Original Article

Association of Uterine Atonicity and Serum Calcium Levels- A Case Control Study

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Abstract:
Background: The main causes of maternal death in Bangladesh is haemorrhage and PPH accounts for 31% of maternal death. Among the causes of PPH, majority (80%) due to uterine atonicity. There are numerous causes of uterine atonicity in our study we evaluate the serum calcium level and it's association with uterine atonicity. Calcium plays and important role in smooth muscle contraction. So, there may be an association between serum calcium levels and uterine atonicity. **Methodology:** This study was conducted as case control study in the dept. of Obstetrics and Gynaecology, Sir Salimullah Medical College Mitford Hospital, Dhaka over a period of 12 months from January 2022 to December 2022. Total 200 pregnant mothers were taken as study subjects who meet the eligibility criteria. (5 ml of blood sample was collected from each of the women in the active phase of labor and who underwent c/s to measure the serum calcium level.) Total study subjects are divided into two groups Group A: Hypocalcaemia with uterine atony and Group B: Normocalcaemia/ Eucalcaemia with uterine atony. **Results:** Total 200 study subjects were studied. Among them 100 study subjects with hypocalcaemia and 100 study subjects with eucalcaemia. In woman with hypocalcaemia 17 patients develop uterine atonicity and women with eucalcaemia 5 patient developed uterine atonicity. **Conclusions:** This study concludes that there is a association of hypocalcaemia with uterine atonicity.

Keywords: Serum calcium, Uterine atony, PPH.

Introduction:

Post partum haemorrhage is an obstetric emergency which is the leading direct cause of maternal mortality in low income countries, representing 27.1% of maternal deaths.[1] According to WHO, every year nearly 2,95,000 women die due to complications induced by the pregnancy and most of them are preventable or, treatable.[2] PPH is one of the most preventable cause of maternal death. There is a strong evidence that the rate of PPH is increasing worldwide.[3] PPH accounts for 31% of maternal deaths.[4]

Primary PPH is defined as a cumulative blood loss >500 ml following vaginal delivery or >1000 ml following caesarean delivery or any amount of blood loss within 24 hours after birth evidenced by rise in pulse rate, and falling blood pressure.[5] PPH can be classified as minor (500-1000 ml blood loss) and major (more than 1000 ml blood loss).[6] Though PPH is unpredictable in most of the cases the risk factors associated with primary PPH include non-white ethnicity, older age, history of PPH, history of blood disorders, nulliparity, low parity, grand multiparity, high blood pressure, antepartum hemorrhage and multiple pregnancies.[7]

Atoncity of the uterus is the commonest cause (80%) of PPH. Uterine atony can be defined as inadequate contraction of the corpus uteri

myometrial cells in response to endogenous oxytocin that is released in the course of delivery.[8] According to WHO, PPH can be prevented by active management of third stage of labor which is practiced routinely. It reduces PPH by 60%. In AMTSL, oxytocin 10 IU I/M given within 1 minute of delivery. These oxytocic drugs acts by increase intracellular calcium resulting uterine smooth muscle contraction. Calcium has a role in muscle contraction by triggering the muscle proteins. In management of PPH sometimes several oxytocic drugs are required but they are associated with side effects & complications.[9] A study had shown patient with PPH from atonic uterus had not responded well to oxytocics but had responded well to the I/V calcium gluconate with marked hardening of uterus and lessening PPH.[6] So, optimum level of serum calcium is very important for contraction of uterine smooth 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 optimizing normal physiological calcium levels in the setting of augmented prolonged labour, which is at a higher risk of poor uterine contraction and PPH.[10]

Material and method:

Over the course of 12 months, spanning from January 2022 to December 2022, this case control study took place at the Dept. of Obstetrics & Gynecology in Sir Salimullah Medical College Mitford Hospital, Dhaka. Consecutively consenting 200 pregnant women who were admitted with term, alive, singleton pregnancy with or without spontaneous onset of labor were enrolled in this study following inclusion and exclusion criteria

Inclusion criteria:

- Age: 18-35 year
- Pregnant women with or without spontaneous term pregnancy onset of labor admitted for delivery.
- Alive, singleton pregnancy.

Exclusion criteria:

- Women presented in second stage of labor,
- Multiple pregnancy
- Polyhydramnios,
- Fibroids in pregnancy,
- Obstetric disorders- abruptio placenta and placenta previa.
- Co-existing medical disorders like hypertensive disorders, diabetes mellitus.

After enrollment 5 ml of blood sample was collected from each of the study subjects to measure the serum calcium level. Partograph was employed as needed to monitor the progress of labor. Following delivery to the baby, active management of third stage of labor was routinely done. The participants were monitored for evidence uterine atonicity. Features of atonicity- uterus feels soft, distended, lack of muscle tone and per vaginal bleeding. Then the study subjects are divided into two groups. Group-A: Hypocalcaemia with uterine atony and Group-B: Normocalcaemia with uterine atony.

The obtained date were processed and analysed using SPSS version 24 and chi-square test were used to compare the atonicity in both groups and P-value <0.05 at 95% confidence interval was considered as statistically significant.

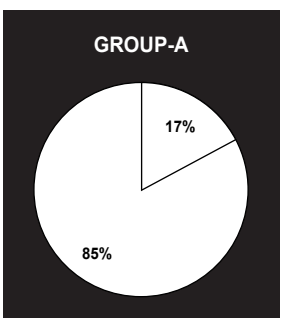
Results:

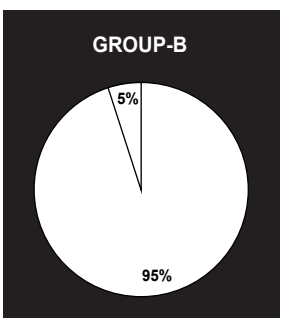
Total 200 study subjects were studied among them hypocalcaemia where serum calcium <8.5 mg % and normocalcaemia where serum calcium >8.5 mg%. In women with hypocalcaemia 17 patient developed uterine atonicity and in women with normocalcaemia only 5 patient developed uterine atonicity.

Table-I: Association of serum calcium level with uterine atonicity

Serum calcium levels	Uterine atonicity	Uterine atonicity absent	P-value
<8.5 mg%	17	83	0.017
>8.5 mg%	05	95	

P-value was determined by Chi-square (X^2) test.





The mean of serum calcium of pregnant women who developed Primary PPH was 7.98±0.39 mg/dL while 8.78±0.64 mg/dL in patients who didn't develop Primary PPH. There was statistically significant association serum calcium and Primary PPH (p<0.001).

Table-II: Relation between serum calcium and occurrence of Primary PPH (n=22)

Primary PPH	Mean	SD	p-value*
Yes	7.98	0.39	<0.001
No	8.78	0.64	

*p value was determined by Independent student test

Discussion:

Postpartum haemorrhage due to uterine atonicity have serious adverse consequences to mother including maternal morbidity & mortality. For managing such condition sometimes peripartum hysterectomy needed. Calcium plays an important role in Post-partum hemostasis and uterine tone and ionized calcium is a key coagulation cofactor. Identification of hypocalcaemia before delivery may facilitate rapid identification of high risk patients requiring multidisciplinary obstetric and medical management.

This study aimed that there is an association of hypocalcaemia with uterine atonicity and primary post-partum haemorrhage.

Optimum serum calcium level is essential for the effective uterine contraction and low serum calcium level may cause atonic uterus and PPH. Incidence of atonicity of uterus is more when serum calcium <8.5 mg% as compared to serum calcium >8.5 mg% which is statistically significant, 17 patient developed uterine atonicity in hypocalcaemic group. Similar result reported by Premalahata, 2016.[11] The mean serum calcium who developed primary PPH was 7.98±0.39 mg/dl while 8.78±0.64 mg/dL in patients who didn't develop primary PPH. There was significant relation between serum calcium and uterine atonicity in PPH patient (p<0.017). Patient who didn't develop PPH had higher level of serum calcium in comparison to those who developed PPH due to uterine atony and there was statistically significant association which is similar to my current study findings[12] (Adinma et al., 2019).

Conclusion:

PPH accounts for 3% to 8% of all deliveries.[13] Prevention of PPH is an obstetric challenge for us because it is the utmost cause maternal mortality and morbidity. The most common cause of postpartum haemorrhage is uterine atony.[14] There are multiple risk factor associated with uterine atony.[13] This study has shown that hypocalcaemia is associated with uterine atonicity in primary PPH. And study suggest that there is a need to perform a randomized controlled trail to assess the effects of serum calcium, calcium supplements in minimizing and controlling the incidence and severity of primary PPH due to uterine atonicity. Identification of hypocalcaemia may aid in recognizing high risk patients who require multidisciplinary obstetric and medical management.

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