

Correlation between UTME and post-UTME candidates scores 2019/2020 academic session: A case study of Gombe State University

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Abstract:

Unified tertiary matriculation examination and Post-UTME are examination conducted by joint admission and matriculation board and universities which serve as an entry requirement for admission into various degree programmes. This research is determined to find the relationship between UTME and Post-UTME scores. Common misuses of the techniques are considered. Tests and confidence intervals for the population parameters are described, and failures of the underlying assumptions are highlighted. We used correlation coefficient for the analysis. In the first analysis we experienced that the correlation coefficients for the Pearson = 0.2884, spearman = 0.1611 and Kendall's = 0.1361 are all close to zero, this implies that the relationship between the Jamb and Post-UTME scores is not cordial. And, in the second analysis we experienced that the correlation coefficients for the Pearson 0.5132, spearman = 0.5909 and Kendall's = 0.4546 are within the middle interval, this implies that the relationship between the Jamb and Post-UTME scores is moderate. Hence, we conclude that there is strong correlation between UTME and POST – UTME Scores in Gombe State University. Post UTME screening is very important as an entry requirement for any university in Nigeria.

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1. Introduction.

University matriculation examination (UME) is an examination conducted by the Joint Admission and Matriculation Board (JAMB) on yearly basis for the sole purpose of selecting and placing suitable qualified candidates into the Nigerian Universities [1]. Education in Nigeria is nationally conceptualized not simply as the medium for cultural transmission but the main vehicle for accelerating individual, community and national development. It is a mechanism through which the society generates the knowledge and skills required for its survival and sustenance. It enriched people's understanding and the world. It improves the quality of their lives and leads to broad social benefits to individuals and society. There has been a consistent denigration of the system in the last two or three decades. Graduates of the educational system are not only derided, but are also described as lacking in quality, low in perception and unfit in skill [2]. The general societal expectations on a university student are high, under normal circumstances an average undergraduate student should face academic studies with ease. He should be able to pass his courses without embarking on any form of examination malpractice because of his numerous experiences in public examination he has passed through before gaining admission.

In Nigeria universities student are expected to be sound academically. They are expected to have sat for senior secondary School Certificate Examination as an

achievement test and pass at the minimum requirement for Joint Admission and Matriculation Board (JAMB) Examination as a selection test and pass at acceptable cut-off point before being offered admission into the University [3]. Despite this public examination that Nigeria undergraduate do go through, Academic performance among university student is far below expectation most especially in the last two decades. Many students hardly pass all their first-year courses, majority of those who successfully do so, have poor grades. Greater percentage of university graduates in Nigeria today fall below second-class upper division; the number of spills over student in various departments are on a high increase. The situation is now worse as those who even manage to graduate are not productive in the labour market because they fail to meet the expectation of the employers [4]. It is obvious that no one is happy with this scenario. No parent will actually want to send his child to university to come out with a third class or pass degree or spend more than the stipulated number of years for his/her course of study. Though this scenario has been going on for more than a decade, frantic effort was made in 2005 when then president of Nigeria, president Obasanjo recommended that further Screening be concluded on candidate who sat and score in the University matriculations examination at the approve points usually 180-200 points depending on how the University where admission is sought. Then the Nigerian President made the recommendation with the hope that the post-JAMB screening exercise would make university education only for

those who want it and need it [5]. Post-Jamb screening exercise was first organised for the students who were admitted Into Nigerian university system in the 2005/2006 academic session. The post-JAMB Screening exercise was faced, and which could not guarantee their admission. Jamb officials were also not happy for they felt post-JAMB might expose their shortcomings [6]. This worrisome development got authorities in universities thinking, culminating in the preposition for a further test. Proponents argue that scores from the latter test will serve as an instrument for cross-validation of students JAMB scores, and the end result of cross-validation cannot but have the best prospect of doing well in their university work. Starting from the 2007/2008 academic session, the Gombe state university (GSU) first Proposed a follow-up test or further screening of prospective students who have written and "passed" the University matriculation examination (UME) conducted annually by the Joint Admission and Matriculation Board (JAMB). A statistical Model for combining JAMB and POST-JAMB scores processes was that individual universities fashioned out their own methods of use. we believe that the latter methods mostly abhor in nature, can be improved upon on the basis of statistical analysis. In statistics, correlation is any statistical relationship, whether causal or not, between two random variables or bi-variate data. In the broadest sense correlatn is any statistical association, though it commonly refers to the degree to which a pair of variables are linearly related. Correlation means association - more precisely it is a measure of the extent to which two variables are related. There are three possible results of a correlational study: a positive correlation, a negative correlation, and no correlation.

Despite stringent measures and strategies employed by the Nigerian government to ensure that educational standards are maintained at least at university level, students whom after passing through all these vigorous examinations still performs far below expectations [4]. The first convocation ceremony was held on 22nd May 2010 at the Gombe State University Convocation ground, Gombe, 165 students that graduate received the first-degree certificate. Only 25% of the students actually graduated with satisfactory result and will not face challenges of discrimination in the labour market where second-class upper division and above is more marketable. This also tells that 75% of students had academic challenges as undergraduate students. he high rate of poor academic achievement among undergraduate is not unconnected with the channel through which they found themselves into the University system [5], observed that using JAMB as a Yardstick for admission of students into Nigerian universities has led to intake of poor calibre of candidates who are characterised by high failure rate, increase in examination malpractice High spill overs and the production of poor quality output that are neither self-reliant nor able to contribute effectively in the world of work. Chronically, as the demand for University Education now is higher than ever before the quality of students admitted, and graduates produced in Nigerian universities today is on high decline. The quality of students admitted into the University system also improved the quality of graduates produced. This research therefore intended to find out how JAMB and

POST-JAMB has influenced academic achievement of undergraduate's students since its inception in 2005/2006 academic session in Gombe State University.

2. Materials and method

2.1 Source of data

The data used for this study was secondary, obtained from Gombe State University (GSU) database reports of the candidates 2018/2019 and 2019/2020 Jamb and Post-UTME scores.

2.2 Pearson's correlation coefficient.

Pearson's r is a measure of the linear relationship between two interval or ratio variables, and can have a value between -1 and 1. It is a measure of the relationship between a dichotomous (yes or no, male or female) and an interval/ratio variable [7]. The advantage of using Pearson's r is that it is a simple way to assess the association between two variables; whether they share variance (covariance), if the relationship is positive or negative, and the degree to which they correlate. The disadvantages of using Pearson's r is that, it cannot identify relationships that are not linear, and may show a correlation of zero when the correlation has a relationship other than a linear one.

The following formulae can be used to compute Pearson's r : For small samples, Pearson's r may be calculated manually [8] using:

$$r = r_{xy} = \frac{cov(x,y)}{s_x s_y} \quad (1)$$

where;

$$COV(x, y) = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{n} = \frac{\sum x_i y_i}{n} - \bar{x} \bar{y} \quad (2)$$

$$s_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}} = \sqrt{\frac{\sum x_i^2}{n} - \bar{x}^2} \quad (3)$$

$$s_y = \sqrt{\frac{\sum(y_i - \bar{y})^2}{n}} = \sqrt{\frac{\sum y_i^2}{n} - \bar{y}^2} \quad (4)$$

A single formula for computing correlation coefficient is giving by

$$r = \frac{n \sum x_i y_i - \sum x_i \times \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}} \quad (5)$$

In case of group frequency distribution, we have

$$COV(x, y) = \frac{\sum_{i,j} x_i y_j f_{ij}}{N} - \bar{x} \times \bar{y} \quad (6)$$

$$s_x = \sqrt{\frac{\sum_{i,j} f_{io} x_i^2}{N} - \bar{x}^2} \quad (7)$$

$$s_y = \sqrt{\frac{\sum_{i,j} f_{oj} y_j^2}{N} - \bar{y}^2} \quad (8)$$

Where:

x_i = Mid-value of the t^i class interval of x ; y_i = Mid-value of the j^i class interval of y f_{10} = Marginal frequency of x ; f_{oj} = Marginal frequency of y ; f_{ij} = Frequency of the $(i, j)^{th}$ cell

$$N = \sum_{i,j} f_{ij} = \sum_i f_{io} = \sum_j f_{oj} = \text{Total frequency}$$

"The larger the covariance is, the stronger the relationship. The covariance can never be bigger than the product of the standard deviation of the two variables" [9]. The denominator in the equations is always positive, however the numerator may be positive, zero, or negative, "...enabling r to be positive, negative, or zero respectively" [10].

2.2.1 Assumptions

In order to refer that the calculated r is applicable to the population from which the sample was drawn, statistical analysis must be performed to determine whether the coefficient is significantly different from zero [11].

2.2.2 Significant Testing of Pearson's r

The hypothesis that the population correlation coefficient is 0, and may be computed by calculating t :

$$t = r \sqrt{\frac{n-2}{1-r^2}}$$

Where: t = t -value required for the test of significance of the correlation coefficient r ; n = sample size of the paired scores; r = Pearson's product-moment correlation coefficient; degree of freedom = $n - 2$.

If the sample size is small, a high correlation coefficient (close to -1 or 1), may be non-significant. Contrary to a large sample may have a statistically significant r but have no clinical significance. Subsequently it is important to consider both the magnitude of the correlation coefficient, the significance of the t -test, and the context of the research question.

2.2.3 Coefficient of Determination

By squaring the correlation coefficient r , the total variability in Y can be accounted for after regressing Y on X ; r^2 can be considered to be a measure of the strength of the linear relationship. The resulting value when multiplied by 100 results in a percent variance. X explains the variability in Y [10].

2.3 Spearman's Correlation

In statistics, Spearman's rank correlation coefficient or Spearman's ρ , named after Charles Spearman and often denoted by the Greek letter rho or as r , is a nonparametric measure of rank correlation. It assesses how well the relationship between two variables can be described using a monotonic function. Spearman's correlation coefficient is a statistical measure of the strength of a monotonic relationship between paired data. In a sample it is denoted by r and its interpretation is similar to that of Pearson's, e.g., the closer is to the stronger the monotonic relationship. The linear correlation is declared significant at a given level if it is not greater than the corresponding formula.

$$\rho = \frac{cov(x,y)}{\delta_x \delta_y} \quad (9)$$

$$\Rightarrow cov(x,y) = \rho \delta_x \delta_y \quad (10)$$

But

$$\bar{x} = \frac{n+1}{2}; \bar{y} = \frac{n+1}{2}; \delta_x^2 = \frac{n^2-1}{12}; \delta_y^2 = \frac{n^2-1}{12}; d_i = x_i - y_i$$

$$d_i = (x_i - \bar{x}) - (y_i - \bar{y}) \quad (11)$$

$$\sum_{i=1}^n d_i^2 = \sum_{i=1}^n [(x_i - \bar{x}) - (y_i - \bar{y})]^2 \quad (12)$$

$$\frac{1}{n} \sum_{i=1}^n d_i^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 + \frac{1}{n} \sum_{i=1}^n (y_i - \bar{y})^2 - 2 \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y}) \quad (13)$$

Now

$$\begin{aligned} \frac{1}{n} \sum_{i=1}^n d_i^2 &= \delta_x^2 + \delta_y^2 - 2 cov(x,y) \\ &= 2\delta_x^2 - 2\rho\delta_x\delta_y = 2\delta_x^2 - 2\rho\delta_x^2 \end{aligned}$$

$$\frac{1}{n} \sum_{i=1}^n d_i^2 = 2\delta_x^2(1 - \rho) \quad (14)$$

$$\begin{aligned} 1 - \rho &= \frac{\sum_{i=1}^n d_i^2}{2n\delta_x^2} = \frac{\sum_{i=1}^n d_i^2}{2n(n^2-1)/12} \Rightarrow 1 - \rho = \frac{6\sum_{i=1}^n d_i^2}{n(n^2-1)} \\ \Rightarrow \rho &= 1 - \frac{6\sum_{i=1}^n d_i^2}{n(n^2-1)} \quad (15) \end{aligned}$$

Where; ρ = Spearman's rank correlation coefficient; d_i = difference between the two ranks of each observation; n = number of observations

2.4 Tests for Correlation

$H_0: \rho = 0$ $H_i: \rho \neq 0$; $P > 0$ or $P < 0$; Decision rule is to reject H_0 if $\frac{r}{\sqrt{\frac{1-r^2}{n-1}}} < -t_{\frac{(n-2)\alpha}{2}}$ Or $\frac{r}{\sqrt{\frac{1-r^2}{n-1}}} > t_{n-2}$

3. Analysis

Firstly, we look at the relationship between Jamb and Post-Jamb candidate's scores for the various departments in the university (Gombe State University). R software version 3.8 was used throughout in the analysis.

3.1 Pearson's product-moment correlation

Data: x and y

$$t = 1.73, df = 33, p\text{-value} = 0.09298$$

Alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:

$$-0.04966344, 0.56710673$$

Sample estimates: $\text{cor} = 0.2883554$

The results from 3.1 above shows that there is a less relationship between the two scores according to Pearson's. The p -value of the test is =0.09298 which is greater than the significance level $\alpha = 0.05$, we can conclude that Jamb and Post-jamb scores are significantly correlated with a correlation coefficient of =0.2883554 and p -value of = 0.09298.

Figure 1 shows the horizontal axis (x axis) represent the post-UTME scores and the vertical axis (y axis) represent the jamb scores, R represent the correlation coefficient and P represent the p -value of the scattered plot. The R value 0.29 is the correlation coefficient while P value = 0.093. The graph indicates that the scores are most likely high at the horizontal axis (Jamb) which implies that the student scored the highest marks in their Jamb mother the post-JAMB

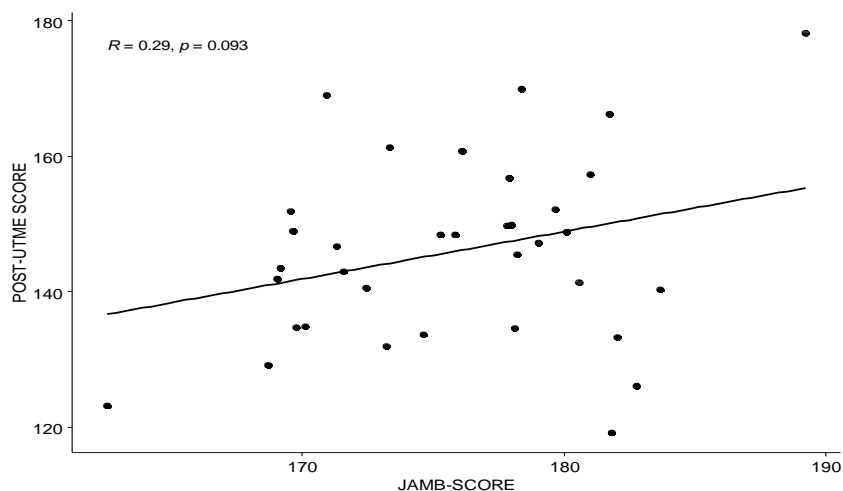


Figure 1. Pearson's product moment graph.

3.2 Spearman's rank correlation (ρ)

Data: x and y

S = 5990, p-value = 0.3539

alternative hypothesis: true rho is not equal to 0
sample estimates:

$\rho = 0.1610644$

The result from 3.2 above shows that there is a very weak relationship between the two scores according to spearman's. The p-value of the test = 0.3539 which is greater than the significance level $\alpha = 0.05$, we can conclude that Jamb and Post-jamb scores are correlated with a correlation coefficient of = 0.1610644 and p-value of 0.3539.

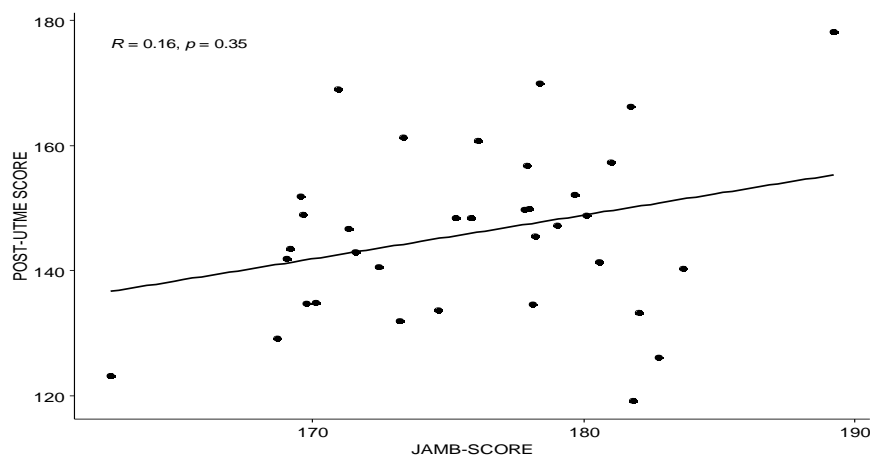


Figure 2: Spearman's rank correlation graph.

Figure 2 shows the horizontal axis (y axis) represent the post-UTME scores and the vertical axis (x axis) represent the jamb scores, R represent the correlation coefficient and P represent the p-value. The R value 0.16 is the correlation coefficient while P value = 0.35. The graph indicates that the scores are most likely high at the horizontal axis (Jamb) which implies that the student scored the highest marks in their Jamb mother the Post-JAMB.

3.3 Kendall's rank correlation (τ)

Data: x and y

T = 338, p-value = 0.258

Alternative hypothesis: true τ is not equal to 0
Sample estimates:

$\tau = 0.1361345$

The result from 3.3 above shows that there is a very weak relationship between the two scores according to Kendall's. The p-value of the test = 0.258 which is greater than the significance level $\alpha = 0.05$, we can conclude that Jamb and Post-jamb scores are correlated with a correlation coefficient of 0.1361345 and p-value of 0.258.

Figure 3 shows the horizontal axis (y axis) represent the post-UTME scores and the vertical axis(x axis) represent the jamb scores, R represent the correlation coefficient and P represent the p-value of the scattered plot. The R value 0.14 is the correlation coefficient while P value = 0.26. The graph indicates that the scores are most likely high at the horizontal axis (Jamb) which implies that the student scored the highest marks in their Jamb mother the Post-JAMB

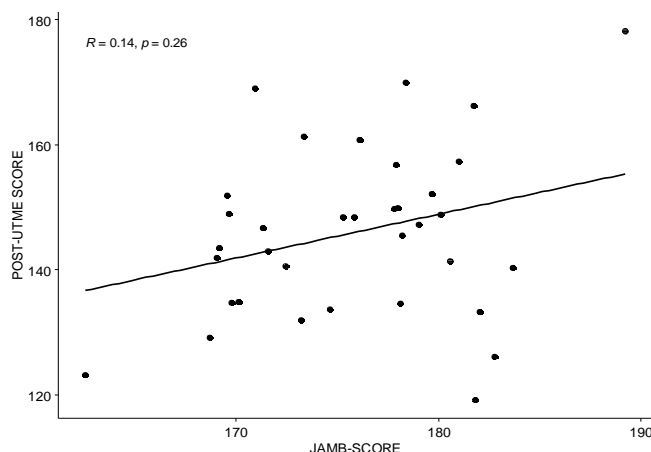


Figure 3: Kendall's rank correlation graph

3.4 Post-UTME scores of LGA's in Gombe state.

This analysis covered all the eleven local government of Gombe state. The result is as follows;

-0.1252317, 0.8510672

sample estimates:

cor = 0.5131964

3.4.1 Pearson's product-moment correlation

Data: x and y

$t = 1.7938$, $df = 9$, $p\text{-value} = 0.1064$

Alternative hypothesis: true correlation is not equal to 0.
95 percent confidence interval:

Heading 3.4.1 shows that there is a moderate relationship between the two scores according to Pearson's. The p-value of the test = 0.1064 which is greater than the significance level $\alpha = 0.05$, we can conclude that Jamb and Post-jamb scores are correlated with a correlation coefficient of = 0.5131964 and p-value of = 0.1064

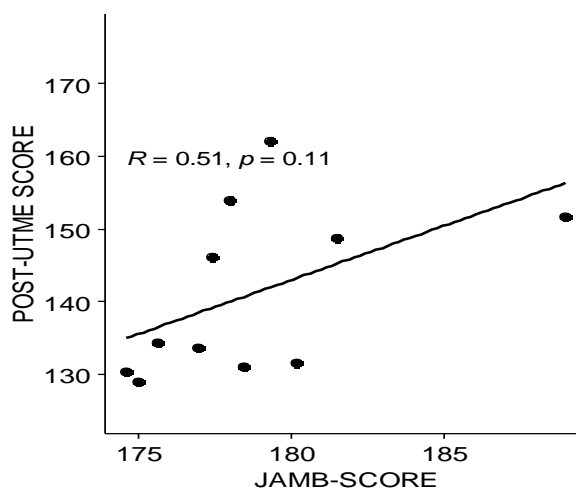


Figure 4: Pearson's product moment graph

Figure 4 shows the horizontal axis (x-axis) represent the post-utme scores and the vertical axis(y axis) represent the jamb scores, R represent the correlation coefficient and P represent the p-value of the scattered plot. The R value 0.51 is the correlation coefficient while P value = 0.11. The graph indicates that the scores are most likely high at the horizontal axis (Jamb) which implies that the student scored the highest marks in their Jamb mother the Post-Jamb.

Alternative hypothesis: true rho is not equal to 0

Sample estimates:

$\rho = 0.5909091$

3.4.2 Spearman's rank correlation (ρ)

Data: x and y

$S = 90$, $p\text{-value} = 0.06073$

The result from 3.4.2 above shows that there is a moderate relationship between the two scores according to Pearson's. The p-value of the test = 0.1064 which is greater than the significance level $\alpha = 0.05$, we can conclude that Jamb and Post-jamb scores are correlated with a correlation coefficient of = 0.5131964 and p-value of = 0.1064

Figure 5 shows the horizontal axis (x axis) represent the post-utme scores and the vertical axis(y axis) represent the jamb scores, R represent the correlation coefficient and P represent the p-value. Here we see that there is a strong

relationship between the two scores according to spearman's. The R value 0.59 is the correlation coefficient while P value = 0.061.

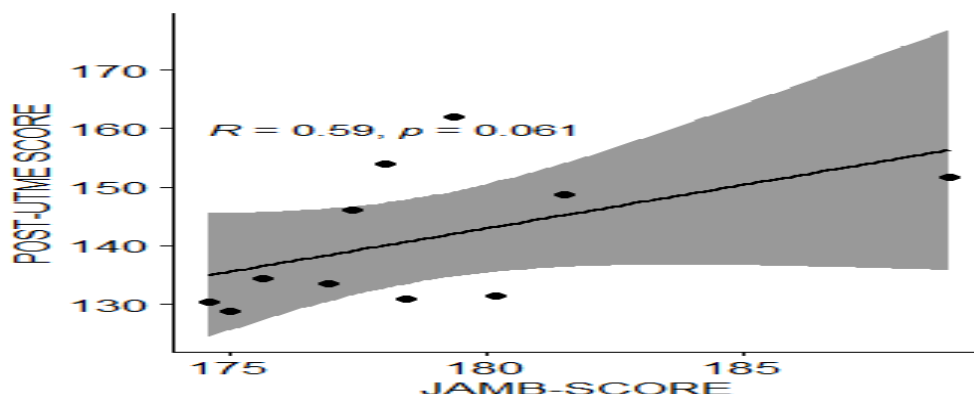


Figure 5: Spearman's ranks graph

Figure 5 indicates that the scores are most likely high at the horizontal axis (Jamb) which implies that the student scored the highest marks in their Jamb mother the Post-Jamb.

3.4.3 Kendall's rank correlation (τ)

Data: x and y

$T = 40$, p -value = 0.06017

Alternative hypothesis: true tau is not equal to 0

Sample estimates:

$\tau = 0.4545455$

The result from 3.4.3 above shows Kendall's correlation coefficient between x and y are 0.4545455 and the p-value is 0.06017. This implies a moderate relationship between the two scores. Figure 3.4.3 for Kendall's rank here is the same with spearman's rank correlation graph.

4 Conclusion

In this research, we observed that the first analysis correlation coefficients for the Pearson, spearman and Kendall's are all close to zero, this implies that the relationship between the Jamb and Post-UTME scores is very weak. And, in the second analysis we experienced that the correlation coefficients for the Pearson, spearman and Kendall's are within the middle interval, this implies that the relationship between the Jamb and Post-UTME scores is moderate. For one to sit for post-jamb, it depends on the person scoring the cut-off point. If the person does not have the required points/marks, the person will not even think of sitting for the post-jamb exams/screening (even as the name implies), but sitting for Jamb/ UTME does not depend on post-jamb. JAMB is an objective question that can be passed by luck, but post-jamb is an essay writing which is require to test the ability of the student to know whether the student can be able to read and write or create a room for every student that pass jamb to come and prove his/her self that he is the one that sat for jamb exams or not. We can say that post-jamb proves those that really passed the jamb

by luck. According to the correlation there is no relationship between jamb and post jamb scores and this shows that there is difference between jamb and post jamb, meaning post jamb is more effective than jamb alone.

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