guidelines on Maternal Nutrition in Uganda 2010). Eligible postpartum mothers (Hb of 11g/dl and above) were recruited and followed up to determine the development of new cases of anaemia by the 10th week post-partum. At recruitment on ward, a questionnaire was filled out to capture description of home address, basic information and reliable telephone contact for follow up. At 10 weeks visit, Random Blood Sugar, Hemoglobin and Rapid diagnostic test for Malaria i.e. combo RDT(CareStart™ Malaria RDTs are rapid diagnostic tests that diagnose malaria infection from whole blood of patients in 20 minutes. Extensive lineup of 11 malaria RDT products targeting different combinations of Plasmodium parasites that cause malaria in humans, namely P. falciparum, P. vivax, P. malariae, P. ovale, as well as HRP2 deleted P. falciparum mutant malaria(http://www.accessbio.net/eng/products/products01_02.asp). . Reliable test results with high sensitivity

and specificity) made in the laboratory and examined under a microscope for the presence of malaria parasites. The client was given a plastic container to put a stool specimen. A slide was prepared and examined under the microscope for presence of worms such as ascaris, hookworms, trichuris trichuria, S. mansoni and E.histolytica. Once results were availed, the mothers were contacted and the results were discussed with the patient and recorded in the laboratory form by the Principal Investigator. Full post natal examination was done and family planning counseling for all study participants. Also newborn assessment was done and vaccination ensured by the research team at discharge.

Sample Size Determination: Sample size calculation was done based on Sample-size estimation formula for Cross-sectional study, Cohort or Clinical Trials by Kelsey et al., (1996) accessed from *http://www.openepi.com/oe2.3/menu/openepimenu.htm on 09th February 2015*

The following assumptions were made:

Two-sided significance level(1-alpha):	95
Power(1-beta, % chance of detecting):	80
Ratio of sample size, Unexposed/Exposed:	1
Percent of Unexposed with Outcome:	5
Percent of Exposed with Outcome:	16
Odds Ratio:	3.5
Prevalence Ratio:	3.1
Risk/Prevalence difference:	11

The percentage outcome in the exposed group of 16% was based on a prospective cohort study; Determinants postpartum anemia among women from a rural population in southern India (Rakesh et al., 2014).

A total sample size of 256 patients was estimated. In consideration of the participants who were anticipated to have missing or incomplete data, a 10% of the calculated N was added giving an overall estimated sample size of, N= 282 patients.

Study Instruments; Screening tool: All mothers on the postnatal ward were approached for screening for participation. This included an informed written consent.

Consent form: Informed written consent in a language understandable to the patient, i.e. Runyankore or English was obtained from every mother before participation in the study.

Laboratory form: Laboratory forms were developed to capture Random Blood Sugar, Hemoglobin, stool analysis and Rapid diagnostic test for Malaria parasites results from every patient.

Questionnaire; A questionnaire was developed, pre tested before the study. This questionnaire was used to collect socio-demographic information, information correlates of postpartum anemia among women in Mbarara Regional Referral Hospital. The questionnaire captured -information on parity, infections, adherence to hematinics, mode of delivery, socioeconomic status, education levels, parity, inter-pregnancy interval, medical history, infections and infestations.

Inclusion Criteria; All mothers from Mbarara district delivering from MRRH between 37 and 42 completed weeks of amenorrhea regardless of mode of delivery and fetal outcome with postpartum hemoglobin levels more than 11g/dl at discharge.

Exclusion Criteria

1. Mothers delivering with known diagnosed disorders like, SCD, Leukemia at time of recruitment
2. Mothers discharged after more than one week postpartum.
3. Mothers below 18 years of age.

Study Variables; *Primary Outcome Variable*, Postpartum anaemia

Independent variables

Parity, infections, adherence to hematinic, mode of delivery, socioeconomic status, education levels, parity, inter-pregnancy interval, medical history, infections and infestations.

Data Management

Filled questionnaires were checked for completeness after filling daily before storing them in a lockable cabinet. The collected data was entered into a password protected computer using Microsoft excel, and data was then imported into STATA software for analysis. Univariate analysis was carried out on the data. Categorical variables: like age, religion, and mode of delivery were then summarized using frequency, proportions and bar charts. Continuous variables: were summarized using means, standard deviations and median. Bivariate analysis was done between the various factors, Multivariate analysis was done for those factors found to be statistically significant to control for confounding.

Quality Control

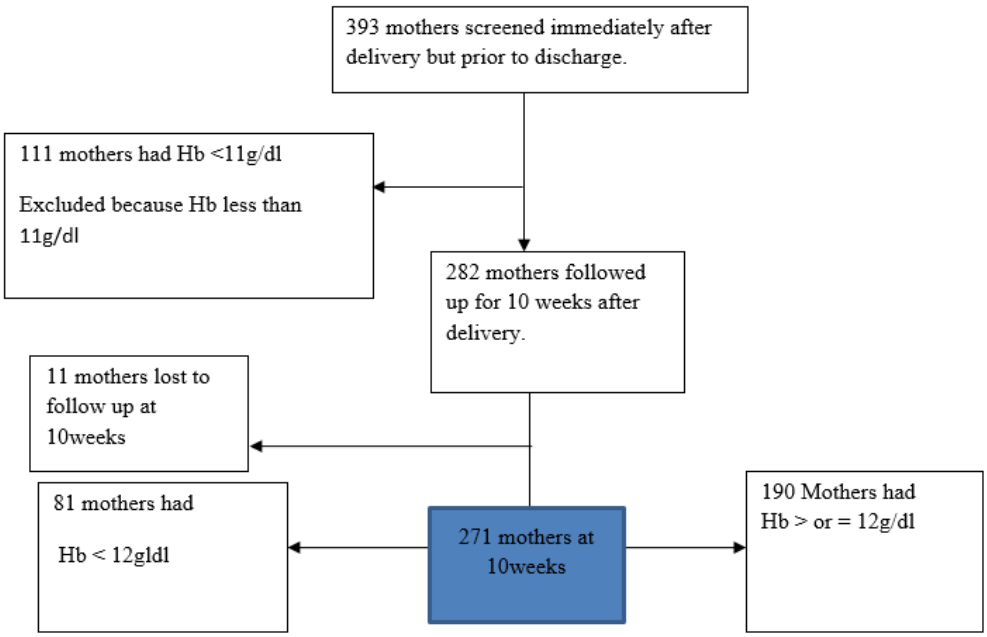
Assessment for validity and reliability of the study tool was done. The study tools were pretested and modified before the study. Data was collected by a single researcher. The research team used standard operating procedure manuals to guide interviewers in data collection, and for accuracy and completeness, checked completed questionnaires on a daily basis after filling each questionnaire. We also reviewed all questionnaires for

inconsistencies, accuracy and completeness.

Ethical Issues and Approval

Institutional clearance from Department of Obstetrics and Gynecology MUST, Faculty Research and Ethics committee and the Research and ethics committee of MUST, clearance from the Hospital Director MRRH was sought. Written informed consent was obtained from all respondents and confidentiality was observed. Study participants were identified by study codes and not their names, for issues of confidentiality. Privacy and confidentiality were observed to protect the dignity of the participants by interviewing and examining them in a closed and private room and all information obtained was kept under lock and key to unauthorized persons. The filled questionnaires were kept in a locked file cabinet and its key was kept by the Principal Investigator. Information got was communicated to the clinical care team for immediate patient care and management. Access to data was limited to those directly involved in the study, and the clinical team who were to assist in the management of the patients. The consent form was translated into local language (Runyankore) language so that participants could understand very well whatever they would be signing. The study carried minimal risks to the participants who would be free to opt out of the study at any time of the study. For all the mothers found to be anemic, we linked them up to the clinical care team. Data was entered in a password protected computer by the Principal Investigator.

RESULTS Figure 1: Flow diagram



Demographics

Data was collected from 282 participants and during analysis 271 participants were considered. This gave a response rate of 96.1%.

Table 1(below); Distribution of participants by their social demographic characteristics (N=271)

Variable		Frequency	Percentage
County	Mbarara municipality	180	66.4
	Kashari	49	18.1
	Rwampara	42	15.5
Residence type	Peri urban	108	39.9
	Urban	163	60.1
Age	<20yrs	19	7.01
	20-29yrs	179	66.5
	>=30yrs	73	26.9
Education level	No formal education	13	4.8
	Primary	98	36.2
	Secondary	105	38.7
	Tertiary	55	20.3
Marital status	Single	13	4.8
	Married	135	49.8
	Cohabiting	123	45.4
Religion	Christian	225	83.1
	Muslim	46	16.9
Occupation	Unemployed	133	49.1
	Employed	138	50.9
Income	Independent	29	10.7
	Partially dependent	174	64.2
	Dependent	68	24.1
Income per month	>or =90,000	117	43.2
	<90,000	154	56.8
Domestic violence	Yes	13	4.8
	No	258	95.2
Alcohol consumption	Yes	18	6.6
	No	253	93.4
Tribe	Munyankore	185	68.3
	Muganda	38	14
	Others	48	17.7
Husband employment	Yes	254	93.7
	No	17	6.3

Majority of the participants were between 20 and 30years, residing in Mbarara municipal council and were Banyankore by tribe. Most participants had Secondary education and were in a marriage relationship.

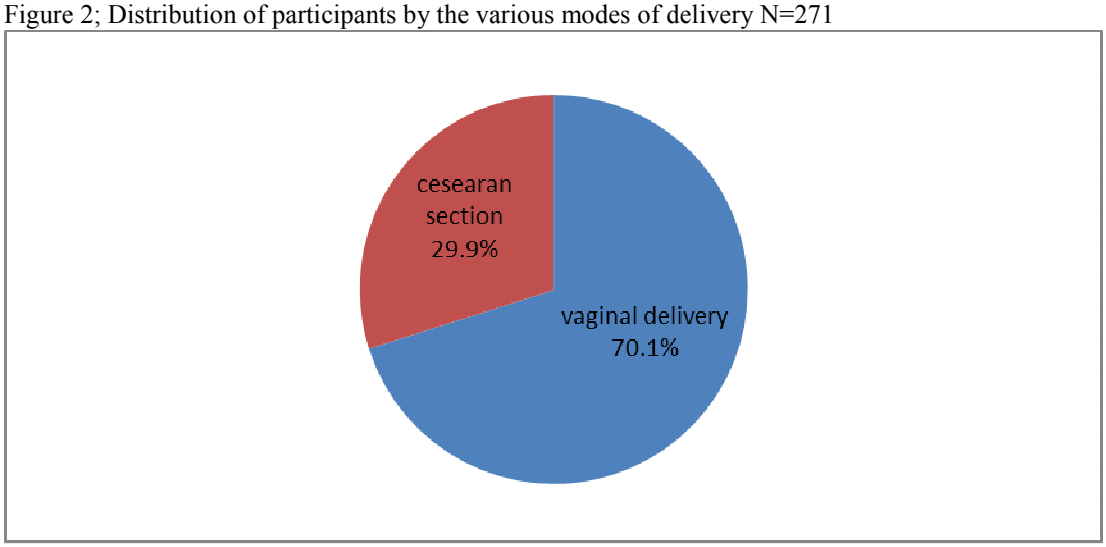
Alcohol consumption

Only 18(6.6%) of the participants had consumed alcohol before while the rest had never consumed alcohol before. Among those who consumed alcohol, 16 were still currently drinking occasionally while 02 had stopped.

Obstetric and Medical history

Most of the participants parity was ≤ 3.0 219 (80.8%) while 52(19.2%) had a parity of ≥4.0. contraception use was almost equally distributed among the participants with 133(49.1%) having used contraception before while 138(50.9%) had never used contraception at any one point in their lives. The various hormonal methods used include, Depo-Provera 91(82.6%), pills 17 (14.04%) and implants 13(10.74%) while the non-hormonal methods used include the intrauterine device 06 (50%) and barriers (condoms) 06(50%). Most participants had supportive husbands during their pregnancy 258(93.7%) and 254 (93.7%) of the participants husbands were employed while 17(6.3%) were unemployed. More than a quarter of the participants 80 (29.9%) had cesarean section mode of delivery as shown in Figure 2.

Figure 2; Distribution of participants by the various modes of delivery N=271

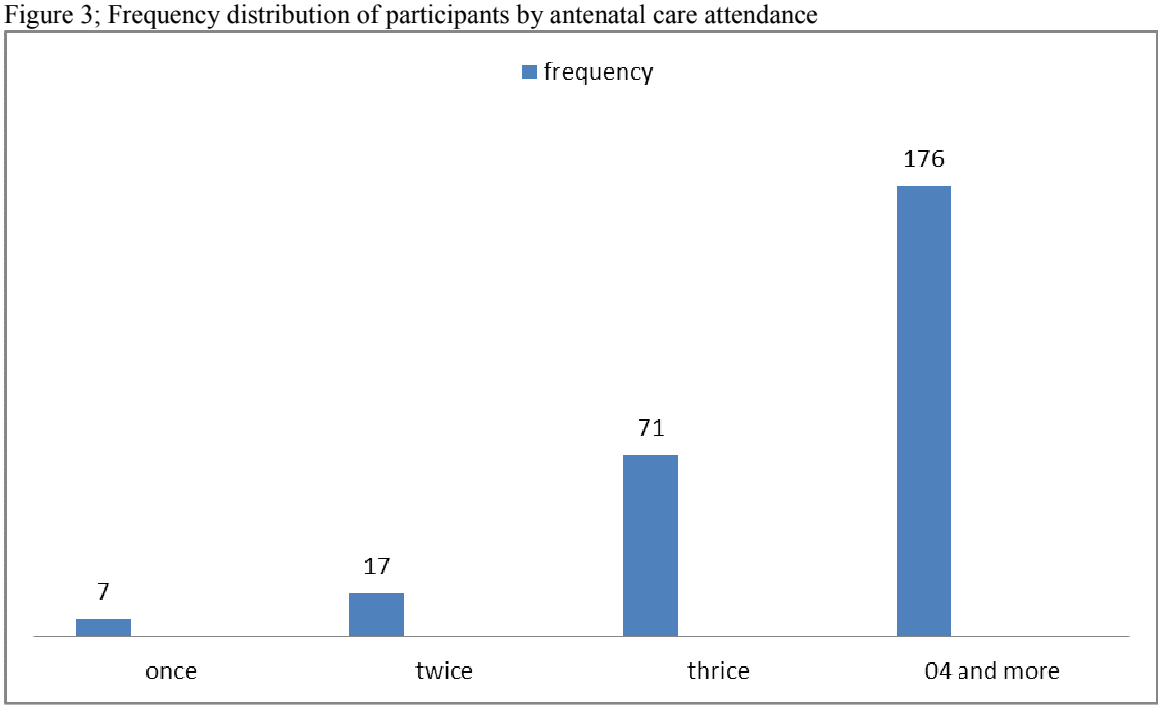


Almost all the participants gave birth to live babies 267(98.5%) while 4(1.5%) gave birth to dead babies. Only 11.1% of the participants had complication after delivery while 88.9% had no complications after delivery. Among those who had complications after delivery, 20(66.7%) had PPH while more than a quarter 10(33.3%) had puerperal sepsis.

As regards to the participants medical conditions ,235 (86.7%) had no chronic illness while 36 (13.3%) had chronic illness of which majority 35 had HIV while only 01 had diabetes mellitus. Among those with HIV 20 had been on medication for more than a year, 08 for less than a year while 07 had not been on ART. Half of the participants 137(50.5%) were not adherent to hematinics medication while 134 (49.4%) were adherent to hematinics medication.

Majority of the participants attended antenatal care as shown in figure 4 below

Figure 3; Frequency distribution of participants by antenatal care attendance



Hemoglobin profile of the patients: The hemoglobin profile of the participants was assessed to determine the level of anemia immediately after delivery and after 10weeks to assess for postpartum anemia. Mean Hemoglobin after delivery was 12.32g/dl SD +/ - 1.18

Figure 4, showing Post-partum anemia after 10weeks

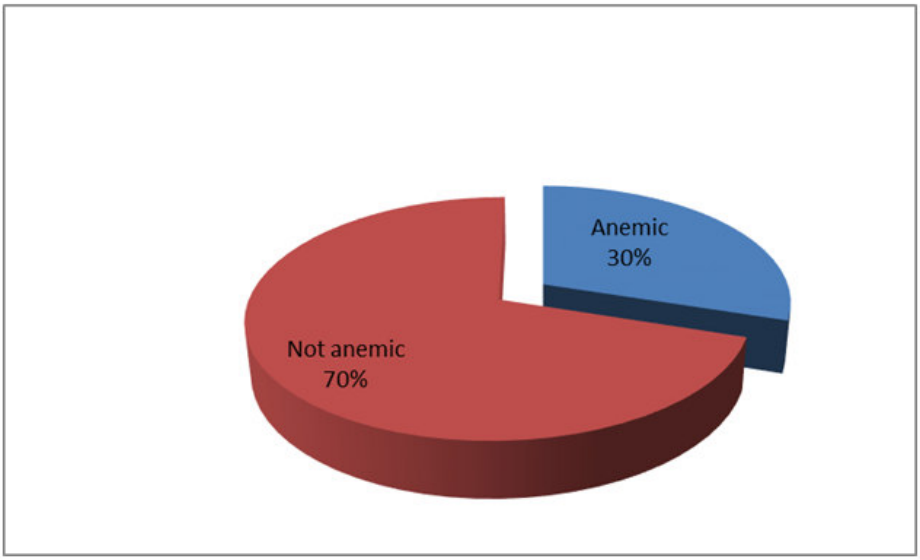


Table 3: Bivariate analysis of social demographic characteristics with postpartum anemia

VARIABLE		COR (95% CI)	P VALUE
Age in years	20 - 30	1	
	15-19	0.47(0.13- 1.68)	0.97
	>30	1.47(0.82- 2.62)	
County	MMC	1	
	Kashari	2.01(1.04-3.86)	0.037*
	Rwampara	0.95(0.44-2.03)	
Residence type	Urban	1	0.07
	Rural	1.63(0.96-2.76)	
Education level	Secondary + tertiary	1	0.009*
	No formal+ Primary	2.03(1.19-3.44)	
Marital status	Married + cohabiting	1	
	Single + separated	1.04 (0.81- 1.34)	0.744
Occupation	Professional+ business	1	0.624
	Unemployed +peasant	1.14(0.68-1.92)	
Income	= or >90,000	1	0.59
	< 90,000	1.16(0.69-1.95)	
Domestic assault	No	1	0.001*
	Yes	8.8(2.35-32)	
Alcohol consumption	No	1	0.09
	Yes	0.28(0.06- 1.23)	
Husband employment	Employed	1	0.039*
	Not employed	2.84(1.05-7.66)	

Table 4; Bivariate analysis of social, medical and obstetric history with postpartum anemia N=271.

Variable		COR (95%CI)	P VALUE
Child spacing	>2years	1	
	= or less than 2yrs	1.86(1.08-3.32)	0.026*
Mode of delivery	Non operative	1	
	operative	1.74(0.999-3.0160	0.05
ANC	4 or more times	1	
	Less than 4	2.22(1.30-3.797)	0.004*
Contraception	Yes	1	
	No	1.30(0.77-2.19)	0.32
Chronic Medical condition	No	1	
	Yes	1.20(0.57-2.54)	0.628
Complications of delivery	No	1	
	Yes	0.51(0.24-1.11)	0.092
Parity	Prime Para	1	
	Multi Para+ grand Para	2.32(1.295-4.14)	0.005*
Hematinic adherence	Yes	1	
	No	5.00(2.77-9.03)	<0.000*
Malaria infection	No	1	
	Yes	4.35(1.73-10.95)	0.002*
Helminthic infection	No	1	
	Yes	10.73(5.15-22.32)	<0.000*
HIV infection	No	1	
	Yes	1.32(0.64-2.74)	0.454

At bivariate analysis of social demographics, county P value 0.037, education P value 0.009, domestic assault P value 0.001 and husband employment status P value 0.039 were found to be significantly associated with postpartum anemia. The rest of the variables were not significantly associated to postpartum anemia. This is shown in the table below.

Bivariate analysis of the medical, social and obstetric factors showed that childspacing P value 0.026, ANC attendance P value 0.004, Parity P value 0.005, Hematinic adherence P value <0.000, malaria infection P value 0.002, Helminthic infection P value <0.000 were associated with postpartum anemia. The rest of the variables were not significantly associated with postpartum anemia.

Table 5; Logistic regression analysis of social, medical and obstetric characteristics that affect postpartum anemia among the participants

Variable	Odds ratio	95% CI	Std. Err.	P Value
Helminthic infections	12.88	(5.25- 31.64)	5.9	<0.000*
Malaria infection	4.74	(1.50-14.94)	2.77	0.008*
Hematinic adherence	6.81	(3.17-14.62)	2.65	<0.000*
Parity	2.48	(1.11- 5.54)	1.02	0.026*
Husband employment	3.92	(1.14 – 13.39)	2.45	0.030*
Domestic violence	4.96	(0.87- 28.16)	4.39	0.07
Child spacing	0.76	(0.33-1.76)	0.33	0.518
County of residence	1.83	(0.81-4.13)	0.76	0.145
Education level	1.38	(0.67- 2.85)	0.51	0.377
ANC attendance	1.3	(0.65- 2.64)	0.47	0.453

P value <0.05 is statistically significant. In the table above *indicates statistically significant. As shown in the Table above there was a significant statistical association between Helminthes infections AOR95%CI; 12.88(5.25- 31.64, P<0.000), MalariaAOR95%CI 4.74(1.50-14.94, P=0.008), Hematinics adherence AOR95%CI, 6.81(3.17-14.62, P<0.000), Parity AOR95%CI, 2.48(1.11- 5.54, P=0.026), and husband employment AOR 3.92(1.14 – 13.39, P=0.030).The rest of the characteristics were not statistically significant.

DISCUSSION

Incidence of postpartum anemia: Our study found the incidence of postpartum anemia at Mbarara regional referral hospital was at 29.9%. This is high putting into consideration the effects of postpartum anemia to both the mother and her growing new born baby. Not much work has been done to find out the incidence of

postpartum anemia in Uganda even in the previous National Demographic Health Surveys but mostly prevalence studies about the subject have been done. The high incidence also compares well with (Milman, et al 2011, Agarwal 2006, Petraro P et al 2013) who in developing countries, found the postpartum anemia was in the range of 50-80% but most of these studies were cross sectional making it difficult to identify the new cases. The 64% postpartum anemia found by Sserunjogi (2003) in the study among post-partum women in Eastern Uganda was also high but this is explained by the fact that the study populations were different since Serunjogi recruited postpartum women up to one year and his design was cross sectional. This high incidence can be interpreted as a failure of the ante natal care and post natal care management systems. These findings show the need to strengthen health systems, improve detection and treatment strategies for post-partum anemia and anemia in pregnant mothers and make efforts to reach and give health education talks to communities in order to reach a goal of total reduction of postpartum anemia.

Factors associated with postpartum anemia

In this study we found that, hematinics non adherence, husbands unemployment status, increasing parity, malaria infection and helminthes infestation were found to be associated with post-partum anemia.

Non adherence to hematinics medication: Poor adherence to hematinics has long been established as an important factor associated with post-partum anemia. Similar findings have been found in other studies i.e. Harsha Kumar H et al 2015, Reveiz et al 2011, Rakesh et al 2014,Trinh LT et al 2007 and UDHS 2011. The World Health Organization currently recommends weekly supplementation for women of reproductive age with 60 mg of elemental iron + 2800 μg (2.8 mg) of folic acid (WHO 2011c) in populations where the prevalence of anemia is above 20%. In addition to increasing iron stores, this intervention represents an opportunity to improve folate status before pregnancy and in the very early stages of pregnancy, particularly for those women who may become pregnant or do not know they are already pregnant and are not covered by other programmes as many pregnancies are not planned (WHO 2011c).Treatment and follow up for iron deficiency anemia in postpartum women are the same as for non-pregnant women(Yip et al., 1998). Iron supplementation coverage is generally low in Uganda. About one in four women (24 percent) did not take any iron tablets during their last pregnancy. Sixty-one percent of women took them for fewer than 60 days, and 4 percent took them for 90 days or more during their last pregnancy. In general, the percentage of women who took iron tablets for 90 or more days increases as educational status and wealth index increase (UDHS 2011).Traditionally, gestational and postpartum anemia have been prevented with the provision of daily iron supplements throughout pregnancy, but adherence to this regimen due to side effects, interrupted supply of the supplements, and concerns about safety among women, and in Uganda this intervention has been embraced but inadequate supplies, and poor postnatal attendances have affected the general outcomes and this predisposes mothers to anemia in the postpartum period. It should be noted therefore that there is a breach in adherence to hematinic supplementation protocols pre conception, during ante natal care and during the postnatal periods which presents with high maternal morbidity and mortality trends and hence hematinic supplementation by all risk groups needs to be emphasized by our governments in the developing world for better neonatal and maternal outcomes.

Malaria Infection: Malaria was highly associated with postpartum anemia in our study and being in a malaria endemic zone it still remains a major problem in Uganda. Our study findings were concordant with other studies elsewhere (Dellicor 2010,WHO 2011d; WHO 2011e,Oppenheimer 2001. Villar 1997 Stoltzfus ,et al 2003). Malaria in pregnancy and postpartum increases the risk of maternal morbidity due to anemia, maternal death miscarriage, stillbirth and low birth weight with associated risk of neonatal death (WHO 2011d; WHO 2011e).Provision of iron in malaria-endemic areas has been a long-standing controversy due to concerns that iron therapy may exacerbate infections, in particular malaria (Oppenheimer 2001). Although the mechanisms by which additional iron can benefit the parasite are far from clear (Prentice 2007), intermittent supplementation might be an effective intervention to prevent anaemia and improve malaria treatment in malaria endemic areas since less iron is available for the parasite. Malaria was associated with an increased risk for postpartum anemia, and presumptive malaria reduced the recovery from anemia and majority of the mothers affected were poor antenatal attendees.

Helminthic infestation: Infection with helminthes or intestinal worms is associated with high levels of iron deficiency anaemia and other nutritional deficiencies. Similar findings were found in studies by (Villar 1997, (WHO, 2008), Stoltzfus, (2003) UDHS 2011. Regular treatment with deworming medication is a simple, cost-effective measure to address these infections , however it has not been embraced due to irregular supply of drugs in most government facilities. In a survey conducted by Ministry of health Uganda (UDHS 2011), half of mothers received deworming medication during their last pregnancy. Urban women were found to be more likely than rural women to have taken deworming medication (54 percent compared with 49 percent). This is in agreement with our research findings were a large proportion of mothers were found to have helminthes infestation and lacked access to deworming medications.

Increasing parity: Increasing parity was found to be significantly associated with postpartum anemia in our study.

Parity refers to the number of times a woman has been pregnant for 20 or more weeks regardless of whether the infant is dead or alive at birth (The current pregnancy is not included.). Parity, or the number of previous pregnancies, has been shown to impact the long-term health status of women and pregnancy outcomes, specifically anemia. The parity had a clear effect on the incidence of anemia. The women with more than two pregnancies had significantly higher rate of anemia. Increasing parity has also been established to be associated with postpartum anemia (UDHS 2011,Harsha Kumar H et al 2014,Adeniran A Set al 2014).This also compares well with Petraro (2013) and other studies in Ethiopia and Mexico have found the same result, while a study in south India has reported higher rate of anemia for the parity index more than four. This might be due to the increase of women's nutritional needs during pregnancy, and also shows the importance of contraception educations, particularly in rural areas.

Husband support: Husband support both during both ante natal and post natal care was found to be associated with postpartum anemia. This can be explained by the fact that support from the husband improves general wellbeing i.e. nutrition and health seeking behavior thereby improving out comes. This is because husbands are the bread winners and most families entirely rely on them for their support. This is concordant with Petraro2013, UDHS 2011.

HIV infection: HIV infection was not found to be significantly associated with postpartum anemia in our study. This can be explained by the advances in option B plus where all pregnant mothers diagnosed with HIV are started on ART in the elimination of mother to child transmission of HIV. ART given to these mothers helps in boosting their immunity downplaying the impact of the HIV.

CONCLUSION

- The incidence of postpartum anemia in Mbarara Regional Referral Hospital is very high.
- Hematinic adherence, husband's employment status, parity, malaria infection and helminthic infestation were found to be significantly associated with post-partum anemia at MRRH.

RECOMMENDATIONS

- Support and improvement on post natal care services with emphasis on screening, supplementation and treatment of infections i.e. Malaria, Helminthic infestation.
- Improve on the supply chain of hematinics and health education messages to communities on the importance of hematinics pre conception, antenatal and during the post natal period.
- Create an environment which is accommodative of men in maternal health so that they can be more involved in their wives health care.
- Encourage uptake of contraception by women to improve maternal and neonatal outcomes.

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