

Per-Partum Anaemia and Missed Post-Partum Haemorrhage in Low Resources Settings

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Abstract

Background: Post-partum haemorrhage is the leading cause of maternal death throughout the world, and anaemia is one of its indirect causes. Anaemia during labour increases the risk of PPH and may lead to maternal mortality even after moderate PPH. Undiagnosed PPH and post-partum anaemia increases the risk of late maternal death in the community. The aim of this study was to assess the prevalence of anaemia on admission for labour, the occult early post-partum haemorrhage and the magnitude of post-partum anaemia in a low resource setting. **Methods:** This was a longitudinal study. We included pregnant women in labour. Haemoglobin concentration was measured on admission (H0), then 24 hours (H24) and 48 (H48) hours later. The post-partum blood loss was estimated by delta haemoglobin, using the criteria of M. Driessen *et al.* **Results:** We recruited 245 pregnant women. The mean age was 27.0 ± 6.0 years. The mean hemoglobin concentration was 11.7 ± 1.9 g/dl, the frequency of anaemia was 30.6% and was related to ethnicity ($P = 0.042$) gestational age ($p < 0.001$) marital status ($p = 0.014$) and the inter pregnancy time space ($p = 0.001$). Twenty-two-point two percent had post-partum haemorrhage among which 40% were undiagnosed. The mean blood loss was 375 ml and post-partum anaemia rate was 44.5%. **Conclusion:** Anaemia on admission was related to socio-demographic characteristics. The frequencies of anaemia during labour, missed PPH and undiagnosed post-partum anaemia were high. Haemoglobin concentration on admission for labour and after delivery, reliable method to assess PPH should be mandatory, to better identify per and post-partum anemia, and the management of PPH, in low income environments.

Keywords

Haemoglobinometer, Per-Partum, Anaemia

1. Introduction

The pregnancy process brings many physiological changes to the pregnant women amongst which hemodilution due to plasma volume increase and lesser red blood count increase causing physiologic anaemia [1]. Anemia defined as hemoglobin concentration < 11 g/dl, is also a nutritional deficiency affecting close to 33 million pregnant women worldwide, both in developed and developing countries, and Africa has the second highest anaemia prevalence and the highest prevalence of severe anaemia both in pregnancy [2]. Cameroon is a sub-Saharan central African developing country in the Gulf of Guinea, with 25 million inhabitants. The climate is a tropical and malaria, an indirect cause of maternal mortality [3] is endemic throughout the whole country and is another leading cause of anaemia during pregnancy by haemolysis occurring during the process of this infection and adverse effect on iron storage [4] [5]. Nearly 50% of Cameroonian pregnant women presented anaemia during pregnancy in 2011 and the level of public health significance was severe [2]. Anaemia represents 50% of indirect causes of severe maternal outcome defined as a woman having had a maternal death or maternal near miss [3], underlying 115,000 maternal death and 591,000 perinatal deaths in the world per year [6]. Anaemia during pregnancy is also related to poor perinatal outcome increasing the risk of pre-term birth, low birth weight, and small gestational age when occurring in the first trimester and the risk of low birth weight in the third trimester [7].

There is always some blood loss in every delivery process, and therefore a worsening potential of preexisting anemia after delivery during postpartum blood loss. Anaemia during labour even increases the risk of postpartum haemorrhage (PPH) [8], the first direct cause of maternal death throughout the world [9], and may lead to maternal mortality even following a moderate PPH.

Visual estimation is still the most commonly used postpartum blood loss assessment [10], but underestimation represents 25% - 50% when visual assessment is compared to photo spectrometry [11]. Visual estimation was even recently found to be inaccurate and requested to be withdrawn from standard obstetric practice [12]. The incidence of undiagnosed abnormal post-partum blood loss measured by collector bag versus peripartum haemoglobin concentration assessment was still 11% in a recent study in France, a developed country [13]. Postpartum anaemia is also a worldwide issue and its prevalence is highest in developing countries [14], post-partum severe anaemia acute or chronic can triple maternal mortality in the post-partum [15].

In Cameroon, a country with a maternal mortality rate 3.5 times higher than the recommended maximum of 140 [16], there's no assessment of hemoglobin

concentration on admission before and after delivery. Undiagnosed PPH due to visual estimation of blood loss and post-partum anaemia cases may be discharged, with potential late maternal death in the community.

The aim of this study was to analyse the prevalence of anaemia before and after labour, in order to assess clinically occult early post-partum haemorrhage and the magnitude of post-partum anaemia, for a better management of maternal perinatal anaemia in low resource setting.

2. Patients and Methods

This was a longitudinal study, conducted from February 1st to April 30th 2017, in three university teaching hospitals affiliated to the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, Cameroon, namely, the University Teaching Hospital, the Central Hospital and the Gynaeco-Obstetric and Paediatric Hospital, all in the capital city and representing the top of the health system pyramid in Cameroon. The study population was women delivering in the maternities of these three hospitals.

This study received the approval of the ethical committee of the University of Yaoundé I, and the authorizations of the directors of the three-university teaching hospital. The follow up of pregnant women is carried out by specialists in obstetrics and gynaecology, some of them university lecturers, offering complete obstetric care. This study was conducted.

An informed written consent was signed by every participant, after due explanations on the risks and benefits of this study, which didn't interfere with the appropriate management of the labour process. We included pregnant women at a gestational age of at least 28 completed weeks, admitted in labour in the maternities of these hospitals. Women with a past history of antenatal haemorrhage, who delivered by caesarean section, those with multiple pregnancy, homozygous sickle cell disease, or who received any blood product transfusion prior to admission were excluded.

The procedure included, capillary haemoglobin (Hb) concentration of blood from fingertip, collected after due asepsis, measured by HemoCue Hb 301 hemoglobinometer (Cera chek[®]) on admission called hour zero (H0). The data were read after 6 seconds as recommended by HemoCue Hb 301 hemoglobinometer user manual. Women were sampled on admission, at 24 hours and 48 hours post-admission counted in minutes, called H24 and H48. Anaemia was defined according to Grewal and Levy criteria corresponding to Cameroonian standards as haemoglobin concentration < 10 g/dl. Delta haemoglobin was used to calculate post-partum blood loss according to M Driessen. The degree of anaemia according to haemoglobin concentration was defined as follows:

Blood loss according to M Driessen's criteria: [17]

Data were processed using the SPSS 21.0.X2 for quantitative data and Fisher exact test for dichotomic data. $P \leq 0.05$ was the threshold of statistical significance.

3. Results

We included 245 cases, 49% (n = 120) from the Central Hospital, 41% (n = 102) from the Gynaeco-Obstetric and Paediatric Hospital and 9.4% (n = 23) from the University Teaching Hospital. The prevalence of anaemia on admission in labour room was 30.2% (75/245). The mean age was 27.0 ± 6.0 years the extremes from 17 to 42 years.

Anaemia rate on admission was 30.6% amongst which 25.3 was mild, there was no severe anaemia. The mean Hb level was 11.7 ± 1.9 g/dl (minimum 6.5 and maximum 15.8 g/dl).

After delivery, the frequency of anaemia increased to 46.6% including 1.2% severe anaemia from zero on admission. The mean PP Hb concentration was 10.2 ± 1.9 g/dl (5.3 - 15.0 g/dl).

Early post-partum haemorrhage frequency was 22.5%, 3.2% were severe. The mean blood loss was 1.5 g/dl (375 ml).

Up to 40% of the 55 post-partum haemorrhage were undiagnosed.

4. Discussion

This longitudinal study had some limits due to the short period of enrolment and its prospective and multicentric approach.

4.1. Prevalence of Anaemia on Admission

Our frequency of anaemia on admission was 30.6% (75/245) (**Table 3**). It was higher in Thailand (41%) on admission for labour, although only HIV positive women were included [18], the HIV status being one of the main causes of anaemia as shown by other studies [19] [20]. More than 90% were anemic on admission for labour in a study in India and it was related to number of antenatal care (ANC), education level and lack of folic acid intake [21].

In China, Ma in a randomized study analysing 6.413 pregnant women sampled within two weeks before delivery, found a prevalence of anaemia defined as haemoglobin concentration < 11 g/dl varying from 48.1% to 70.5% for an average of 58.6%. They suspected nutritional status [22]. Chen had shown indeed that, nutrient supplementation during pregnancy in China was not popular, with one third of them who never used any supplementation and the recommendations were poorly implemented [23]. It was lower than the prevalence of iron deficiency anaemia in the third trimester in one of the study sites of our study in 2016 [24], probably due to optimized intake of iron and the management of underlying diseases like malaria at the end of third trimester of pregnancy as it is the case in our study, as compared to the whole third trimester considered in that one. Fikir also identified Intestinal helminth infection as a cause of anaemia [25].

Lower frequencies of anaemia in the third trimester of pregnancy were found in Turkey (19.8%), this was explained by the routine prescription of iron tablet [26]. This lower frequency of anaemia compared to the developing countries mentioned previously is probably explained by Cameroon's lower anaemia di-

agnostic criteria (Hb < 10 g) and its mandatory routine iron intake during the whole pregnancy. Iron deficiency can concern up to 90% of anaemia cases during pregnancy [27]. Other reasons may be the countrywide national policy of the prevention of malaria, another tropical cause of anaemia in pregnancy, by in-situ administration of free sulfadoxine-pyrimethamine tablets during pregnancy and a nationwide distribution of free mosquito nets.

However, after several months of pregnancy and probably poor follow up, one third still presented with mild to moderate anaemia on admission for labour, an avoidable indirect cause of maternal death, with little time needed to easily improve the haemoglobin concentration, in a low resource setting (Table 4). Shilpa *et al.* found a rate of 5.6% of severe anaemia, defined as Hb concentration < 7 mg/dl, out of 3963 deliveries on a three-year period [28]. WHO advocates the identification of populations at greatest risk of anaemia especially when resources are limited [29].

Anaemia on admission in our study was related to marital status, short inter-pregnancy intervals, and gestational age, (Table 1 and Table 2) as found in previous studies [7] [30]. We found some influence of ethnicity concerning anaemia on admission, (Table 2) which need to be confirmed by case control studies. However, some cultural and ethnic behaviours like geophagia have been shown to reduce iron absorption [31]. We didn't notice a correlation with parity, (Table 3) probably because of our cut-off method which was ≤ 5 instead of analysing one parity after another as it has been done in previous studies.

4.2. Post-Partum Hemorrhage

Only 53.4% still had normal haemoglobin concentration 24 hours post-partum (Table 4) compared to 69.4% on admission (Table 3) and PPH occurred in 22.5% of the study population (Table 5), higher than the 9% in rural Uganda, using a calibrated under-buttocks VBRASSS drape in women who had vaginal birth [20], and the global rate of 6% [32]. The difference of method of evaluation cannot explain this gap.

Table 1. Hb concentration according to sociodemographic data.

Variables	Hb concentration (g/dl)		Total N (%)	Odds Ratio (95% CI)	P value
	<10 g N (%)	>10 g N (%)			
Ethnicity					
Beti	42 (40.8)	49 (34.5)	91 (37.1)	0.54 (0.29 - 0.98)	0.042
Bamileke	29 (28.2)	63 (44.4)	92 (37.5)		
Bamoun	12 (11.7)	10 (7.0)	22 (8.9)		
Other ethnicities	20 (19.4)	20 (14.1)	40 (16.3)		
Marital status					
Married	47 (44.6)	60 (42.3)	107 (43.6)	0.45 (0.27 - 0.87)	0.014
Divorced	2 (1.9)	2 (1.4)	4 (1.6)		
Single	45 (43.7)	55 (38.7)	100 (40.8)		
Co-habiting	9 (8.7)	25 (17.6)	34 (13.8)		

Table 2. Obstetrical data on admission according to Hb concentration.

Variables	Hb level		Total N (%)	Odds Ratio (95% CI)	P value
	<10 g/dl N (%)	≥10 g/dl N (%)			
Parity					
≤5	73 (44.2)	94 (55.8)	167 (68.1)	1.24 (0.71 - 2.15)	0.43
>5	30 (38.5)	48 (61.5)	78 (31.8)		
Gestational age (weeks)					
<37	37 (45.6)	44 (54.3)	81 (33.0)	1.25 (0.72 - 2.14)	< 0.001
≥37	66 (40.2)	98 (59.8)	273 (67.0)		
Inter-pregnancy interval (years)					
≤2	31 (26.7)	85 (73.3)	116 (47.3)	3.2 (1.87 - 5.54)	0.0001
>2	67 (54.0)	60 (47.0)	127 (52.6)		
ANC (number)					
≤4	22 (44.9)	27 (55.1)	49 (20.0)	1.15 (0.61 - 2.17)	0.79
>4	81 (41.3)	115 (58.7)	196 (80.0)		

ANC: antenatal consultation.

Table 3. Hb concentration on admission (H0).

Hb (g/dl)	N	(%)
>10 g/dl	170	69.4
[8 - 10[g/dl	62	25.3
[6 - 8[g/dl	13	5.3
<6 g/dl	0	0
Total	245	100

H0: hour of admission.

Table 4. Early post-partum Hb concentration evolution (H0 minus H24).

Hct (%)	Hb (g/dl)	N = 245	(%)
> 30%	>10 g/dl	131	53.4
[24% - 30%[	[8 - 10[g/dl	92	37.6
[18% - 24%[	[6 - 8[g/dl	19	7.8
<18%	<6 g/dl	3	1.2

H24:24 hours post admission.

Table 5. Measurement of early post-partum haemorrhage.

ΔHb (g/dl)	Value in ml	N = 245	(%)
<1	<250	10	4.08
[1 - 2[	[250 - 500[	180	73.4
[2 - 3[	[500 - 750[	36	14.6
[3 - 4[	[750 - 1000[	11	4.4
> 4	> 1000	8	3.2

One of the reasons may be the high rate of anaemia on admission. Anaemia during pregnancy is indeed a predicting factor of PPH as there is a correlation between low Hb levels and blood loss [8] [33], thus emphasizing the need for an efficient management of anaemia before the onset of labour.

Delivery assisted by qualified health care provider, which was supposed to be the case in these University Teaching Hospitals, is one of the pillars of the fight against maternal morbidity and mortality. Moreover, the active management of the third stage of labour has been adopted in those maternities for years, making this high frequency of PPH quite unexpected. Lack of motivation and regular trainings, frequent replacement of skilled personnel by new comers, lack of appropriate medical material, and ignorance of patients are some reasons among others of below standard practice in poor environment. [34].

Concerning the human factor, shown by the 3.2% of severe PPH (**Table 5**), which should not happen within a first category medical centre providing full obstetrical emergency care, normal vaginal delivery, condition of enrolment in this study, is usually conducted by nurses, with fewer midwives due to the closure for more than 15 years of midwifery schools in Cameroon. Gynaecologists and obstetricians are called upon when a patient shows or complains about early signs of pre-shock, usually after blood loss of 1000 ml and above.

Lack of motivation and regular trainings, frequent replacement of skilled personnel by new comers, lack of appropriate medical material, and ignorance of patients are some reasons among others of below standard practice in such a poor environment [24]. Such factors were not investigated in this study.

In the United States, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) recommends that blood loss be formally measured by calibrated under-buttocks bag after every birth [35]. Its use is mandatory in Japan [36]. It is applied at the end of third stage of labour, with an alert line when blood loss reaches 350 ml, timing the moment when the nurse should call for better expertise, to reduce the frequency and the magnitude of blood loss. We think that it should be systematically adopted, to improve the recognition and early management of post-partum blood loss in low income environment and as such avoid severe PPH. Spontaneous delivery with episiotomy/perineal tear and forceps delivery can also cause a greater blood loss [37]. These relationships were not investigated in this work.

4.3. Missed Post-Partum Hemorrhage

Nearly half of PPH went undiagnosed, (**Table 6**) due to non-routine evaluation of blood count before and after delivery as it is the case in developed countries [38]. An unreliable blood loss estimation can delay the recognition and management of PPH, moreover, even ignored and discharged mild or moderate anaemia may worsen during late post-partum period in the community as prolonged breastfeeding has been shown to reduce iron concentration [39].

Post-partum anaemia is an important and yet partly unrecognized problem

even in developed countries [40]. It remains a major concern in developing countries with a prevalence of 50% to 95% [41], but was lower (30%) in the United Kingdom [42]. Post-partum severe anaemia acute or chronic can almost triple maternal mortality during pregnancy and in the post-partum [15]. Post-partum anaemia on day 2 in our study concerned 45.5%, (**Table 7**) twice higher than a German study concerning 43,807 deliveries, where it was mostly related to delivery blood loss [40], or the 26.5% found in India [43].

This may be attributed to higher frequency of anaemia on admission and PPH, with chilling potential postpartum complications as the anaemic mother returns to the community, without close care as compared to the antenatal follow up period, since most of the study population might have gone undiagnosed thanks to this study, as routine assessment of the Hb profile is only done when patients present clinical signs of anaemia, and iron intake is yet to be a mandatory recommendation in our country. Screening or not in the post-partum of nursing mothers remains a debate [44]. Charrafine has shown indeed the advantage of blood count during the post-partum [38], moreover as mentioned above, breastfeeding can increase maternal anaemic status, as Increased total breastfeeding duration, a culture in Africa, is associated with decreased iron stores [39].

5. Conclusion

Anaemia during labour was related to socio-demographic characteristics. The frequencies of anaemia during labour, missed PPH and undiagnosed post-partum anaemia were high. Screening of Hb concentration on admission for labour and after delivery, the use of reliable blood assessment method like calibrated

Table 6. Diagnosed and missed PPH.

Post-partum hemorrhage	n	(%)
Clinically diagnosed PPH & Management	33	60
Missed (Undiagnosed) PPH	22	40
Total	55	100

PPH: post-partum haemorrhage.

Table 7. Post-partum anaemia after 48 hours post admission.

Hb (g/dl)	N	(%)
>10 g/dl	136	55.5
[8 - 10[g/dl*	90*	36.7*
[6 - 8[g/dl*	17*	6.9*
<6 g/dl**	2**	0.8**
Total	245	100

The frequency of anaemia on day 2 postpartum was 44.5%. *all cases of light to moderate anaemia were discharged on day 2 with oral iron tablets; **The two cases were yet to receive the prescribed full blood transfusion two days after delivery.

under-buttocks bag after every birth and post-partum anaemia assessment can improve the identification of cases of anaemia before discharge to the community and should be a recommendation in low income environment like ours.

Declaration of Interest

This study was self-financed and didn't receive any assistance of any kind by any organization. The authors declare no conflict of interest.

Submission Declaration and Verification

This work has not been published previously, this is the very first submission. The original collected data are available in a SPSS mask.

Contribution of Authors

MVE KOH Valere Salomon wrote the manuscript.

NOA NDOUA, DOHBIT SAMA and NANA NJOTANG read and brought inputs to the manuscript.

TEFEE II collected the samples.

LIMITATIONS: the short period of study as long as incidence of anaemia during labor was concerned and the 48 hours short and early post-partum period concerned.

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