

Frequency of Hypocalcemia in Patients Undergoing Plasmapheresis

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ABSTRACT

Objective: To determine the number of patients who experience Hypocalcemia while receiving Plasmapheresis.

Study Design: An observational study that is cross-sectional and descriptive.

Place and Duration of Study: The research was conducted for one year, from 21st April 2020 to 21st April 2021.

Methods: A total of 177 individuals having Plasmapheresis between the ages of 15 and 45 were included in the study. Participants in the study who had recently undergone thyroid or parathyroid surgery, those with renal failure, arrhythmias, and persons who were difficult to comply with, were excluded (1). After that, each patient had a therapeutic plasma exchange, commonly known as Plasmapheresis, performed by skilled medical professionals with comparable levels of expertise. After the process, a venous blood sample was drawn to measure the amount of calcium ionized. Hypocalcemia was either present or not, defined as ionized calcium levels below 4.5 mg/dl.

Results: The average age of the eighty-two patients was 38.43 years, and 46.33% were between 36 and 45. Among these 117 patients, 109 of them were men and 68 of them were women, making up 38.42% of the entire population's patients (61.58%), or a ratio of 1:6:1. Hypocalcemia was found in 18 people with a percentage of 10.17%, whereas the disorder was absent in 159 patients with a percentage of 89.83%. Patients in this group are undergoing Plasmapheresis.

Conclusion: Therefore, Plasmapheresis should be used to routinely evaluate serum calcium levels to appropriately manage any cases of Hypocalcemia that may emerge since Hypocalcemia often happens in patients getting Plasmapheresis (10.17% of the time).

Keywords: Exchange of plasma, calcium level.

INTRODUCTION

Plasmapheresis is a drawing technique involving extracting blood plasma from the body, dividing it into cells and plasma, and injecting the cells into the arteries. It is used to treat autoimmune conditions primarily by detaching antibodies (2). Plasmapheresis is essentially a method of cleansing human blood. Michael Rubinstein saved a young man in 1959 who had thrombotic thrombocytopenic purpura at the historic Cedars of Lebanon Hospital in Los Angeles, and this was the first time Plasmapheresis was used to treat an immunological illness. In the U.S., Plasmapheresis was first performed in 1963 and 1968 (3).

By employing a needle or recently implanted drip, Plasmapheresis primarily involves the removal of plasma-rich blood from the body. A cell splitter is employed to separate the plasma from the blood. Unlike traditional Plasmapheresis, which initially keeps the plasma, which includes the antibodies, before giving it to the patient, therapy-receiving patients receive their blood cells back after the plasma has been separated (4). During the plasma exchange operation, the detached plasma is removed, and the patient is given albumin, spare donor plasma, or an albumin and salt mixture, frequently made up of 70% albumin and 30% salt. Seldom, additional replacement fluids such as hydroxyethyl starch may be used in patients who refuse blood transfusions, although they are rarely used due to their negative side effects (5).

Plasmapheresis is especially recommended for treating autoimmune diseases such as Guillain-Barre syndrome, myasthenia gravis, chronic inflammatory demyelinating poly-Neurotherapy, thrombotic thrombocytopenic purpura, multiple sclerosis, etc.

Before the blood is returned to the body after plasma exchange, unhealthy plasma is exchanged for healthy plasma or a plasma substitute (6). Treatments for Plasmapheresis take 3 to 4 weeks and are administered intravenously (IV) into a peripheral vein.

Hypocalcemia has long been a serious obstacle to Plasmapheresis. Hypocalcemia is a general and horrifyingly destructive result of therapeutic plasma exchange. Low blood calcium levels in adults are known as Hypocalcemia (7). Unbound ionized calcium, calcium bonded to anions like citrate and phosphate, and calcium connected to proteins are the three major

phases of calcium in human blood (mainly albumin) (8). Ionized calcium that is unbound is the only calcium that functions physiologically. Dietary changes, vitamin D-rich foods, and magnesium supplements have all been useful in treating Hypocalcemia.

Before 2012, Pakistan lacked a plasmapheresis treatment facility. The third medical unit of the Nishtar hospital in Multan housed the first Plasmapheresis facility, which is still operational today. The objective of my research was to detect the Hypocalcemia produced by Plasmapheresis that may be avoided by following the right procedures as it is currently a vital medical technique.

MATERIALS AND METHODS

The Plasmapheresis Unit, the third medical division of Nishtar Hospital Multan, also housed a descriptive, cross-sectional study. The research was conducted from 21st April 2020 to 21st April 2021 when it was finished. One hundred seventy-seven patients in total made diverse contributions to the study. The sample size of 177 patients has been estimated using the suggested approach with a 95% level of confidence, a 4% error margin, and the assumption of an 8% anticipated frequency of Hypocalcemia.

Sequential non-probable sampling was employed in this experiment. Additionally, individuals with normal Q.T. intervals on their ECGs and normal blood concentrations of ionized calcium before Plasmapheresis were included, and patients who underwent Plasmapheresis while hospitalized. Additionally, all sexes and patients between the ages of 15 and 45 had to meet the inclusion criteria (9). Patients who satisfied the exclusion criteria included those who had previously had parathyroid and thyroid surgery, had a Glasgow Coma Scale of less than 15 by 15, had renal failure, and had a prolonged Q.T. interval before the ECG test, were unwilling volunteers, and met other criteria as well.

Data Analysis: The information for this study was assessed using the SPSS 23 version. The information was assessed using descriptive statistics. S.D. Mean was used to calculate the patients' ages, and qualitative variables were employed to calculate fractions and occurrences, such as inquiries concerning Hypocalcemia and gender. A chi-square test with a P 0.05 criterion was used to determine whether phase and sex, two stratified outcome transformers, significantly affected the result.

RESULTS

Participants in the research ranged in age from 15 to 45, with a mean age of 38.43 ± 4.67 years. Table I demonstrates that 82 (56.33%) patients had an average age between 36 and 45. The 177 instances had a ratio of 109 (61.58%) men to 68 (38.42%) women or a ratio of 1.6:1.

Figure II shows that only 18 of the 159 patients undergoing Plasmapheresis (10.17%) had Hypocalcemia, showing that this condition was not widespread. It can be shown in Table II that there was no appreciable variation in the prevalence of Hypocalcemia among the different age groups when stratification was done based on age groups. Similarly, when stratification was done based on gender, it was discovered that there was no discernible difference between males and females.

Table 1: Age distribution of the patients (n=177).

Patient's age (in years)	Patients in Number	Percentage %
15-25	32	18.08
26-35	63	35.59
36-45	82	46.33

The average age is 38.43 years, with a standard deviation of 4.67 years.

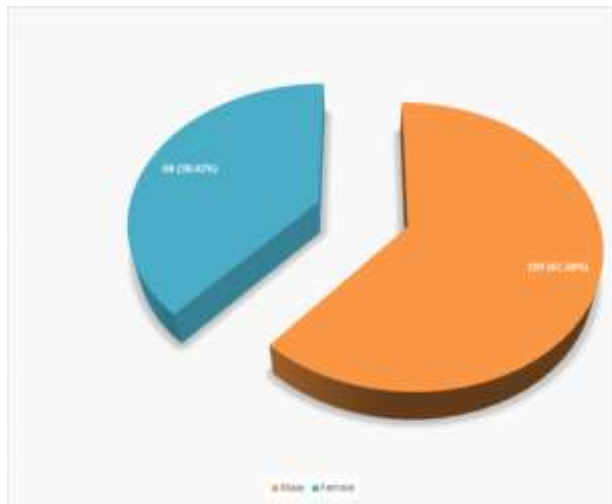


Figure 1: Patient percentages by gender (n=177)

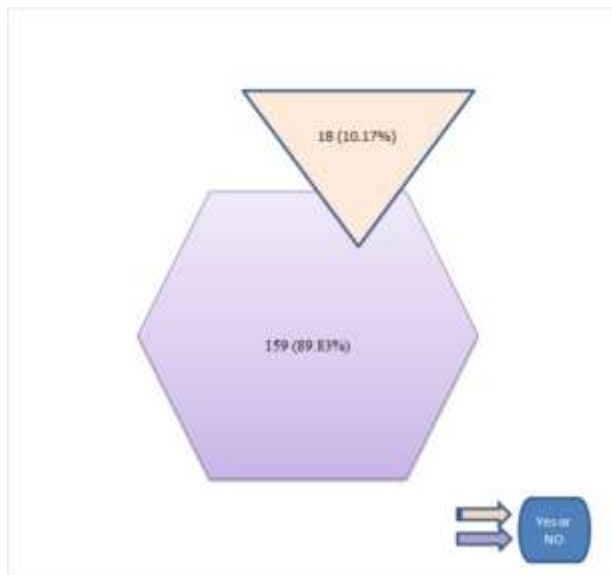


Figure 2: Hypocalcemia prevalence (n=177).

Table 2: Age group stratification in relation to hypocalcemia.

Age (period)	Hypocalcemia		Probability
	Never	Certainty	
15-25	29 (90.63%)	03 (9.37%)	0.693
26-35	58 (92.06%)	05 (7.94%)	
36-45	72 (87.80%)	10 (12.19%)	

Table 3: Stratification of Gender with respect to Hypocalcemia

Gender	Hypocalcemia		p-value
	Yes	No	
Female	05 (7.35%)	63 (92.65%)	0.327
Male	13 (11.93%)	96 (88.07%)	

DISCUSSION

This is possibly the first research from the South Punjab district of Pakistan, representing the number of patients who experience hypocalcemia while receiving Plasmapheresis and the cause of this condition. Our hospital has seen the significance of the treatment of Plasmapheresis, so it has tried a lot to treat as many patients as possible (10). This research has determined surprising outcomes.

The malicious phase of patients in our research was greater than in different western republics. This specifies that the individuals living in the South Punjab district of Pakistan are more inclined to get exposed to hypocalcemia (11). This highlights that more threat stratification, especially at primary age, and customization of threatening aspects to prevent patients from getting Plasmapheresis.

Amongst the most threatening aspects of Plasmapheresis, hypocalcemia was the utmost predominant in our municipal. The predominance of hypocalcemia while receiving Plasmapheresis is far greater than ever reported by researchers. This research has exposed that 10.17% of patients in South Punjab were receiving Plasmapheresis, and they got exposed to hypocalcemia.

The Cobe Spectra, Fenwal Aurora, and Fresenius COM.TEC family of machines are centrifuge-based systems that may be used for Plasmapheresis. A double-lumen central venous catheter or two large-bore antecubital peripheral lines are required for patients. Anesthesia is the first stage in preparing the patient for Plasmapheresis, followed by placement (12). Patients who develop hypocalcemia or hypomagnesaemia symptoms before, during, or after the treatment can be treated with replacement calcium or magnesium.

During the surgery, patients might commonly get hypothermic. Thus they need to be warmed up properly.

It has been known for more than 50 years that Plasmapheresis has the potential to be utilized therapeutically since it can be used to separate blood cells from plasma. As a result, this technique is also known as therapeutic plasma exchange (TPE), mostly because of its advantages for health, even if it may also be used to gather plasma for the production of various drugs (13).

Numerous medical disciplines may be engaged since Plasmapheresis treats disorders affecting the nervous system, kidneys, hematology, and other organ systems. In the past 40 years, Plasmapheresis has developed into a routine technique that is generally safe. There is a wide range of methods available today, each with potential drawbacks.

Plasmapheresis is not risk-free as an invasive procedure. Less than 1% of all plasmapheresis operations result in serious problems, although about 40% of patients have some issue. The negative side effects are linked to big vascular catheterization, coagulation problems, septic issues brought on by compromised immunity due to the elimination of antibodies during the surgery, catheter-associated infections, and those connected to blood transfusion products (14).

This study was done to find out how often plasmapheresis patients have hypocalcemia. In our study, 18 (10.17%) patients receiving Plasmapheresis had hypocalcemia, while 159 (89.83%) did not.

CONCLUSION

Before the transplant, antibodies from the recipient against the donor blood type are removed via Plasmapheresis so they cannot attack and harm the donated organ (15). Hypocalcemia, the most frequent occurrence during Plasmapheresis and can result in various other negative problems, can occur during Plasmapheresis due to low calcium levels in the individuals. This study discovered that the local population in Pakistan's district of South Punjab is more susceptible to developing hypocalcemia because they do not consume enough calcium-friendly diet.

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