Report 1.0

A CASE STUDY TO EVALUATE RELATIONSHIP BETWEEN GENDER AND WEIGHT, LENGTH, HEAD CIRCUMFERENCE.

INTRODUCTION

The weight and length of babies at birth has been linked with the development of chronic diseases such obesity and type 2 diabetes (Baran *et al*., 2019). Weight has been found to be affected by maternal and physiological factors which may or may not be related to baby gender. (Genowska *et al*., 2022). Studies in the past have argued that baby boys are usually bigger than baby girls citing that baby boys grow more in the womb (Eriksen J *et al*., 2010).

In this study, we seek to use available data to determine if there is a relationship between gender and weight, length or head circumference of babies born at term. The data file contains the weights, height, and head circumference measurements of 256 babies collected at 1month of age. The data will be checked for errors and the sex distribution of each variable will be compared to determine possible relation at term.

METHOD

The analysis was done using SPSS. The data was checked for outliers and missing values, then the data distribution of the variables (weight, length, and head circumference) was checked using histogram Q-Q plot and the Shapiro-wilk test. Descriptive analysis of the data sets was carried out to determine the mean and standard deviation of each of the variables. Then an alternative hypothesis was drawn for each category and tested. The one sampled independent t-test was used to test the hypothesis for the variables weight and head circumference then the Mann - Whitney U test was used for the length. All tests were carried out at 95% confidence intervals.

H_1 =. alternative hypothesis

H_0 = null hypothesis

Hypothesis for length comparison:
H_1 = Male babies have a significantly different length compared to females

H_0 = All genders have same length/height

Hypothesis for weight comparison:

H_1 = Male babies have a significantly different weight compared to females

H_0 = All genders have the same weight

Hypothesis for head circumference comparison:

H_1 = Males babies have a significantly different head circumference compared to females.

H_0 = All genders have the same head circumference.

RESULT

The graph below (fig 1.1) shows a histogram for the data distribution for baby length (blength).

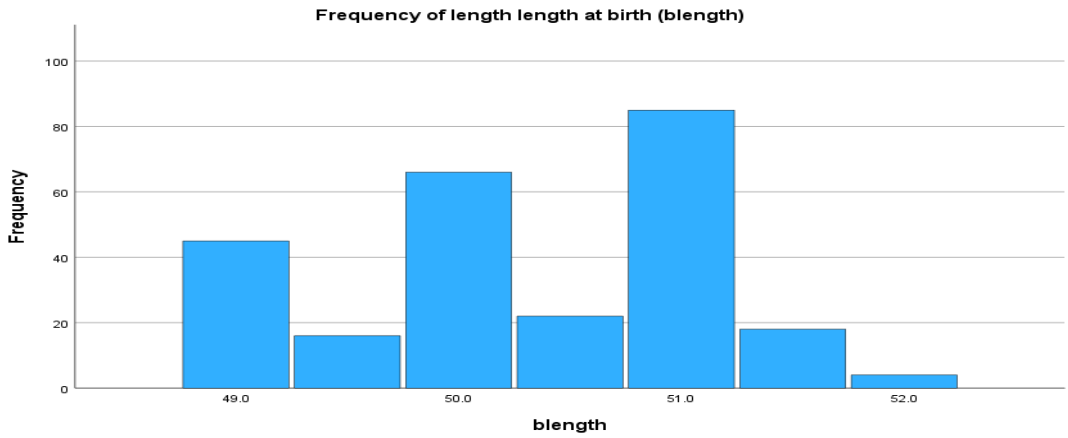

fig 1.1

The graph below (fig 1.2) shows a Q-Q plot of the data distribution for baby length (blength).

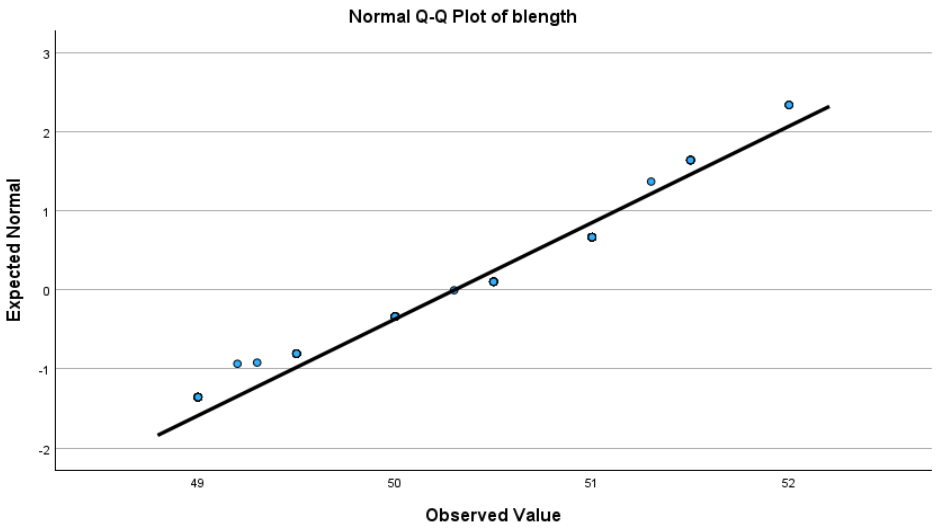

fig 1.2

The Shapiro-wilk test for the baby length data gave a test statistic of 0.641 and p value <0.001 at 95% confidence interval.

The table below shows the descriptive statistics of birth length by gender.

Gender	N	Mean	S. Deviation	S. Error Mean
Female	137	50.28	0.85	0.07
Male	119	50.33	0.78	0.07

Table 1.0

Comparing the length for the two groups, we have a mean difference of 0.05 with the male group having the higher mean. The Mann-Whitney U Whitney test is 8741 and a p value of 0.577 (95% confidence interval, S.E 0.07).

The graph below (fig 1.3) shows a histogram for the data distribution for baby weight (bweight).

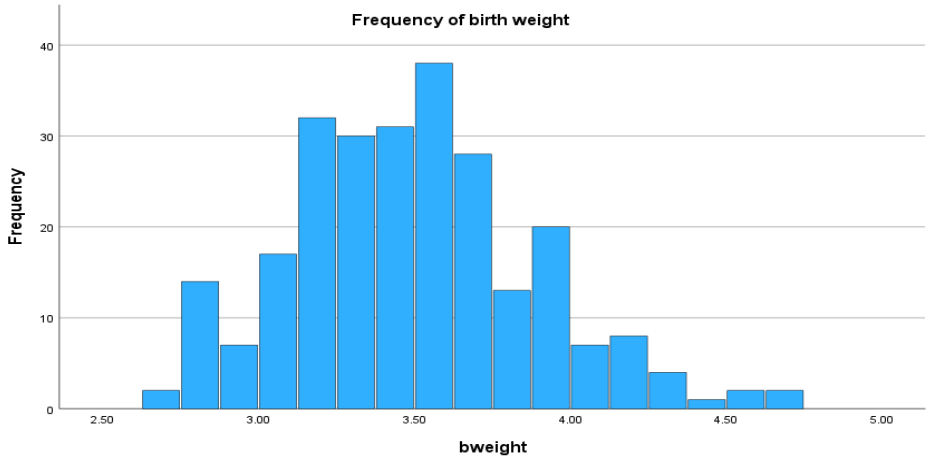

fig. 1.3

The graph below (fig 1.4) shows a Q-Q plot of the data distribution for baby weight (bweight).

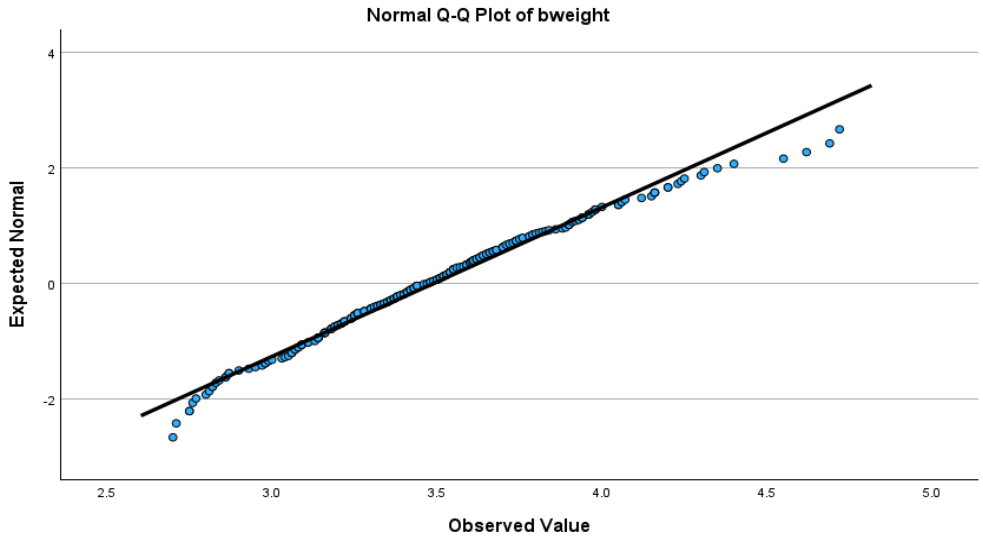

fig. 1.4

The table below shows the descriptive statistics of birth weight by gender.

Descriptive statistics of birth weight (in kg) by gender

Gender	N	Mean	Std. Deviation	Std. Error Mean
Female	137	3.53	0.43	0.37
Male	119	3.44	0.33	0.30

Table 1.1

From the statistical analysis result above, the mean difference in birth weight in both male and female babies is 0.089kg.
The observed result of Levene's test for equality of variance yielded an F-value of 6.094 with a significance level of 0.009. With equal variance assumed, the T test for equality of mean gave a t-value of 1.832 and a significance level of 0.034. With unequal variance assumed, the t-value was 1.865 and a significance level of 0.032. The effect size as measured by the Cohen's d value was 0.386.

Analysis result for comparison of head circumference.

The graph below (fig 1.5) shows a histogram for the data distribution for baby head circumference (bheadcir).

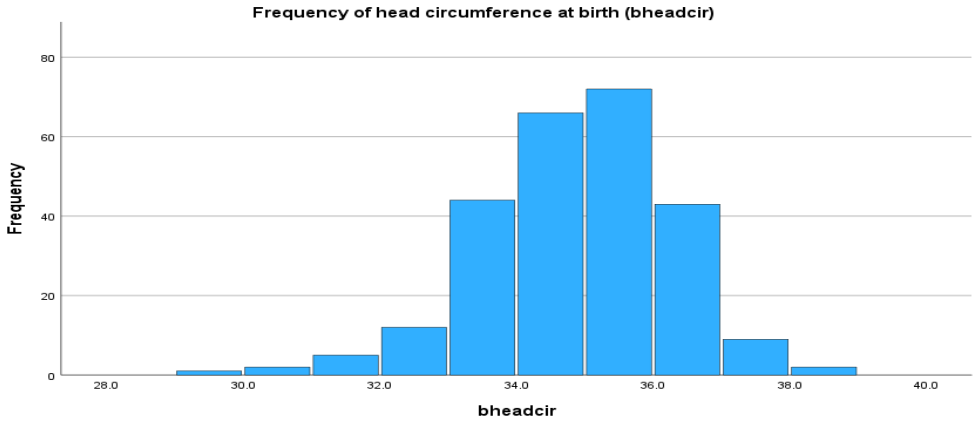

fig. 1.5

The graph below (fig 1.6) shows a Q-Q plot of the data distribution for baby head circumference (bheadcir).

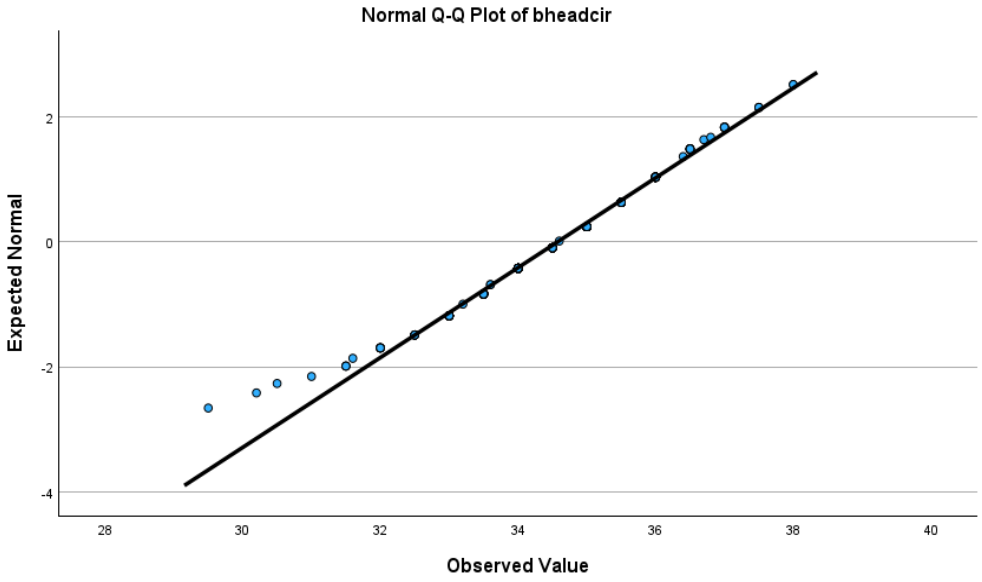

fig. 1.6

Descriptive statistics of birth head circumference (in cm) by gender

Gender	N	Mean	S. Deviation	S. Error Mean
Female	137	34.25	1.38	0.12
Male	119	34.94	1.30	0.12

Table 1.2

From the statistical result above, the mean difference in head circumference in both male and female babies is 0.69cm.
The observed result of the independent t-test, Levene's test for equality of variance yielded a F-value of 0.257 with a significance level of 0.613. With equal variance assumed, the T test for equality of mean gave a t-value of 4.082 and a significance level of <0.001. The effect size measured by the Cohen's d value was 1.348.

The graph below shows the mean comparison of the three parameters (length, weight, and head circumference) between the two genders.

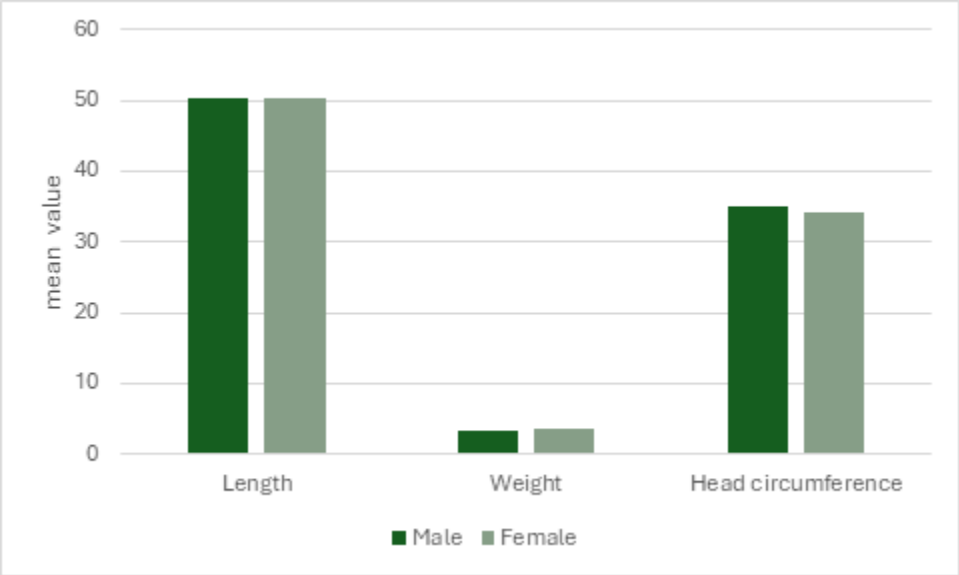

fig. 1.7

DISCUSSION

The result showed male babies having a higher mean length than female babies, but the difference is however not practically significant as the hypothesis test yielded a non-significant p value. It suggests that both genders are about the same length.

Female babies, from the result, had a higher weight than male babies though, the difference in weight is significant but with a small effect size. Therefore, male babies are not heavier than female babies. The analysis goes contrary to results of previous studies which had male babies bigger than female babies. Considering the weights were calculated at 1 month of age rather than at birth, other factors such as nutrition and health could have impacted on the weight of the babies at the time of measurement, this impact was not captured in this study.

Finally comparing the head circumference of the two groups, the result shows male babies have a larger head circumference than female babies with a large effect size.

The Mann-Whitney U test was used for hypothesis testing of baby length because the data for length is not normally distributed as confirmed by the Q-Q plot and Shapiro wilk test and also the comparison is between two independent groups. On the other hand, the independent test was used to assess the hypothesis for weight and head circumference because the data is normally distributed, and the comparison is between two groups which are independent of each other.

CONCLUSION

Male babies are not significantly heavier than female babies, they are also not significantly longer than female babies. Male babies, however, ten to have a larger head circumference than female babies.
I would suggest increasing sample size and using measurements collected at birth to be able to get a more random sample effect free of external influence. This will help make a clearer conclusion on the effects of gender on these parameters.

REFERENCE:

Genowska, A. *et al.* (2022) 'Inequalities in Birth Weight in Relation to Maternal Factors: A Population-Based Study of 3,813,757 Live Births', *International Journal of Environmental Research and Public Health,* 19(3), pp. 1384. Available at: https://doi.org/10.3390/ijerph19031384(Accessed: Jan 17, 2024)

Baran, J. *et al.* (2019) 'Relationship between Children's Birth Weight and Birth Length and a Risk of Overweight and Obesity in 4–15-Year-Old Children', *Medicina,* 55(8), pp. 487. Available at: https://doi.org/10.3390/medicina55080487(Accessed: Jan 17, 2024)

Eriksson, J. G., Kajantie, E., Osmond, C., Thornburg, K., & Barker, D. J. (2010). Boys live dangerously in the womb. *American journal of human biology : the official journal of the Human Biology Council*, *22*(3), 330–335.