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FOREWORD

It is with great delight I welcome you to volume 4 issue 2 of Federal Polytechnic – Journal of Pure and Applied Sciences (FEPI-JOPAS). It is a peer-reviewed open-access multi-disciplinary Journal of global recognition which is referenced and indexed in African Journal Online (AJOL). It is a highly commendable Journal that publishes excellent research contributions and exhibiting also special attention to experience papers coming from the many application areas of pure and applied Sciences. FEPI-JOPAS publishes full-length research work, short communications, critical reviews and other review articles.

The aim of FEPI-JOPAS is to provide intellectual bedrock for both indigenous and international scholars with quality research outputs to express and communicate their research findings to a broader populace. It serves as a valuable platform for the dissemination of information to 21st Century researchers, professionals, policymakers, manufacturers, production staff, R & D personnel as well as governmental and non-governmental agencies. It also aimed to provide a platform for academics and industry practitioners to share cases on the application of management concepts to complex real-world situations in pure and applied sciences and related fields.

This volume 4 issue 2 of FEPI-JOPAS is loaded with quantum and well-featured diversity of trending topics in applied and basic research. These hot and trending topics are: Sustainable Art and Design: Activating Sighting as the Phenomenon of Representational Drawing; Assessment of Heavy Metals in Processed Meat (Tinko) Sold within Igbesa Community; The Hypoglycemic Effect of Musa Sapientum in Alloxan Induced Diabetic Albino Wistar Rat; Rainwater Quality Evaluation for Agricultural Use: Case Study of a Portland cement Producing Area; Analytical Approach to Investigating the Influence of Blood Group and Blood Genotype on the Performance of Students of Federal Polytechnic, Ilaro; Dough Mixing Time: Impact on Dough Properties, Bread-Baking Quality and Consumer Acceptability; Chemical Composition of Harvested Rainwater Around a Cement Factory in Ibeshe, Yewa North, Ogun State.

Furthermore, other topics to be encountered in this issue that have added colour and beauty to this edition are: Physicochemical properties and sensory evaluation of milk candy ‘toffee’ (a

NIGERIA candy) enrich with coconut, tigernut and groundnut; Informal Settlements in Developing Countries: Issues, Challenges and Prospects; Comparison of Sensory Properties of Meals Produced from Cowpea and Pigeon Pea; Automated Lecture Timetable Generation Using Genetic Algorithm; Septic Tanks Contamination in Groundwater Quality around Elementary Schools in Ibadan, Oyo State Nigeria; and Waste Disposal Systems in Some Selected Abattoirs Located in Ilaro Metropolis. FEPI-JOPAS has been centered on discerning the changing needs of the academic world and is committed to advancing research around the world by publishing the latest research in various academic fields and ensuring that the resources are accessible in print, digital, and online formats.

In addition, I would like to thank many people who worked so hard to ensure that publishing this issue 2 of volume 4 is a reality. I would like to thank the Editorial Board for their guidance and the publishing team for the continued support and effort in streamlining the publication process. I am grateful to the reviewers who provided timely and constructive reviews for the papers assigned to them. The authors are solely responsible for the information, date and authenticity of data provided in their articles submitted for publication in the Federal Polytechnic Ilaro – Journal of Pure and Applied Sciences (FEPI-JOPAS).

I am looking forward to receiving your manuscripts for the subsequent publications. You can visit our website (https://fepi-jopas.federalpolyilaro.edu.ng) for more information, or contact us via e-mail us at fepi.jopas@federalpolyilaro.edu.ng

Thank you and best regards.

Prof. Olayinka Oyewale AJANI

(Editor-in-Chief)

TABLE OF CONTENTS

https://fepi-jopas.federalpolyilaro.edu.ng Analytical

Analytical Approach to Investigating the Influence of Blood Group and Blood Genotype on the Performance of Students of Federal Polytechnic, Ilaro.

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Abstract

The liquid tissue in human being called blood, which circulates and thus transports oxygen and other vital materials around the body is grouped into eight based on the presence or absence of antigens on the surface of the red blood cell found in the blood. This blood group system is called the ABO. The kind of genetic material that is present in individual blood is the blood genotype of such an individual. Because there are variations in the blood group and blood genotype within the group of people in a population, this paper analyzed the effect of the variation in blood group and blood genotype on the academic performance of students. JASP data analysis software was used for the analysis of the data used in this paper. ANOVA was carried out on the mean score of the students in each of the blood groups and blood genotypes. The results of the ANOVA show a t-test with p-values that are less than 0.001 which means that there is no statistically significant difference in the mean score of each of the groups and genotypes, hence, the academic performance of students does not depend on the blood group or genotype to which the students belong.

Keyword: Antigens, Blood group, Blood genotype, Red blood cell, plasma.

INTRODUCTION

The Blood is a combination of plasma and cells that circulate through the body (Adam, 2021). It is the body fluid responsible for the transportation of substances like oxygen and nutrients in the body. Basically, blood is a tissue in liquid form, unlike bone which is in solid form. The importance of blood in a living organism cannot be over-emphasized. It is a major component of life responsible for transportation, regulation of body temperature, and removal of waste to mention but a few. Blood as a tissue contains cells. The Red blood cells contained in the blood is generated from bone marrow and it has a life cycle of 120 days in the body. The red blood cell is responsible for the oxygenation of cells in the body, White blood cells are also generated from the bone marrow and are responsible for fighting harmful germs that enter the body.

Blood may contain antigens on the surface of it red blood cell. The presence or non-presence of this inherited antigenic substance formed the bases on which the blood is classified otherwise known as the blood group. Basically, blood is grouped into four which are groups A, B, AB, and O.

Apart from the ABO blood group that is very popular, there exist other classifications of blood such as MN, Diego, Kidd, and Kell as mentioned by Erin, (2012). Duffy blood group is another blood classification that is based on the Duffy antigen (Erin, 2012). People who have the antigen can be attacked by *Plasmodium vivax* which causes malaria while people who lack the antigen are immune to the parasite.

According to Wikipedia, the MN blood group system was based on alleles found on the autosomal locus of chromosome 4. The alleles are designated L^M and L^N.

Another blood grouping is called the Diego blood group. Diego was the first patient to produce an antibody against the new blood system's antigens, thus, the presence or absence of Di^a and Di^b became an important factor determining a person's Diego blood type.

The Kell blood group system is complex and contains many antigens that are highly immunogenic (Laura, 2005), according to Laura, K antigen was described as the most immunogenic antigen next to the ABO and Rh blood group antigens.

The Kidd (JK) glycoprotein is the red blood cell (RBC) urea transporter. Antibodies that target Kidd antigens are a significant cause of delayed hemolytic transfusion reactions (Laura, 2005 and Erin, 2012),

The ABO blood group antigens are of prime importance in blood transfusion. After the discovery of a substance called Rh-D factor, another type of antigen, which was first discovered in Rhesus macaque, the classification of blood took another look. The presence of Rh-D factor in blood was tagged positive while absence was tagged negative. This presence or absence of Rh-D factor makes the blood group become eight in number which are A+, A-, B+, B-, AB+, AB-, O+ and O-. Blood genotype is the genetic make-up of the blood of an individual, as defined by Medbury (2021). It is the protein that is contained in the hemoglobin of the red blood cell. This protein varies from individual. This protein is what some authors called genetic or biological code. According to Medbury (2021), this biological code that specifies the uniqueness of an individual (genotype) is of five distinct types which are: AA, AS, AC, SC and SS.

Human beings are created in varieties. There are differences that exist in any population of a given species. These differences are known as variation. Variation can be as a result of gene, environment or the combination of the two. The difference caused by these three factors is called a phenotypic variation. A phenotypic variation describes the variation observed in or between species. Variation can be continuous on discontinuous. Blood group ABO classification is an example of discontinuous variation where intermediate blood type is not possible.

Each human being possesses at random, one each of the blood groups and blood genotypes.

Brian et al. (2016), said, from the research conducted, genetic make-up has strong influence on the academic performance of students. He also mentioned the strong effect of environment (nature) on the performance of students. Samagra (2018), concluded from the research conducted by Malanchini, UT, that good grades are genetic.

According to Sachin (2022), blood group is different from blood genotype. While blood group is the different kind of blood that can be observed in humans as indicated by the antigens found on the surface of the red blood cell, genotype is the genetic constituency of the cells in human being.

Of what significant are blood groups and blood genotypes to the academic performance of students. This study investigated any relationship binding a specific blood group or blood genotype to the academic performance of students.

Literature review

Joseph (2019), compared genotype polymorphism with the academic performance of students. In his paper, the blood group of the individual compliments the genotype as well as the achievement of students. He concluded that there is no statistically significant mean difference in the academic achievement of students and their genotypes.

Mahumad (2014) examined the relationship between blood group and students' intelligence. He found, from his study that the blood group (AB) received the highest average in the Intelligence Quotient (IQ) test. He also found that blood group AB is also the highest in the GPA while the blood type (B) was the lowest in the GPA and in test results.

Attire (2015) analyzed blood type and blood group among the undergraduate physics students of Dilla University, Ethiopia. His research was to find out the distribution of blood group among the tribes in Ethiopia and concluded that blood group O was the highest having a percentage frequency of 38.33, followed by group A (29.44) and group B, (28.88%) while group AB with 3.33% was the least among each ethnic groups. However, he did not investigate any relationship between blood group and academic performance of the students.

Birhan (2018) researched on the Factors that affect Students' Academic Performance in Gubalafto Woreda. He concluded that academic performance of the student depends on a number of socio-economic factors, which are, teacher related variables, and student related variables. He however suggested that there may be other factors that may have direct effect on the performance of the students

Bharathi et al (2018) wrote on weather blood groups determine the academic Performance of Medical Students. They concluded that the maximum number of

students with better performance in their academics belonged to blood group A. The research however has some limitations which are unequal count among the different blood groups and low number of participants with blood type AB and A. not this alone, another limitation to their research is that, academic performance was based only on marks obtained in some written tests.

Niraj and Asha (2017) carried out a comparative study of blood groups with relation to academic achievements. This was done on medical students in North India. They however concluded that there was no real correlation between blood groups and academic scoring hence, no significant association between any blood group and academic scores.

Kumar et.al (2020) researched on Blood group and gender impact on personality among medical students. They concluded that there is no considerable difference among personality scores of individuals of different blood groups.

Rihab (2020) also researched on relationship between Personality Traits and Blood Groups among the students of Palestinian University. He however concluded that there is no relationship that exist between them.

Melissa and Dominic, (2021) explained the difference between blood group and blood genotype. According to them, while blood group is the presence or absent of antigens on the surface of red blood cell, a genotype is the two letters combination that determines which traits or gene are inherited.

Sachin (2022), in his article written on byjus.com said blood group is a blood classification based on presence or absence of antibodies and inherited antigenic particles on the surface of red blood cells and he explained genotype as genotype form genetic constituency of cells in human.

MATERIALS AND METHODS

The reason behind this study is to find out the relationship between the academic performance of students and the blood group and blood genotype of such a student. The dependent variable in this study is the academic performance which is the students CGPA. The independent variables are blood group and the blood genotype. The variable blood group has the following attributes: A+, A-, AB+, AB-, B+, B-, O+ and O-. while the variable blood genotype has the following attributes: AA, AC, AS, SC and SS.

In order to have valid and reliable data, the results of the students of computer science department of Federal Polytechnic, Ilaro were obtained. These were obtained directly from the exam unit of the department. This made the data valid and reliable. The data concerning the blood group and genotype were collected from the exam unit of the school as recorded during the student registration. The data of 641 students were collected and analyzed. JASP (Jeffreys's Amazing Statistics Program), a free and open-source program for statistical analysis, was used for the analysis of the data collected.

Data Viewer

File

	BLOOD_GRP	BLOOD_GEN	GENDER	CGPA
1	A+	AA	M	2.04
2	A+	AA	M	3.18
3	A+	AA	M	2.21
4	A+	AA	F	2.19
5	O+	AA	M	2.23
6	O+	AA	F	2.18
7	O+	AA	F	2.65
8	A+	AA	M	2.73
9	B+	AA	F	2.96
10	B+	AS	F	2.60
11	A+	AA	M	1.66
12	O+	AA	M	3.11
13	O+	AA	M	1.82
14	O+	AA	F	2.24
15	O+	AA	M	2.18
16	O+	AS	M	1.46
17	A+	AA	F	2.68
18	O+	AA	M	2.92
19	O+	AA	F	2.25

Table 1: Showing 19 of 641 Students performance in Computer Science Department (FPI)

This paper is testing two hypothesis which are:

Hypothesis 1: Academic performance of students has no relationship with the blood group of the student.

Hypothesis 2: Academic performance of students has no relationship with the blood genotype of the student.

Discussions

The Blood Group

Table 2 and figure 1 below illustrate the relationship between the dependent variable (CGPA) and independent variable (blood group). It can be observed that the people with blood group O+ and A+ have the highest population. Blood group O+ is the highest having 54% percent of the population (as illustrated in figure 1), that is in every 100 people in a population, there are 54 people with blood group O+. Blood group B- and A- negative have the least taking up 1% each. This means that for every 100 people in a population, there is one person with blood group A- likewise B-

	CGPA						
	A+	**A-**	**AB+**	**B+**	**B-**	**O+**	**O-**
Valid	231	2	8	45	2	343	10
Missing	0	0	0	0	0	0	0
Mean	2.633	3.240	2.717	2.786	2.660	2.648	2.754

	CGPA						
	A+	**A-**	**AB+**	**B+**	**B-**	**O+**	**O-**
Std. Deviation	0.553	0.085	0.519	0.440	0.028	0.513	0.429
Minimum	0.170	3.180	1.700	2.070	2.640	0.740	2.130
Maximum	3.840	3.300	3.180	3.940	2.680	3.880	3.390

Table 2: The Descriptive Statistics of Blood group Vs CGPA

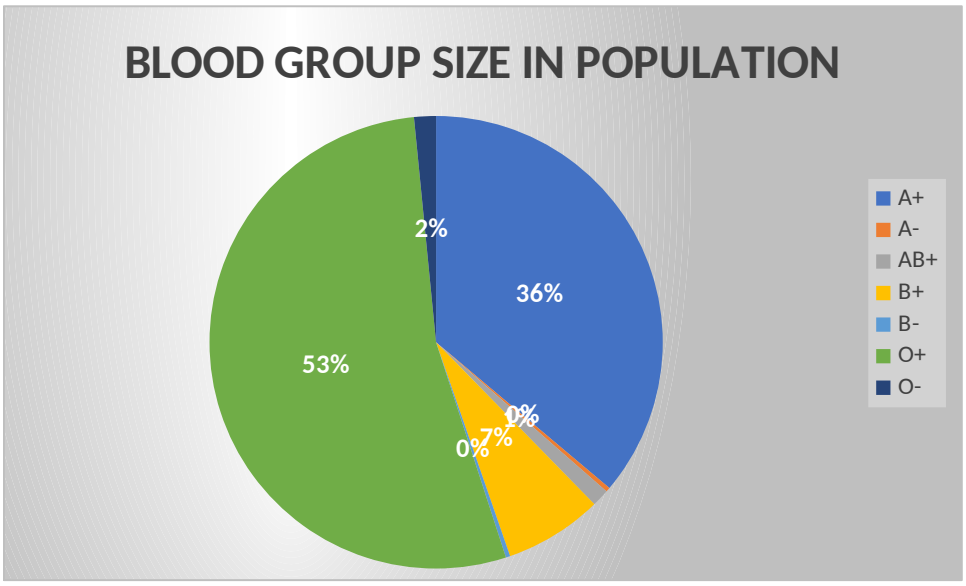

Figure 1: percentage distribution of blood group

Table 3 displayed the mean distribution of the CGPA of the different blood groups. There are 231 students with blood group A+. The mean CGPA of students with blood group A+ is 2.633 and standard deviation of 0.553. There are two students with blood group A- and the average or mean CGPA of the two students is 3.240 and standard deviation of 0.085. Eight students with blood group AB+ having mean CGPA of 2.717 and standard deviation. There are 45 students with blood group B+ and the mean CGPA of the 45 students is 2.786 and standard deviation of 0.440. Two students have blood group B- and their mean CGPA is 2.660 and standard deviation of 0.028. There are 343 students with blood group O+ with mean CGPA of 2.648 and standard deviation of 0.513 while blood group O- have 10 students with mean CGPA of 2.754 and standard deviation of 0.429

BLOOD GROUP	MEAN CGPA
A+	2.633
A-	3.24

AB+	2.717
B+	2.786
B-	2.66
O+	2.648
O-	2.754

Table 3 showing the mean score according to blood group

Blood group B+ has the highest CGPA which is 3.940 while the least CGPA was 0.170 from blood group A+. Although the highest CGPA was found in blood group B+, the average / mean CGPA with the highest value, i.e. the highest mean CGPA is from blood group A- which is 3.240. It will be too early to conclude that students with blood group A- are the best due to size difference. There are just two (2) students with blood group A- while the like of A+ and B+ have over 300 students. It will be better to run an ANOVA on the data to ascertain the validity of the mean values on the table, that is, if there are differences in the means.

ANOVA - CGPA

Cases	Sum of Squares	df	Mean Square	F	p
BLOOD_GRP	1.705	6	0.284	1.046	0.394
Residuals	172.177	634	0.272		

Table 4: CGPA Vs Blood group ANOVA

The important element on the ANOVA table 4 above is the p-value. P-value is used to evaluate the validity or the correctness of the null hypothesis which says that all the means are the same. The p-value (Prob > F) from the table above is 0.394. This p-value is more than 0.05 value which can be taken as evidence that the means are all the same.

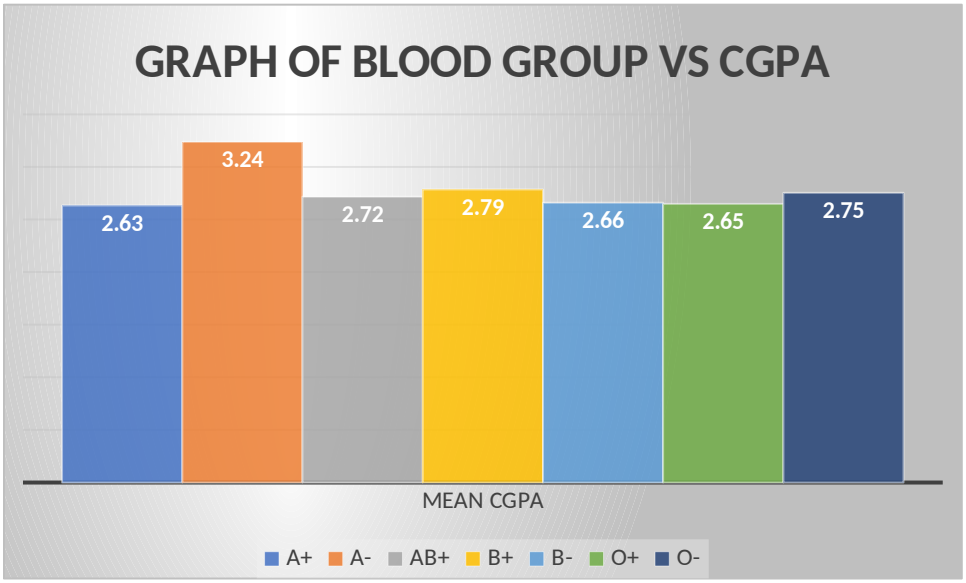

Figure2: Graph of CGPA against Blood group.

Figure 2 above is the graph of mean CGPA against the Blood group to illustrate the relationship in the distribution of CGPA among the Blood group.

The blood genotypes.

Table 5 below illustrate the relationship between the dependent variable (CGPA) and independent variable (blood genotype).

Five Blood genotypes were identified in the mist of the students of computer science of Federal Polytechnic, ilaro. The five blood genotypes are AA, AS, AC, SC AND SS. The descriptive statistics of the five blood genotypes are as shown in the table 6 below. From the whole population, just a single student has blood genotype SS. Genotype AA is having the highest number, 548 students. It is observed that the people with blood genotype AA dominate the entire population having 86% of the population (as shown in figure 4). People with AS are 11% of the population. AS genotype is just one out of 641 people. The mean CGPA of the students according to the blood genotype distribution is shown on the table 5 with the highest from SS with value 3.430. However, the highest CGPA is from blood genotype AA.

Table 5 showing blood genotype with the corresponding mean score

BLOOD GENOTYPE	MEAN SCORE
AA	2.642
AC	2.947
AS	2.681
SC	2.580
SS	3.430

Descriptive Statistics

	CGPA				
	AA	**AC**	**AS**	**SC**	**SS**
Valid	548	20	70	2	1
Missing	0	0	0	0	0
Mean	2.642	2.947	2.681	2.580	3.430
Std. Deviation	0.515	0.510	0.551	0.679	NaN
Minimum	0.170	1.600	0.740	2.100	3.430
Maximum	3.940	3.840	3.780	3.060	3.430

Table 6: The statistics description Blood genotype and CGPA

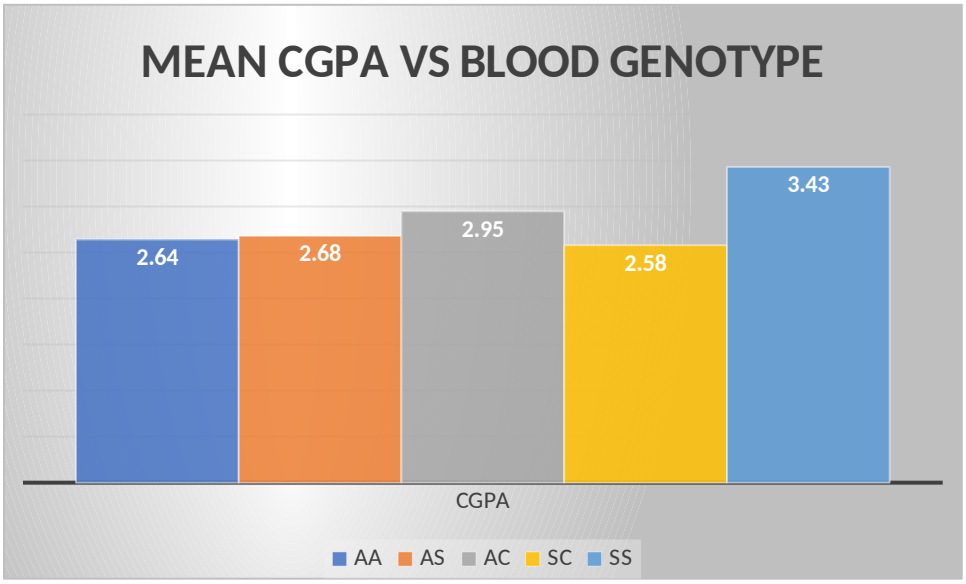

Figure 3: The graph of mean CGPA against Blood genotype

To ascertain the validity of the means an ANOVA test was carried out. Because of different sizes of the groups (blood genotype), we need to test if the difference in the means is statistically significant. From the result on the table 6 below, there is no statistically significant difference in the mean as it is observed on the table. Meanwhile, the mean value of SS was removed since it is a single value which cannot be used for ANOVA test.

ANOVA - CGPA

Cases	Sum of Squares	df	Mean Square	F	p
BLOOD_GEN	1.858	3	0.619	2.298	0.076
Residuals	171.426	636	0.270		

Table 7: CGPA Vs Blood genotype ANOVA

The p-value (Prob > F) from the table above is 0.076. This p-value is more than 0.05 value which can be taken as evidence that the means are all the same.

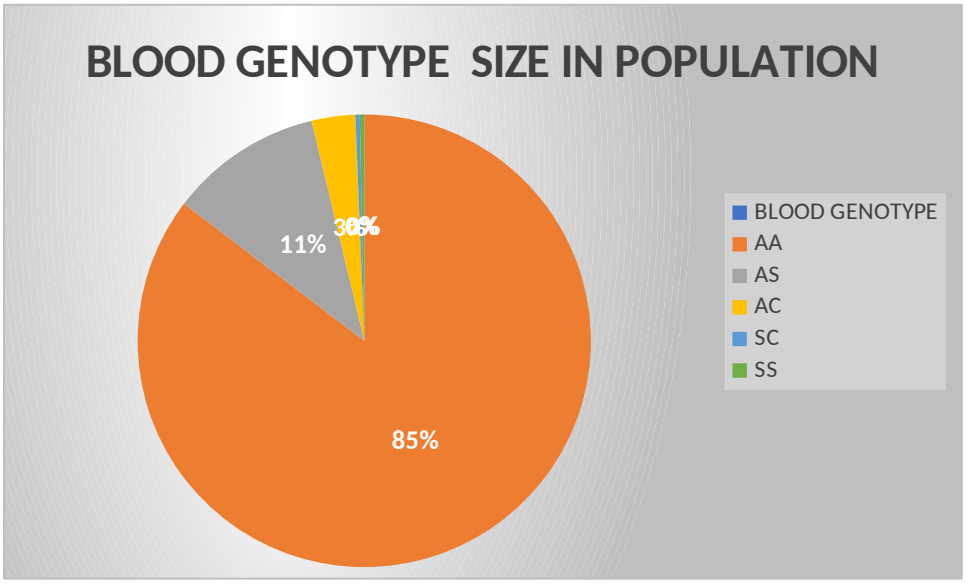

Figure 4: percentage distribution of blood genotype

CONCLUSION

The results from descriptive analysis showed variation in the mean score. The mean scores indicated that blood genotype AC has a better performance with mean score of 2.947 while blood group A- has the better performance with mean value of 3.240 with only 2 students. Due to difference in sizes of the population of each group, inferential analysis was carried out and the results showed a p-value that is less than 0.001. these results inferred that there is no statistically significant difference in the mean scores of the two independent variables. This made the Author to adopt the null hypothesis that says, blood group and blood genotype have no influence on the general performance of the students. This result is in agreement with the conclusion of Niraj (2017).

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