

A Study of Relationship between Serum Calcium Levels and the Occurrence and Severity of Post-Partum Hemorrhage

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Abstract: ***Objective:** The objective of the study was to evaluate the occurrence and severity of post-partum hemorrhage and serum calcium levels. **Design:** Case-control study. **Methods:** This study was conducted in obstetrics and gynaecology department of GMC Srinagar from April 2017 to 2018. Total number of subjects included in the study were 100 amongst which 50 subjects were in group A with serum calcium level <8.5 mg/dl and 50 were in group B with serum calcium level of >8.5 mg/dl. **Results:** A total of 100 subjects were studied. There were 50 subjects with serum calcium <8.5 mg/dl amongst which 12 subjects developed PPH; and 50 subjects with serum calcium >8.5 mg/dl of which only one subject developed PPH. **Conclusion:** Our study revealed that there is a high occurrence of PPH in patients with low serum calcium levels and low serum calcium levels are associated with increased risk of major PPH.*

Keywords: Post-partum haemorrhage, serum calcium

1. Introduction

Post-partum haemorrhage (PPH) accounts for about one-quarter to one-third of all maternal deaths. Worldwide, 7 women die of PPH every hour.^[1] There is a strong evidence to believe that the rate of PPH is increasing worldwide.^[2] The main reason for this increase is the growing frequency of uterine atony.^[3]

PPH can be classified as minor (500-1000 ml blood loss) and major (more than 1000 ml blood loss). PPH has also been classified as primary PPH (within 24 hours after delivery; >80% of which is caused by uterine atony) and secondary PPH (24 hours to 12 weeks after delivery).^[4] Most cases of post-partum bleeding occur within the first 4 hours after delivery.^[5]

Optimum levels of calcium are very important for contraction of uterine muscle. Low levels of serum calcium result in a reduced contraction. It has been shown that myometrial contraction can be augmented by increasing calcium levels within the body or by optimizing normal physiological calcium levels in the setting of augmented prolonged labour, which is at a higher risk of poor uterine contraction and PPH.^[6]

Calcium exerts its effect by activating the muscle proteins and causing effective uterine contraction. Intravenous calcium gluconate can promote uterine contraction and plays a key role in preventing and treating PPH by increasing the tone of the uterus.^[7] Patients with PPH from atonic uterus that had not responded to the usual oxytocic's had responded well with intravenous calcium gluconate with marked hardening of uterus and lessening PPH.^[8] Serum calcium status regulated

by vitamin D plays a role in smooth muscle function in early labor. Calcium supplementation before LSCS has been used to prevent and treat PPH due to atonicity of uterus.^[9] It was speculated that the higher serum calcium levels played a role in the mechanism of initiation of labor which is the result of adequate uterine smooth muscle contraction.^[10] Reduced serum calcium level may affect the contractility of uterine smooth muscle hence, may result in atonic uterus and PPH. So present study is conducted to determine the relationship of serum calcium levels with PPH in a tertiary care hospital.

2. Methods

This is a prospective case control study conducted in the department of obstetrics and gynaecology, GMC Srinagar from April 2017 to 2018. A total of 100 subjects were included in the study. The study subjects were divided into two groups: group A with serum calcium less than 8.5 mg/dl (50 subjects) and group B with serum calcium more than 8.5 mg/dl (50 subjects). The blood sample was collected for serum calcium in 1st and 2nd stage of labor. In both the groups, PPH was defined as blood loss of ≥ 500 ml following vaginal delivery and ≥ 1000 ml following caesarean delivery.

Inclusion criteria

- 1) Age between 20 – 30 years
- 2) Primigravida
- 3) Both vaginal and caesarian deliveries
- 4) Term pregnancies
- 5) Spontaneous onset of labour

Exclusion criteria

- 1) Multiparity
- 2) Placenta previa

- 3) Abruptio placenta
- 4) Retainedplacenta
- 5) Bigbaby
- 6) Anemia
- 7) Traumatic PPH
- 8) Multiple pregnancies.
- 9) Abnormal labour (precipitate labour, Induced labor, prolonged labour, obstructive labour)
- 10) Hydramnios
- 11) Uterineanomalies
- 12) Bleeding disorders.

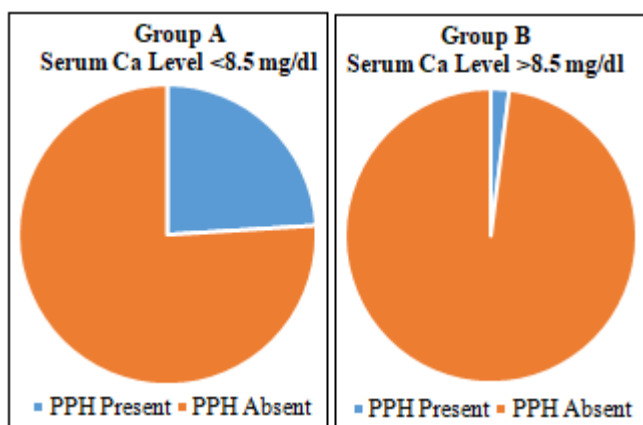
Written informed consent was taken from all the subjects and approval from institutional ethical committee was obtained. Chi-square test was applied to compare the occurrence of PPH in both the groups. Serum calcium levels and occurrence of PPH were correlated.

3. Results

A total of 100 subjects were studied. Amongst 50 patients with serum calcium <8 mg/dl, 12 patients developed PPH and in those with serum calcium >8 mg/dl, only one patient developed PPH

Table I: Serum calcium level and number of patients with PPH

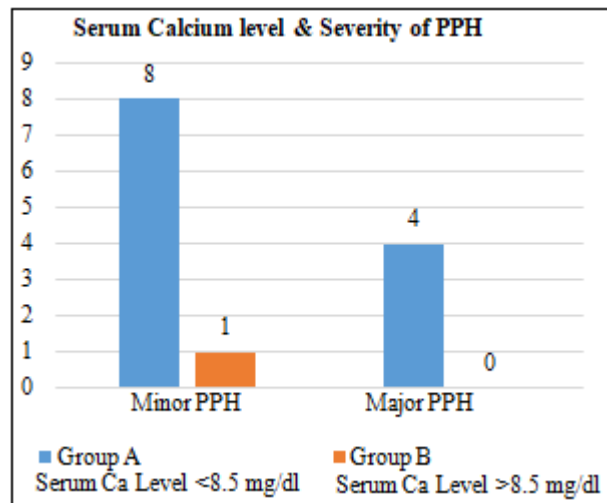
	Serum Ca Level (mg/dl)	PPH Present	PPH Absent	Total no. of subjects
Group A	<8.5	12	38	50
Group B	>8.5	1	49	50



Chi square test $X^2=0.04 (< 0.05)$. This implies PPH is more when serum calcium is <8.5 mg/dl as compared to serum calcium >8.5 mg/dl which is statistically significant.

Table II: Serum calcium level and severity of PPH

	Minor PPH (500-1000 ml)	Major PPH (>1000 ml)	Total No. of patients with PPH
Group A Serum Ca Level <8.5 mg/dl	8	4	12
Group B Serum Ca Level >8.5 mg/dl	1	0	1



4. Discussion

Post-partum haemorrhage is a leading cause of maternal mortality and morbidity worldwide and 75-90% of these haemorrhages result from uterine atony.^[11] In this study we have compared the levels of serum calcium levels and the occurrence of PPH, a life threatening condition which may lead to emergency hysterectomy.

In table I, in group A, out of 50 patients patients with serum calcium levels <8.5 mg/dl, 12 developed PPH. In group B with serum calcium levels of > 8.5mg/dl, only 1 patient developed PPH. These findings suggest that optimum serum calcium level is essential for the effective uterine contractions and low serum calcium level may cause atonic uterus and PPH of variable degree. The study subjects who developed PPH were treated with uterotonic (oxytocin, misoprostol). Uterus became firmer and harder and PPH was controlled.

In table II, in group A, 4 out of 12 patients developed major PPH and 8 had minor PPH whereas in group B, no patient had major PPH and 1 patient had minor PPH.

So our study suggests that all subjects admitted in labor should be tested for serum calcium levels and if serum calcium is less than 8.5 mg/dl, PPH should be anticipated. Uterotonic drugs oxytocin, prostaglandins increase the contraction of uterine smooth muscle by increasing intracellular calcium level^[12,13]. As our study suggests that low serum calcium level may be the reason for increased risk of PPH, hence intravenous administration of calcium gluconate may increase the tone of the uterus and prevent PPH and thereby avoiding aggressive procedure like hysterectomy.

5. Conclusion

Our results suggest that low calcium level is strongly associated with increased occurrence of PPH hence, is a risk factor for PPH. Our study also concludes that major PPH is more likely associated with low serum calcium. Our findings suggest that all patients admitted in labor should have

estimation of serum calcium levels and those with serum calcium less than 8.5 mg/dl may be administered intravenous calcium gluconate in second stage of labour in case of vaginal delivery or before LSCS, to prevent PPH and aggressive management like hysterectomy, and to decrease maternal morbidity and mortality.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethical Committee

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