ORIGINAL ARTICLE

Association of Serum Calcium Level with Primary Postpartum Haemorrhage Observed at a Tertiary Care Hospital

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ABSTRACT

Background: Primary postpartum haemorrhage is a leading cause of maternal death worldwide and uterine atony is a major cause of primary postpartum haemorrhage. Calcium plays a major role in uterine contraction and its deficiency may cause uterine atony. This study was planned to observe the association of serum calcium level with primary postpartum haemorrhage.

Methods: This cross-sectional observational study was conducted at the Department of Obstetrics & Gynaecology of Rangpur Medical College and Hospital, Rangpur, from July 2023 to June 2024. With due consent, a total of 100 women at postpartum period were included in this study – among them 50 were postpartum women with primary PPH (Group A) and 50 were postpartum women without primary PPH (Group B). Data was collected in a predesigned case-record form and analyzed by SPSS 26 version.

Results: In Group A (with primary PPH) mean(±SD) age was 27.5(±4.9) years and in Group B (without primary PPH) mean(±SD) age was 25.6(±4.7) years. Serum calcium levels were notably lower in Group A: 60% had levels below 8 mg/dl compared to 20% in Group B ($p<0.001$). The mean serum calcium level was significantly lower in Group A (7.6±1.9 mg/dl) than in Group B (9.2±0.9 mg/dl) ($p<0.001$).

Conclusion: Lower serum calcium level was observed in patients with primary postpartum hemorrhage than in patients without primary postpartum hemorrhage.

Key words: Lower serum calcium, primary postpartum hemorrhage.

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INTRODUCTION

Primary postpartum haemorrhage is a major cause of maternal morbidity and mortality worldwide. In Bangladesh PPH is the cause of about 31% of maternal fatalities [1]. In about 3%-8% of all deliveries, postpartum haemorrhage (PPH) is a primary cause of maternal morbidity and mortality globally [2,3,4]. Uterine atony is a major cause PPH and uterine muscle's ability to contract depends critically on the appropriate level of serum calcium. Reduced serum calcium level leads to impaired muscular function [5].

Total calcium in serum typically ranges from 8.0-10.2 mg/dl or 2.2-2.5 mmol/l mmol/l [6,7]. Lower serum calcium levels have potential impact on the smooth muscle of the uterus, which could lead to atonic uterus and thereby PPH [8]. Research is going on to determine the effect of hypocalcaemia on myometrial contraction – whether normal physiological level of calcium can be optimized or increased to boost contraction, particularly in the context of augmented protracted labour which is a risk factor for uterine atony and PPH; maintaining normal serum calcium level appears to help prevent postpartum hemorrhage caused by uterine atony [7].

And, this study was aimed at having a look into the relationship between serum calcium levels and the risk of primary postpartum haemorrhage in parturient women – the knowledge that may help us managing some of the PPH cases.

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METHODS & MATERIALS

This cross sectional observational study was conducted from July 2023 to June 2024 at the Department of Obstetrics Gynaecology, Rangpur Medical College Hospital, Rangpur.

Total 100 cases were included in this study with due consent. Ethical clearance was obtained from ethical review board. Women who delivered baby at this hospital and then developed PPH or who came to this hospital due to PPH after a home delivery was included as case of this study by purposive sampling technique (Group-A, n=50). Another group of patients who delivered baby at this hospital and did not develop PPH was included as control (Group-B, n=50).

Primary PPH is defined as the excessive bleeding within 24 hours after delivery which is either >500 ml in vaginal delivery or >1000 ml in cesarean delivery and is accompanied by features of hypovolemia. American College of Obstetricians and Gynaecologists (ACOG) updated the definition of PPH in 2017 to include bleeding connected to signs or symptoms of hypovolemia within 24 hours of delivery, regardless of delivery method, or cumulative blood loss of ≥1000 ml [9,10,11,12].

Multiple pregnancies, presentations other than cephalic, polyhydramnios, prolonged labour, grand multipara, leiomyomas, PPH due to anything other than uterine atony, induction with oxytocin or augmentation of labour, previous haemorrhage in third stage of labour, any bleeding disorder or getting drug that causes bleeding disorder and refusal to give consent were excluded.

A single sample of 05 ml antecubital venous blood was collected by aseptic procedure from all participants of each group and was sent for measuring serum total calcium.

After the baby was born, the third stage of labour was "actively managed". Over the next 24 hours, the participants were watched for signs of primary PPH. The amount of postpartum blood loss in the first 24 hours after delivery was estimated by the usual clinical visual assessment, the number and weight of soaked pads and the blood transfusion that was given. Loss of tone in the uterine muscle or the inability of the myometrium to contract after the placenta has been delivered, along with bleeding from the placental site, are signs of uterine atony.

Data were collected using a pre-structured case record form. Data analysis was done using SPSS for windows version 26.0 and "*p*" <0.05 was considered as level of significance.

RESULTS

Age distribution (Mean±SD) of Group A was 27.5 ± 4.9 years and of Group B was 25.6 ± 4.7 years. Age was significantly higher among the women who had primary PPH (*p*=0.021 for independent 't').

In Group A and in Group B 10% and 16% of the women had delivery at home respectively and rest of the women had delivery in hospital. In both Group A and Group B majority had normal vaginal delivery (52% vs 82%) but caesarean section was found significantly higher among the women with PPH than without PPH (48% vs 18%). (Table-I)

Table-I: Delivery related information among the study participants (n=100)

	Group A (n=50) n (%)	Group B (n=50) n (%)	p-value*
Place of delivery			
Home	5 (10%)	8 (16%)	0.554
Hospital	45 (90%)	42 (84%)	
Mode of delivery			
Normal VD	26 (52%)	41 (82%)	0.003
LSCS	24 (48%)	9 (18%)	

p-value was determined by Chi-square test.

Data was presented with frequency (%) and within parenthesis percentage over column in total.
Group A= Postpartum women with PPH, Group B= Postpartum women without PPH

Mean ± SD of serum calcium level in Group A was 7.6±1.9 mg/dl and that of Group B was 9.2±0.9 mg/dl (*p*<0.001) Serum calcium level of 60% of Group A (PPH group) was < 8 mg/dl whereas, in Group B 10% cases was < 8 mg/dl. Serum calcium level was significantly lower among the women with PPH.(Table-II)

Table-II: Distribution of the study participants according to investigations findings (n=100)

Serum calcium (mg/dl)	Group A (n=50) n (%)	Group B (n=50) n (%)	*p*-value
<8	30 (60%)	10 (20%)	
8 to 10.2	15 (30%)	33 (66%)	<0.001*
>10.2	5 (10%)	7 (14%)	
Mean ±SD	7.6±1.9	9.2±0.9	<0.001**

p-value was determined by *Chi-square test
**Independent sample 't' test.
Group A= Postpartum women with atonic PPH,
Group B= Postpartum women without PPH.

DISCUSSION

In our study mean age in PPH group was 27.5±4.9 years and in non-PPH group was 25.6±4.7 years (*p*=0.021 for independent 't'). In a previous study mean age of the women with PPH was 27.33 ± 4.78 years which was consistent with current study [5].

In both Group A and Group B majority had normal vaginal delivery (52% vs 82%) but caesarean section was found significantly higher among the women with PPH than without PPH (48% vs 18%) (p=0.003). In these cases, most likely, uterine atony resulted in non-progression or poor progression of labour and ultimately came out as LSCS.

Previous study by Sharma et al. among 550 mothers, 408 (74.2%) had vaginal delivery and 142 (25.8%) had cesarean delivery. The common maternal complications were postpartum hemorrhage (21.1%) which was higher among LSCS compared to vaginal delivery [13]. Other studies also revealed that compared with normal vaginal delivery, cesarean section (CS) remain a common risk factor for severe PPH [14, 15].

In current study 60% of women with PPH had serum calcium level below 8 mg/dl whereas only 20% of women without PPH had hypocalcaemia. Here serum calcium level was significantly lower in PPH group than the non-PPH (*p*<0.001) – an evidence that proposes low serum calcium as a cause of PPH. (Table II)

In the study of Seema et al., out of 50 patients with serum calcium levels <8.5 mg/dl, 12 developed PPH. Besides, 50 patients with serum calcium levels of > 8.5mg/dl, only 1 patient developed PPH which indicated that patients with low serum calcium levels had a higher incidence of PPH [8]. Another study conducted among the women with PPH by Epstein et al. revealed that low serum calcium level at the time of diagnosis of PPH was associated with risk of severe PPH [4]. Adinma et al. found mean serum ionized calcium level of participants without primary PPH was higher (1.11±0.25 mmol/L) than that of participants who had primary PPH (1.0±0.35 mmol/L), (*p*=0.037) and suggesting the role of adequate calcium in preventing obstetrics haemorrhage [7].

Conclusion

The study concludes that significantly lower serum calcium level was observed in patients with primary postpartum hemorrhage than in patients without primary postpartum hemorrhage.

Limitations of this study

i) Sample size is too small to demonstrate anything clearly.
ii) Sample was taken purposively, so randomization was not done.
iii) There was no antepartum serum calcium level taken in this study group .
iv) Sample was taken from a single tertiary level hospital, so that the result of the study may not be reflect the exact status of the population.

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