

**PREVALENCE OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY
AMONG EBONYI STATE UNIVERSITY STUDENTS ABAKALIKI BETWEEN 18-35
YEARS**

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ABSTRACT

A total of one hundred (100) students (50 males and 50 females) of Ebonyi state University were screened for G6PD using methemoglobin reduction method. From the results obtained, (37 males, 46 females) (83.0%) were normal for G6PD 10 (10 males, 0 female) (10.0%) were deficient and 7 (3 males, 4 females) (7.0%) didn't show any observable result i.e. intermediate, Male subjects were mostly affected with $P > 0.05$. Individuals affected were asymptomatic, and should not be exposed to oxidant stressors e.g. drugs infection, among others. Therefore the study concluded that male subjects were mostly affected. Education and mass screening is advocated to eradicate the disease.

KEYWORDS: Prevalence, glucose-6-phosphate dehydrogenase deficiency, Ebonyi State University students.

INTRODUCTION

Glucose - 6 - phosphate dehydrogenase (G6PD) deficiency is the most prevalent enzyme deficiency disease in the world. The global prevalence of G6PD deficiency is geographically correlated with areas inhabited by population historically exposed to endemic malaria, including Africa, Mediterranean Europe, America and South East Asia. In United States, the enzyme deficiency primarily affects population of African and Mediterranean descent (Wajcman *et al.*, 2004).

Glucose - 6 - phosphate dehydrogenase is an enzyme that catalyzes the first rate limiting step in the pentose phosphate pathway that forms part of glycolysis (Wajcman *et al.*, 2004). Glucose - 6 - phosphate: NADP 1 -Oxidoreductase catalyzes the conversion of glucose -6 - phosphate to 6 -phosphogluconate in the pentose phosphate cycle which is a very important source for the production of reduced nicotinamide adenine nucleotide phosphate. This compound acts by reducing glutathione and stabilizing catalase; two compounds that have antioxidant properties in the red blood cells (Wajcman *et al.*, 2004).

Glucose-6-Phosphate dehydrogenase being a house keeping enzyme priorities reducing equivalents in the form of NADPH, to maintain several cellular

biosynthetic pathways and monitor cellular redox regulation. Thus G6PD activity helps the erythrocytes, withstand oxidative stress (Wajcman *et al.*, 2004). Deficient enzyme activity impairs the erythrocyte ability to remove deleterious oxygen species that lead to premature lysis.

The gene encoding G6PD is found on the long arm of the X chromosome (Xq 28) and consists of 13 exons with a length of 18kb. The G6PD locus is thought to be one of the most polymorphic loci among humans with almost 400 allelic variants reported. (Wajcman *et al.*, 2004) The variants are subdivided into 5 classes with class 1 characterized by severe deficiency resulting in chronic non-spherocytic anaemia ranging to class 5 with greater than 150% of normal activity (Beutler *et al.*, 2000).

Although most affected individuals are asymptomatic, factors that exert excess oxidative stress on the body can elicit acute haemolytic anaemia, which may be self limiting or may require a blood transfusion. These factors include various infections, fava beans intake e.g. in Mediterranean variants and a number of drugs including several antimalarials. Susceptibility of G6PD deficient individuals to haemolysis induced by antimalarial drugs is of major public importance, given the geographic correlation between G6PD deficiency prevalence and endemic malaria. The testing and

distribution of antimalarial drugs in the endemic areas is influenced by estimates of the prevalence of G6PD. However the methods of assessment tend to differ markedly across regions and within countries (Luzzato *et al.*, 2001).

In Nigeria the prevalence of Glucose 6 phosphate dehydrogenase differs across age, sex, ethnic groups and states (William *et al.*, 2013; Amiwero and Olatunji, 2012) and has been linked to the cause of Jaundice in children. In Ilorin, Amiwero and Olatunji observed the overall prevalence of Glucose 6 phosphate dehydrogenase deficiency of 50% while prevalence of 15.7% was recorded by (May *et al.*, 2012).

Similar changes in prevalence pattern were observed in states in the Eastern Nigeria. There is need therefore, to study the pattern among Ebonyi State University (EBSU) students and to assess the impact of education in the control of the disease.

Aim

To assess the prevalence of the Glucose-6-phosphate dehydrogenase deficiency among student of Ebonyi State University Abakaliki.

MATERIALS AND METHODS STUDY AREA/POPULATIONS

This study was carried out at Medical Laboratory Science Department (Hematology unit) of Federal Teaching Hospital Abakaliki, using Ebonyi State University students between the ages of 18 - 35 years as subjects in the month of August 2016.

Methaemoglobin Reduction test

Sampling and sample size

The method of sampling was by self selection

Whole blood samples was used and 4mls was collected from each subject. One hundred (100) samples were collected among the students on informed consent, 50 samples from male and 50 samples from female students.

ETHICAL APPROVAL AND INFORMED CONSENT

Ethical approval was obtained from the Ethical committee of Federal Teaching Hospital Abakaliki and informed written consent obtained from the participating students.

Glucose 6-Phosphate Dehydrogenase(G6PD) Assay

Methaemoglobin Reduction test was adopted by (Renu *et al.*, 2008)

PROCEDURE

Appropriate test tubes were labeled and arranged for control and test samples.

To 'normal' tube, only 1ml blood was added.

To 'positive' tube, 1ml blood + 0.05 ml (500ul) + 0.05ml sodium nitrite and glucose solution was added respectively.

To 'test' tube, 1ml blood + 0.05ml sodium nitrite + 0.05ml glucose solution - 0.05ml of methylene blue was added.

The tubes were mixed well by inversions.

The tubes were incubated at 37°C for 3 hours.

After 3 hours, the Test, normal and positive tubes were compared visually.

INTERPRETATION OF RESULTS

G6PD: Normal red colour similar to colour in normal reference tube.

DEFICIENT: Brown colour in test tube similar to colour in reference positive tube.

RESULTS

One hundred students (50 male and 50 female) of Ebonyi State University between of the age of 18 to 35 were screened for G6PD. The mean age of the student was 25.35 years.

Overall 83%, 10% and 7% of the students were normal, deficient and intermediate respectively

Table 1: Sex Frequency of Result

In the male category, 10% and 3% of the students were deficient and intermediate respectively while 4% of the female students were intermediate.

There was no female student that was Glucose 6 phosphate dehydrogenase (G6pD) deficiency.

Table 1: Sex frequency of Glucose 6 phosphate dehydrogenase (G6PD)

Parameters	Male (N=50)	Female (N=50)	Total (N=100)
Normal	37(74.0%)	46(92.0%)	83(83.0%)
Deficient	10(20.0%)	0(0%)	10(10%)
Intermediate	3(6.0%)	4(8.0%)	7(7%)

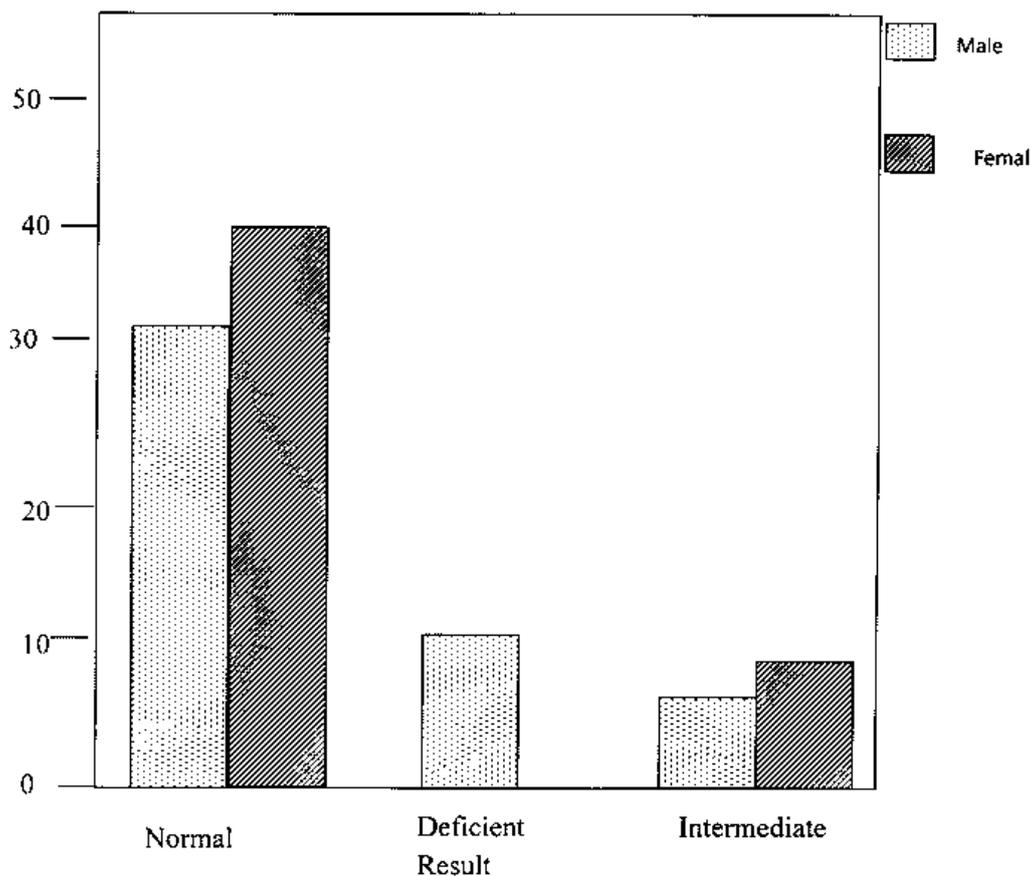


Figure 1: A bar chart of the results.

DISCUSSION

Student (age 18-35 year) of Ebonyi State University were screened for glucose-6-phosphate dehydrogenase (G6PD).male subject were statistically deficient ($P=0.5$).

G6PD is an inherited sex linked disorder that affects more males than females. Female carriers do not sufferer from the disease although they can transmit the defective to their offspring.

This is higher for the findings from this work. G6PD is mainly prevented through mass screening education and counseling. This study indirectly lifts to assess the possible health interventions in this environment. With the present prevalence it seems that the health intervention programmes institute towards eradication of G6PD is effective. Since this is an inherited disorder, there is need for more efforts toward educating the populace on the importance and means of eradicating of the disease.

In relation to Beutte *et al*, the inheritance of G6PD deficiency shows a typical X-linked pattern having a higher incidence in males than in females. Males are homozygous for the G6PD gene may be deficient or have a normal expression of the gene. Females, who have 2 copies of the G6PD gene on the each X chromosome can have normal gene expression or be heterozygous and

heterozygous females, are genetic mosaics as a result of X-chromosome inactivation (Beutler *et al.*, 1966).

CONCLUSION

In conclusion, it is recommended that study on prevalence of G6PD levels should be done especially in other departments of the institution since the Prevalence was high in Medical Laboratory Science department and approaches on what they should do like avoiding exposure to oxidant drugs and other things that illicit crisis made known to them.

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