A comparative study of the effectiveness of platelet harvest processing time, platelet yield, and ACD using Single-needle vs. Double-needle procedure

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Abstract

Introduction: Technological developments in automated cell separators have significantly increased the productivity and quality of apheresis platelet collection. Several studies on automated Plateletpheresis have been performed to examine platelet concentrate quality and its relationship to the donor's biological contribution (platelet count and/or total mass). Traditional blood giving, on the other hand, involves taking a unit of whole blood from a donor and sending it to a laboratory to be separated into its four components - red blood cells, white blood cells, platelets, and plasma. The components are stored and, based on the medical need, are administered to patients following surgery, an accident, sickness, or chemotherapy. While the donor is still connected to the separation apparatus, apheresis separates the blood into these components. **Materials and Methods:** The present study was carried out to evaluate the platelet collection from apheresis devices and compare the efficiency of platelet collection processing time, platelet yield, and ACD used. All Plateletpheresis procedures were performed following the departmental standard operating procedure using a closed system apheresis kit and ACD-A anticoagulant in the proportion of 1:12. The endpoint of each procedure was based on the target yield of $3x10^{11}$ platelets per unit maintaining a blood flow rate for all collections at 50-80 mL/min. To measure the pre-and post-donation hematological values, whole blood samples were collected in EDTA vials just before and within 30 minutes after the procedure. **Result & Observation:** A total of 156 donors underwent apheresis, of which 147 (94.23%) were men and 09 (5.76%) were women. Majority of the donor 94.23% are male donor and very few 5.76% are female donor. The average procedure time required by SN was 86.41 minutes, while the average procedure time by DN was 70.79 minutes. According to mean values, the product yield in SN was 3.10 lac/L and in DN it was 3.11 lac/L. The difference in the end product count between the two was 8.82 lac/L in SN and 8.90 lac/L in DN. The amount of ACD used varied depending on the process, ranging from 220 ml to 460 ml on average in the procedure done on fresenius.com.tec. The procedure's duration was found to be significant with a p-value of 0.000, and the amount of ACD used was also found to be significant with a p-value of 0.001. **Conclusion**: The overall mean value of the different parameters in the study was analyzed, and the student t-test was used to determine the significance of the value. Of all the parameters, the time spent performing the procedure was found to be significant with a p-value of 0.000, and the amount of ACD used was also found to be significant with a p-value of 0.001. Product yield, total product count, and processing time for the DN procedure were all significantly better than for the SN method.

Keywords: Plateletpheresis, ACD, Platelet, Blood, Donation.

Introduction

The productivity and purity of platelet collection during apheresis have significantly increased thanks to technological advancements in automated cell separators. The quality of platelet concentrates and its relationship to the biological contribution (platelet count and/or total mass) of the donor have been the subject of numerous research on automated Plateletpheresis [1]. Traditional blood donation, on the other hand, involves taking a unit of whole blood from a donor and sending it to a facility where it is divided into its four components: red blood cells, white blood cells, platelets, and plasma. After surgery, an accident, an illness, or after chemotherapy, the components are stored and distributed to patients based on their medical needs. While the donor is still attached to the separation apparatus, apheresis divides the blood into these components. A rotating centrifuge or a rotating belt separates the donor's whole blood into its components based on density. [2]

Apheresis

Apheresis is a medical procedure that involves separating whole blood from a donor or patient into its component parts so that one specific portion can be removed. The remaining blood components are then infused back into the bloodstream of the donor or recipient. During apheresis, a part of the blood that contains components that cause disease is removed in order to gather components from donor blood (like platelets or plasma) and treat some medical conditions. In all apheresis procedures, the blood is delivered through tubing from the patient or donor to a device that separates the different blood constituents. Either a centrifuging process or a filtering process separates the components of the blood in the equipment.The desired blood component is then extracted after the separation, and the leftover blood components are then reinfused back into the patient.[3]

Materials and Methods

Platelet collection from apheresis devices was evaluated in this study, and the efficacy of platelet collection processing time, platelet yield, and ACD usage were compared. A total of 156 donors underwent apheresis, with 147 male donors and 09 female donors, with 53 undergoing SN apheresis and 103 undergoing DN apheresis. The donor-cell separator used was determined by the availability of separators at the moment of the procedure. For each procedure, the same resident doctors used the fresinius.com tec separator.

All plateletpheresis operations were performed in accordance with the staff standard operating procedure, using a closed system apheresis kit and ACD-A anticoagulant in a 1:12 ratio. The target yield for each operation was $3x10^{11}$ platelets per unit, and all blood flow rates were maintained between 50 and 80 mL/min. To evaluate the haematological values before and after the donation, whole blood samples were collected in EDTA vials just before and 30 minutes after the procedure. Variables such as Hb concentration, Het, platelet, and WBC counts, mean platelet volume (MPV), and platelet distribution width (PDW) were measured using a calibrated automated instrument.

The data was analyzed using the statistical computer program SPSS. The spearman correlation was used to evaluate pre and post haematological readings.

Result & Observation

Age & Sex distribution of donor

The age of the donor accepted for donation at centre of study is 18-60 years most of donor between the age group of 21 to 30 years (47.43%) on both aphaeresis procedure SN and DN method and was closely followed by donor between 31 to 40 years (35.89%) of age very few donors were less than 20 years and more than 50 years of age. Most donors (85.89%) were between the ages of 18 and 40, while only a small percentage (14.10%) were found to be between the ages of 41 and 60.

Majority of donor (85.89 %) was between the age group 18-40 years very few donor were (14.10%) observed between the age group of 41-60 years of age. (Refer to table no 1, bar chart no.1)

A total of 156 donors underwent apheresis, of which 147 (94.23%) were men and 09 (5.76%) were women. Majority of the donor 94.23% are male donor and very few 5.76% are female donor. (Refer to table no 2, bar chart no.1)

Sex distribution of donors

Total of 156 donors were subjected for apheresis out of them 147 male (94.23%) donor and 09 (5.76%) are female donor. (Refer to table no 2)

Distribution of PHPL according to procedure type

A total of 156 donors underwent apheresis, of which 103 experienced DN apheresis and 53 underwent SN apheresis. Majority of donor (66.02%) underwent DN procedure (Refer to table no 3)

Comparison of mean haematological values of pre-donation and post-donation

The mean platelet count before apheresis was 244.49 lac/ql with the range of 150-478lac/ql and the mean platelet count after apheresis 170.93 lac/ql with the range of 109-331 lac/ql. The mean value of platelet count dropped significantly in post donation. Similarly the mean Hb level before apheresis was 15.5 g/dl with the range of 12.5-18.5 g/dl and after apheresis 15.00g/dl with the range of 10.2-17 g/dl the mean value of Hb dropped marginally in post donation and the mean WBC count before the apheresis is 7.57 X 10^3 /mm^3 with the range of 3.9-15.1X 10^3 /mm^3 and after apheresis it is 7.20 X 10^3 /mm^3 with the range of 3.9-14.9X 10^3 /mm^3. The mean MPV count before the apheresis is 9.33 with the range 6-13 and after apheresis it is 9.36 with the range of 7-13.1. There was no change in PDW before and after the apheresis (refer to table no.4.)

Overall distribution of mean pre and post donation haematological and efficiency parameter

The mean platelet count before apheresis was 244.49 lac/qL and the mean platelet count after apheresis 170.93 lac/qL. The mean value of platelet count dropped significantly in post donation. Similarly, the mean Hb level before apheresis was 15.5 g/dl and after apheresis 15.00 g/dl the mean value of Hb dropped marginally in post donation and the mean WBC count before the apheresis is 7.57 X 10^3/mm^3 and after apheresis it is 7.20 X 10^3 /mm^3. The mean MPV count before the apheresis is 9.33 and after apheresis it is 9.36 there was no change in PDW. (Refer to table no.5)

Comparisons of mean product yield, mean time taken, and mean final product count according to procedure type

Mean time taken in the procedure performed by SN was 86.41 min and in DN procedure it was 70.79 min. The product yield in SN was 3.08 lac/qL and in DN it was 3.11 lac/qL and the difference of final product count is 8.82 lac/qL in SN and 8.90 lac/qL in DN according to mean values. The product yield, final product count, and time taken by DN procedure was comparatively better then with SN procedure.

Mean ACD volume used

The volume of ACD used varied from one procedure to another in the procedure performed on fresenius.com.tec it ranged from 210 ml to 430 ml with the mean of 307.1 ml. The volume of mean ACD used by SN procedure was 330.21 ml with a range of (210-430 ml) and the volume of mean ACD used by DN procedure was 292.7 ml. the mean ACD volume used was lesser in DN procedure when compared to SN procedure.

Case Processing Summary of pre and post-plt count, Hb, PDW and MPV

This is a summary of case processing for eight variables - PrePLCo, PostPLCo, PreHb, PostHb, PrePDW, PostPDW, PreMPV, and PostMPV. The table presents the number of valid cases, missing cases, and the total number of cases for each variable.

For all eight variables, there were 156 valid cases, indicating that there were no missing values in the dataset. The percentage of valid cases for each variable was also 100%, indicating that all cases had complete data for these variables.

This summary suggests that the dataset is complete and no data imputation or cleaning is needed for these variables. However, it is important to note that this summary only pertains to these eight variables and does not provide any information on the completeness or quality of other variables in the dataset. (Refer to table no.6)

Descriptive Statistics for pre and post-plt count, Hb, PDW and MPV

These are descriptive statistics for six different variables: PrePLCo, PostPLCo, PreHb, PostHb, PrePDW, PostPDW, PreMPV, and PostMPV. For each variable, the table reports the mean, standard error, 95% confidence interval for the mean, 5% trimmed mean, median, variance, standard deviation, minimum and maximum values, range, interquartile range, skewness, and kurtosis.

The variable PrePLCo has a mean of 244.4872, a standard deviation of 60.88386, and a range of 328. The variable PostPLCo has a mean of 170.9295, a standard deviation of 57.16012, and a range of 282. The variables PreHb and PostHb both have means around 15, with PostHb slightly lower than PreHb. The variables PrePDW and PostPDW both have means around 13, with PostPDW slightly lower than PrePDW. Finally, the variables PreMPV and PostMPV both have means around 9, with PostMPV slightly higher than PreMPV.

The skewness and kurtosis values indicate that all six variables are approximately normally distributed, with skewness and kurtosis values close to zero. The 95% confidence intervals for the mean provide an estimate of the range in which the true population mean is likely to fall. The interquartile ranges provide information about the spread of the data, with larger values indicating more variability. Overall, these descriptive statistics provide a useful summary of the characteristics of each variable. (Refer to table no.7)

Tests of Normality pre and post-plt count, Hb, PDW and MPV

The table provides the results of normality tests using two different tests: Kolmogorov-Smirnov and Shapiro-Wilk. The tests were conducted on eight different variables, including PrePLCo, PostPLCo, PreHb, PostHb, PrePDW, PostPDW, PreMPV, and PostMPV, with a sample size of 157.

For the Kolmogorov-Smirnov test, the statistic and degrees of freedom (df) are provided along with the significance level (Sig.), which indicates whether the distribution of the variable is significantly different from a normal distribution. For all variables, the Sig. value is greater than .05, indicating that we fail to reject the null hypothesis of normality.

Similarly, the Shapiro-Wilk test provides the statistic and df along with the Sig. value. For most variables, the Sig. value is less than .05, indicating that we reject the null hypothesis of normality. However, it's important to note that the Sig. value for PostPLCo, PreHb, PostPDW, and PreMPV is greater than .05, suggesting that we fail to reject the null hypothesis of normality for these variables.

Finally, it's important to note that a Lilliefors Significance Correction was applied, which provides a more accurate estimate of the true significance level. The asterisk (*) in the table indicates that the reported Sig. value is a lower bound of the true significance level.

In summary, the normality tests suggest that most variables in the dataset are not normally distributed, except for PostPLCo, PreHb, PostPDW, and PreMPV. However, it's important to interpret these results with caution, as the sample size and the specific characteristics of the dataset may influence the results of normality tests. (Refer to table no.8)

Descriptive Statistics for pre and post-plt count, Hb, PDW and MPV

These are the descriptive statistics for eight variables: PrePLCo, PostPLCo, PreHb, PostHb, PrePDW, PostPDW, PreMPV, and PostMPV. The table provides information about the number of observations (N), the minimum and maximum values, the mean, standard deviation, skewness, kurtosis, and the standard errors for skewness and kurtosis.

For PrePLCo, the variable ranges from 150.00 to 478.00, with a mean of 244.4872 and a standard deviation of 60.88386. The skewness value is 0.592, indicating a slight right-skewness, and the kurtosis value is 0.583, suggesting a platykurtic distribution.

Similarly, for PostPLCo, the variable ranges from 53.00 to 335.00, with a mean of 170.9295 and a standard deviation of 57.16012. The skewness value is 0.589, indicating a slight right-skewness, and the kurtosis value is 0.232, suggesting a platykurtic distribution.

The remaining variables (PreHb, PostHb, PrePDW, PostPDW, PreMPV, and PostMPV) also have their respective minimum and maximum values, means, standard deviations, skewness, and kurtosis values. These variables show different ranges, means, and standard deviations, and their skewness and kurtosis values provide information about their distributional characteristics.

The "Valid N (listwise)" value indicates that all variables have a valid sample size of 156, meaning there are no missing values for any of the variables.

These descriptive statistics provide a summary of the central tendency, variability, and shape of the distributions for each variable in the dataset. (Refer to table no.9)

Paired Samples Statistics for pre- and post-plt count, Hb, PDW and MPV

The paired samples statistics show the mean, number of observations, standard deviation, and standard error mean for each pair of variables.

For Pair 1, which compares PrePLCo and PostPLCo, the mean PrePLCo score was 244.49 and the mean PostPLCo score was 170.93. The standard deviation for PrePLCo was 60.88 and for PostPLCo was 57.16. The standard error mean for PrePLCo was 4.87 and for PostPLCo was 4.58.

For Pair 2, which compares PreHb and PostHb, the mean PreHb score was 15.00 and the mean PostHb score was 14.43. The standard deviation for PreHb was 1.29 and for PostHb was 1.34. The standard error mean for PreHb was 0.10 and for PostHb was 0.11.

For Pair 3, which compares PrePDW and PostPDW, the mean PrePDW score was 13.21 and the mean PostPDW score was 13.08. The standard deviation for PrePDW was 2.68 and for PostPDW was 2.69. The standard error mean for PrePDW was 0.21 and for PostPDW was 0.22.

For Pair 4, which compares PreMPV and PostMPV, the mean PreMPV score was 9.37 and the mean PostMPV score was 9.39. The standard deviation for PreMPV was 2.07 and for PostMPV was 2.00. The standard error mean for PreMPV was 0.17 and for PostMPV was 0.16. (Refer to table no.10)

Paired Samples Test for pre- and post-plt count, Hb, PDW and MPV

Based on the paired samples statistics and tests, we can see that for Pair 1 (PrePLCo and PostPLCo), there is a statistically significant difference ($p < .001$) with a mean difference of 73.55769 and 95% confidence interval ranging from 67.71780 to 79.39759. This indicates that there was a significant change in platelet count after the treatment.

For Pair 2 (PreHb and PostHb), there is also a statistically significant difference ($p < .001$) with a mean difference of 0.57051 and 95% confidence interval ranging from 0.50165 to 0.63938. This indicates that there was a significant change in hemoglobin level after the treatment.

For Pair 3 (PrePDW and PostPDW), there is a statistically significant difference ($p < .001$) with a mean difference of 0.13397 and 95% confidence interval ranging from 0.10492 to 0.16303. This indicates that there was a significant change in platelet distribution width after the treatment.

However, for Pair 4 (PreMPV and PostMPV), there is no statistically significant difference (p = .296) with a mean difference of -0.01987 and 95% confidence interval ranging from -0.05727 to 0.01753. This indicates that there was no significant change in mean platelet volume after the treatment. (Refer to table no.11)

Independent Samples Test for pre and post platelet count

The results of the Independent Samples Test for the comparison between PrePLCo and PostPLCo are presented in the table above. The Levene's Test for Equality of Variances showed that the assumption of equal variances was met in the first column (F = 1.723, p = 0.191) but not in the second column (F = 2.877, p = 0.092).

The t-test for Equality of Means indicated that there was no significant difference between the means of PrePLCo and PostPLCo, regardless of whether equal variances were assumed or not (t = -0.793, p = 0.429 for both assumptions). The mean difference was negative, indicating that the PostPLCo scores were lower than the PrePLCo scores, with a mean difference of -7.74359 for both assumptions. The standard error of the difference was 9.76090 assuming equal variances and 9.16571 assuming unequal variances. The 95% confidence interval of the difference ranged from -27.02613 to 11.53895 assuming equal variances, and from -27.03047 to 11.54329 assuming unequal variances. These results suggest that there was no significant change in PLCo scores before and after the intervention. (Refer to table no.12, Chart no 2.)

Independent Samples Test for pre and post Hb

This table displays the results of an independent samples t-test conducted to compare the mean values of two groups on two continuous variables (PreHb and PostHb), assuming equal and unequal variances. The Levene's test for equality of variances was also conducted.

For the PreHb variable, the Levene's test for equality of variances showed that the assumption of equal variances was met, with F(1, 154) = 0.365 and p = 0.546. The t-test for equality of means showed that there was no statistically significant difference between the mean values of PreHb for the two groups, t(154) = -1.626, p = 0.106 assuming both equal and unequal variances. The mean difference was -0.33462, with a standard error of 0.20575, and a 95% confidence interval for the difference ranging from -0.74106 to 0.07183 when equal variances are assumed, and -0.74107 to 0.07184 when they are not assumed.

For the PostHb variable, the Levene's test for equality of variances showed that the assumption of equal variances was also met, with F(1, 154) = 0.173 and p = 0.678. The t-test for equality of means showed that there was a statistically significant difference between the mean values of PostHb for the two groups, t(154) = -3.092, p = 0.002 assuming both equal and unequal variances. The mean difference was -0.64487, with a standard error of 0.20859, and a 95% confidence interval for the difference ranging from -1.05695 to -0.23280 when equal variances are assumed, and -1.05695 to -0.23280 when they are not assumed. (Refer to table no.13, Chart no 3.)

Independent Samples Test for pre and post PDW

Based on the results of the independent samples t-tests and Levene's tests for equality of variances, there were no statistically significant differences between the pre- and post-treatment values for any of the blood parameters measured (PLT count, Hb level, and PDW) in all four cases.

For the PLT count, the t-test showed that there was no significant difference in means, regardless of whether equal variances were assumed or not (t(154) = -.793, p = .429, equal variances assumed; t(149.745) = -.793, p = .429, equal variances not assumed). Levene's test for equality of variances was also not significant, indicating that the assumption of equal variances could be met (F(1, 152) = 1.723, p = .191).

For the Hb level, the t-test showed that there was no significant difference in means when equal variances were assumed (t(154) = -1.626, p = .106), but there was a significant difference when equal variances were not assumed (t(153.727) = -

1.626, p = .106). Levene's test for equality of variances was not significant (F(1, 152) = .365, p = .546), indicating that the assumption of equal variances could be met.

For the PDW, the t-test showed that there was no significant difference in means, regardless of whether equal variances were assumed or not (t(154) = -.158, p = .875, equal variances assumed; t(153.333) = -.158, p = .875, equal variances not assumed). Levene's test for equality of variances was also not significant, indicating that the assumption of equal variances could be met (F(1, 152) = .847, p = .359).

In summary, these results suggest that the treatments did not have a significant effect on the measured blood parameters. (Refer to table no.14)

Independent Samples Test for pre and post MPV

The overall mean value of various parameter of present study were analysed and to ascertain the Significant of the value the independent samples t-test was conducted to compare the means of two groups (Pre and Post) for several variables. The results are presented for four variables, namely PLCo, Hb, PDW, and MPV.

For the PLCo variable, there was no significant difference in means between the pre and post groups, as indicated by the t-test with both equal and unequal variances assumed ($p > .05$). The Levene's test for equality of variances showed non-significant results ($p > .05$) for both cases.For the Hb variable, there was a significant difference in means between the pre and post groups, as indicated by the t-test with both equal and unequal variances assumed ($p < .05$). The Levene's test for equality of variances showed non-significant results ($p > .05$) for both cases. For the PDW variable, there was no significant difference in means between the pre and post groups, as indicated by the t-test with both equal and unequal variances assumed ($p > .05$). The Levene's test for equality of variances showed non-significant results ($p > .05$) for both cases.

For the MPV variable, there was no significant difference in means between the pre and post groups, as indicated by the t-test with both equal and unequal variances assumed ($p > .05$). The Levene's test for equality of variances showed non-significant results ($p > .05$) for both cases.

In summary, the results suggest that there was a significant difference in means between the pre and post groups for the Hb variable, but no significant differences for the other three variables (PLCo, PDW, and MPV). (Refer to table no.15)

Discussion

The mean value of ACD used in present study in SN procedure 330.21 ml and in DN procedure it was 292.7 ml with the combined mean value in both procedure was 307 ml according to [4] reported 482 ml and report 417.58 ± 71.36 ml consumption in apheresis procedure variation in ACD volume used might be due to the different make and models of apheresis devices used that is (CFC continuous flow centrifugation or (IFT) type intermittent flow centrifugation) and variation causes by variable donor distribution in procedure type (SN and DN). [5]

The mean product yield in the present study was 3.08 X 10^{11} /L in SN and in DN it was 3.11 X 10^{11} /L and overall it was 3.11 X 10^{11} /L. [6] reported 3.1 x 10^{11} /L [7] reported 3.11 ± 0.40 x10^{11} /L [8] reported 2.90 ± 0.54 X 10^{11} /L in com.tec [9] reported 5.03 X 10^{11} /L in amicus [10] reported 3.3 X 10^{11} /L in com.tec the finding are in close agreement with present study. According to SN and DN procedure the mean product yield in present study was in SN is 3.08 X 10^{11} /L and in DN it was 3.11 x10^{11} /L are in close agreement with [11] they reported the value in SN 4.1 ± 0.3 X 10^{11} /L and in DN 4 ± 0.3 X 10^{11} /L.

In present study the meantime taken in SN procedure was 86.41 min and in DN it was 70.79 min **P. Pandey et al 2012** reported the value in SN 70 min and in DN it was 50 min [6] in present study the meantime taken in both procedure was 76.12 min **Burgstaler et al in 1999** reported 77 min [9] and **Benjamin et al in 1999** reported 71.5 min [10] the finding are close in agreement with present study. However **Coffe et al 2001** reported 87 – 109 min[12] and **Moog et al 2003** reported 55 ± 11 min [7]**Strasser et al 2005** reported 54 ± 13 min.[13]

Fevzi Altuntas et al in 2008 reported PLT count was higher with the COM.TEC than with the Amicus (198 × 103/μl vs. 223 × 103/μl; p = 0.035). The blood volume processed to reach a target PLT yield of ≥3.3 × 1011 was higher in the COM.TEC compared to the Amicus (3,481 vs. 2,850 ml; p < 0.001). The median separation time was also significantly longer in the COM.TEC than in the Amicus (61 vs. 44 min; p < 0.001). 91 and 88% of the PLT products collected with the Amicus and the COM.TEC, respectively, had a PLT count of ≥3.3 × 1011 (p = 0.325).[14]

Conclusion

The mean platelet yield was compared to the average platelet count prior to giving, and the student t test was used to determine the significance of the difference. The p value of 0.429 indicated that the difference was not statistically significant.The overall mean value of various parameter of present study were analysed and to ascertain the significant of the value the student t test was applied and out of all the parameter the time taken in the procedure was found to be significant p value was <0.000 and ACD volume used was also found to be significant were p value is <0.001.During a total span of study period donation was performed on 156 donors and 25 were temporary deferred and 07 were permanent deferred for various reasons and the most common cause for donor defer for donation in present study was platelet count below 1.5 lac/ųL (11 deferred), Hb value below-12.5g/dl.

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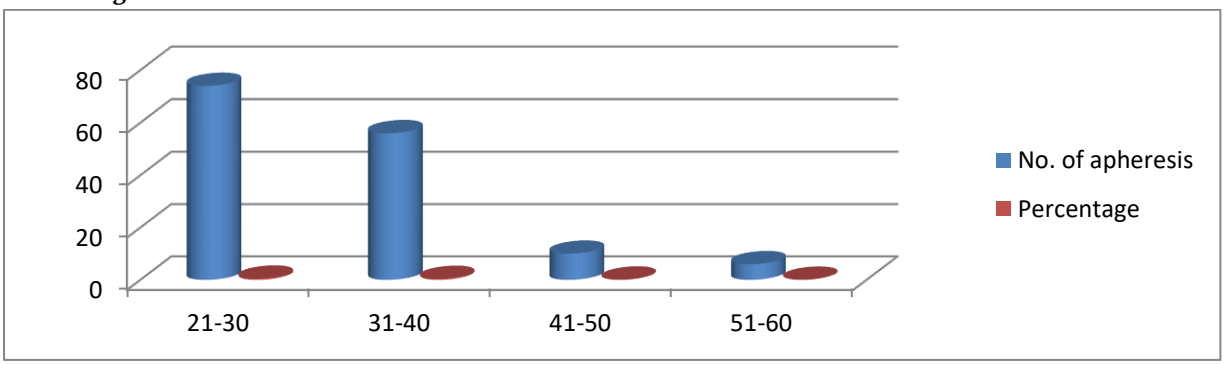
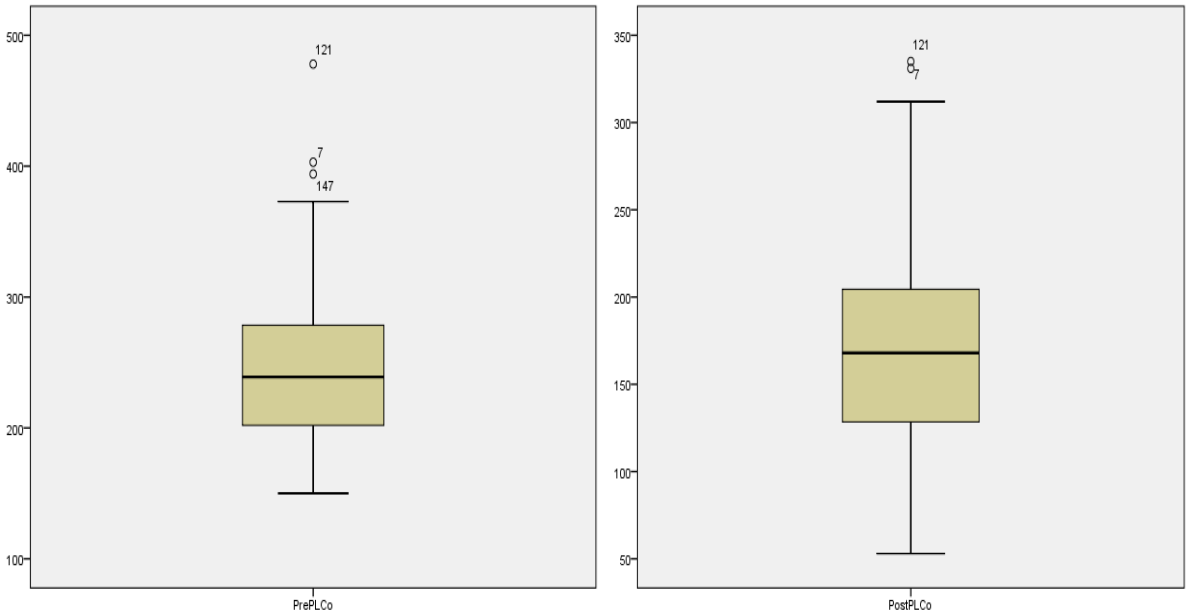
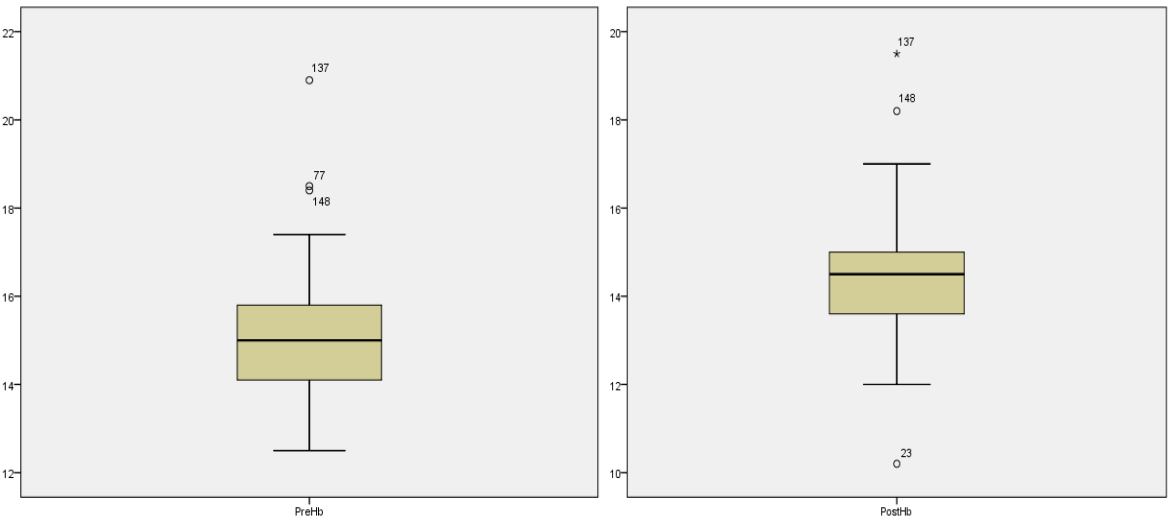


Bar chart no-1 **Distribution of no of PHPL by AGE group**

Box and Whiskers



Box and Whiskers chart no. 2 **Pre and Post platelet count**



Box and Whiskers chart no. 3 **Pre and Post Hb count**

LIST OF TABLES

Distribution of number of PHPL by age group

Range in yr.	No. of apheresis	Percentage
21-30	**74**	**47.43 %**
31-40	**56**	**35.89%**
41-50	**10**	**10.25%**
51-60	**06**	**03.84%**

Table no.1**Distribution of no. of PHPL by age group**

Total PHPL	Male	Percentage	Female	Percentage
156	147	94.23%	09	5.76%

Table no.2**Distribution of no. of PHPL by sex**

DONATION	SINGLE NEEDLE PROCEDURE	Percentage	DOUBLE NEEDLE PROCEDURE	Percentage
156	53	33.97%	103	66.02%

Table no.3**Distribution of no of apheresis by procedure**

HAEMATOLOGICAL VALUES	PRE PLTPHERESIS	RANGE	POST PLTPHERESIS	RANGE
PLTCOUNT(lac/ųl)	244.49	150-478	170.93	109-331
HB(g/dl)	15.5	12.5-18.5	15	10.2-17
WBC COUNT(cu/mm)	7.57	3.9-15.1	7.20	3.9-14.9
PDW (%)	18	8.5-18	18	8.5-18
MPV(fl)	9.33	6-13	9.36	7-13.1

Table no.4 **Comparison of mean haematological values of pre-pltpheresis and post pltpheresis**

Parameter	PreP C/ųl	Post PC/ųl	Product yield/ųl	Pre Hb g/dl	Post Hb g/dl	Pre WBC/mm^3	Post WBC/mm^3	Procedure duration on in min	Pre PDW (%)	Post PDW (%)	Pre MPV (fl)	Post MPV (fl)	ACD Vol (ml)
13	244.49	170.93	3.10	15.5	15.00	7.57	7.20	76.10	13.2	13.03	9.33	9.36	307.1

Table no.05 **Overall distribution of mean pre- and post-donation haematological and efficiency parameter**

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PrePLCo	156	100.0%	0	0.0%	156	100.0%
PostPLCo	156	100.0%	0	0.0%	156	100.0%
PreHb	156	100.0%	0	0.0%	156	100.0%
PostHb	156	100.0%	0	0.0%	156	100.0%
PrePDW	156	100.0%	0	0.0%	156	100.0%
PostPDW	156	100.0%	0	0.0%	156	100.0%
PreMPV	156	100.0%	0	0.0%	156	100.0%
PostMPV	156	100.0%	0	0.0%	156	100.0%

Table no.06 Case Processing Summary of pre and post-plt count, Hb, PDW and MPV

Descriptives				
			Statistic	Std. Error
PrePLCo	Mean		244.4872	4.87461
	95% Confidence Interval for Mean	Lower Bound	234.8579	
		Upper Bound	254.1164	
	5% Trimmed Mean		241.8618	
	Median		239.0000	
	Variance		3706.845	
	Std. Deviation		60.88386	
	Minimum		150.00	
	Maximum		478.00	
	Range		328.00	
	Interquartile Range		77.25	
	Skewness		.592	.194
	Kurtosis		.583	.386
PostPLCo	Mean		170.9295	4.57647
	95% Confidence Interval for Mean	Lower Bound	161.8892	
		Upper Bound	179.9698	
	5% Trimmed Mean		168.5328	
	Median		168.0000	
	Variance		3267.279	
	Std. Deviation		57.16012	
	Minimum		53.00	
	Maximum		335.00	
	Range		282.00	
	Interquartile Range		77.50	
	Skewness		.589	.194

	Kurtosis		.232	.386
PreHb	Mean		15.0045	.10342
	95% Confidence Interval for Mean	Lower Bound	14.8002	
		Upper Bound	15.2088	
	5% Trimmed Mean		14.9739	
	Median		15.0000	
	Variance		1.668	
	Std. Deviation		1.29168	
	Minimum		12.50	
	Maximum		20.90	
	Range		8.40	
	Interquartile Range		1.70	
	Skewness		.590	.194
	Kurtosis		2.089	.386
PostHb	Mean		14.4340	.10714
	95% Confidence Interval for Mean	Lower Bound	14.2223	
		Upper Bound	14.6456	
	5% Trimmed Mean		14.4218	
	Median		14.5000	
	Variance		1.791	
	Std. Deviation		1.33815	
	Minimum		10.20	
	Maximum		19.50	
	Range		9.30	
	Interquartile Range		1.40	
	Skewness		.121	.194
	Kurtosis		1.072	.386
PrePDW	Mean		13.2096	.21468
	95% Confidence Interval for Mean	Lower Bound	12.7855	
		Upper Bound	13.6337	
	5% Trimmed Mean		13.2074	
	Median		13.0000	
	Variance		7.190	
	Std. Deviation		2.68133	
	Minimum		8.50	
	Maximum		18.00	
	Range		9.50	
	Interquartile Range		4.28	
	Skewness		.074	.194
	Kurtosis		-.960	.386
PostPDW	Mean		13.0756	.21548
	95% Confidence Interval for Mean	Lower Bound	12.6500	
		Upper Bound	13.5013	
	5% Trimmed Mean		13.0625	
	Median		12.8000	
	Variance		7.243	
	Std. Deviation		2.69133	
	Minimum		8.40	
	Maximum		18.00	

	Range		9.60	
	Interquartile Range		4.77	
	Skewness		.074	.194
	Kurtosis		-.976	.386
PreMPV	Mean		9.3718	.16549
	95% Confidence Interval for Mean	Lower Bound	9.0449	
		Upper Bound	9.6987	
	5% Trimmed Mean		9.3443	
	Median		9.1000	
	Variance		4.272	
	Std. Deviation		2.06697	
	Minimum		6.00	
	Maximum		13.90	
	Range		7.90	
	Interquartile Range		3.65	
	Skewness		.243	.194
	Kurtosis		-1.100	.386
PostMPV	Mean		9.3917	.16022
	95% Confidence Interval for Mean	Lower Bound	9.0752	
		Upper Bound	9.7082	
	5% Trimmed Mean		9.3514	
	Median		9.0500	
	Variance		4.005	
	Std. Deviation		2.00119	
	Minimum		6.30	
	Maximum		13.10	
	Range		6.80	
	Interquartile Range		3.45	
	Skewness		.293	.194
	Kurtosis		-1.179	.386

Table no.07 Descriptive Statistics for pre and post-plt count, Hb, PDW and MPV

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PrePLCo	.060	156	.200*	.967	156	.001
PostPLCo	.067	156	.088	.971	156	.002
PreHb	.051	156	.200*	.967	156	.001
PostHb	.104	156	.000	.976	156	.007
PrePDW	.109	156	.000	.962	156	.000
PostPDW	.096	156	.001	.962	156	.000
PreMPV	.099	156	.001	.949	156	.000
PostMPV	.134	156	.000	.932	156	.000
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Table no.08 Tests of Normalitypre and post-plt count, Hb, PDW and MPV

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PrePLCo	156	150.00	478.00	244.4872	60.88386	.592	.194	.583	.386
PostPLCo	156	53.00	335.00	170.9295	57.16012	.589	.194	.232	.386
PreHb	156	12.50	20.90	15.0045	1.29168	.590	.194	2.089	.386
PostHb	156	10.20	19.50	14.4340	1.33815	.121	.194	1.072	.386
PrePDW	156	8.50	18.00	13.2096	2.68133	.074	.194	-.960	.386
PostPDW	156	8.40	18.00	13.0756	2.69133	.074	.194	-.976	.386
PreMPV	156	6.00	13.90	9.3718	2.06697	.243	.194	-1.100	.386
PostMPV	156	6.30	13.10	9.3917	2.00119	.293	.194	-1.179	.386
Valid N (listwise)	156								

Table no.09 Descriptive Statistics for pre and post-plt count, Hb, PDW and MPV

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PrePLCo	244.4872	156	60.88386	4.87461
	PostPLCo	170.9295	156	57.16012	4.57647
Pair 2	PreHb	15.0045	156	1.29168	.10342
	PostHb	14.4340	156	1.33815	.10714
Pair 3	PrePDW	13.2096	156	2.68133	.21468
	PostPDW	13.0756	156	2.69133	.21548
Pair 4	PreMPV	9.3718	156	2.06697	.16549
	PostMPV	9.3917	156	2.00119	.16022

Table no.10 Paired Samples Statistics for pre and post-plt count, Hb, PDW and MPV

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PrePLCo - PostPLCo	73.55769	36.92455	2.95633	67.71780	79.39759	24.881	155	.000
Pair 2	PreHb - PostHb	.57051	.43540	.03486	.50165	.63938	16.366	155	.000
Pair 3	PrePDW - PostPDW	.13397	.18369	.01471	.10492	.16303	9.110	155	.000
Pair 4	PreMPV - PostMPV	-.01987	.23648	.01893	-.05727	.01753	-1.050	155	.296

Table no.11**Paired Samples Test for pre- and post-plt count, Hb, PDW and MPV**

Independent Samples Test						
			PrePLCo		PostPLCo	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		1.723		2.877	
	Sig.		.191		.092	
t-test for Equality of Means	t		-.793	-.793	.754	.754
	df		154	149.745	154	148.838
	Sig. (2-tailed)		.429	.429	.452	.452
	Mean Difference		-7.74359	-7.74359	6.91026	6.91026
	Std. Error Difference		9.76090	9.76090	9.16571	9.16571
	95% Confidence Interval of the Difference	Lower	-27.02613	-27.03047	-11.19650	-11.20148
		Upper	11.53895	11.54329	25.01701	25.02199

Table no.12**Independent Samples Test for pre and post platelet count**

Independent Samples Test						
			PreHb		PostHb	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		.365		.173	
	Sig.		.546		.678	
t-test for Equality of Means	t		-1.626	-1.626	-3.092	-3.092
	df		154	153.727	154	154.000
	Sig. (2-tailed)		.106	.106	.002	.002
	Mean Difference		-.33462	-.33462	-.64487	-.64487
	Std. Error Difference		.20575	.20575	.20859	.20859
	95% Confidence Interval of the Difference	Lower	-.74106	-.74107	-1.05695	-1.05695
		Upper	.07183	.07184	-.23280	-.23280

Table no.13**Independent Samples Test for pre and post Hb**

Independent Samples Test					
		PrePDW		PostPDW	
		Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	.847		.697	
	Sig.	.359		.405	
t-test for Equality of Means	t	-.158	-.158	-.125	-.125
	df	154	153.333	154	153.484

	Sig. (2-tailed)		.875	.875	.901	.901
	Mean Difference		-.06795	-.06795	-.05385	-.05385
	Std. Error Difference		.43071	.43071	.43233	.43233
	95% Confidence Interval of the Difference	Lower	-.91882	-.91885	-.90792	-.90794
		Upper	.78292	.78295	.80022	.80025

Table no.14**Independent Samples Test for pre and post PDW**

Independent Samples Test						
			PreMPV		PostMPV	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		.972		.967	
	Sig.		.326		.327	
t-test for Equality of Means	t		.681	.681	.643	.643
	df		154	153.268	154	153.402
	Sig. (2-tailed)		.497	.497	.521	.521
	Mean Difference		.22564	.22564	.20641	.20641
	Std. Error Difference		.33155	.33155	.32106	.32106
	95% Confidence Interval of the Difference	Lower	-.42934	-.42937	-.42783	-.42785
		Upper	.88062	.88065	.84065	.84067

Table no.15 **Independent Samples Test for pre and post MPV**