AWARENESS, ATTITUDE AND PRACTICES OF PRE-MARITAL GENOTYPE TEST AMONG UN-MARRIED STUDENTS OF THE POLYTECHNIC, IBADAN, NIGERIA

BY

Veronica Evwiekpaomare OTEVWOYERE

Matric No: 147619

B.SC/Ed. Hons (Health Education) UNIPORT

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DEDICATION

This work is entirely dedicated to the almighty God, who has been my comforter, saviour, teacher, guide, sustainer, provider, protector and the strength of my life for his wonderful blessing throughout my programme.

ABSTRACT

Sickle Cell Anaemia (SCA) is one of the major causes of morbidity and mortality and a strategic way of reducing the problem is to educate the public and create more awareness on its causes and prevention. There is need for adequate information on awareness and attitude of young adults in tertiary institutions to undertake Pre-marital Genotype Test (PGT).Therefore, this study was aimed at determining the awareness, attitude, and practices of PGT among unmarried students of The Polytechnic, Ibadan.

A cross sectional survey was conducted among 382 students who were randomly selected from the four halls of residence in The Polytechnic Ibadan, using a multistage sampling technique. A semi-structured questionnaire which included information on socio-demographic characteristics, awareness about SCA and PGT, 40- point attitude scale relating to PGT, practice of PGT and intention to undertake the test was administered on the respondents. Scores of < 20 and ≥ 20 were classified as negative and positive respectively. Descriptive statistics and Chi-square test were used to analyse the data with level of significance set at 5%.

The mean age of respondents was 21.6 ± 3.1 years, 56.6% were females, 68.6% were Christians and 35.5% were in their first year of the National Diploma (ND) course. Respondents' awareness of SCA and PGT were 89.0% and 92.3% respectively. Major sources of information on SCA and PGT were television (67.9% and 59.8%), friends (54.9% and 50.6%), parents (44.1% and 59.8%) and health workers (47.4% and 50.3%) for both sexes. More than half of the respondents (58.4%) knew their Haemoglobin (Hb) genotype. Of those that claimed to know their Haemoglobin (Hb) genotype, 37.3%, 17.1%, 3.1% and 0.9% were AA, AS, SS and AC respectively. Parents were the major decision makers for respective Hb genotype testing. Of those that knew their Hb genotype, 18.2% and 26.2% of males and females respectively had informed their partners of the result. In respect to respondent's attitude to PGT, 54.0% had positive and 46.0% had negative attitude. Less than quarter (23.4%) of the respondents would not marry anyone with SCA, 58.4% agreed that it should not be a hindrance to marriage, while 55.4% affirmed their right to know their partner's genotype before marriage and 37.3% reported that their partner's genotype result would affect their selection of spouse. Furthermore, majority (85.3%) knew the importance of PGT. About 35.0% of those who

did not know their Hb genotype intend to undertake the test before marriage. There was significant relationship between respondent's awareness about SCA and awareness about genotype testing (p= 0.001).

Awareness and practice in respect to sickle cell anaemia and pre-marital genotype test among respondents were high. Partner's result affects the decision of respondents especially those with positive attitude towards premarital genotype test as critical factor. More awareness programmes should be created by the stakeholders during fresher's orientation programme by educating the students on premarital genotype test and the consequences of actions guiding their choice of partner.

Keywords: Sickle cell anaemia, Genotype test, Premarital Counselling.

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CERTIFICATION

I certify that this work was carried out by Veronica Evwiekpaomare OTEVWOYERE in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan under my supervision.

SUPERVISOR

PROFESSOR OLADIMEJI OLADEPO
MPH; PhD (IBADAN); FRSPH (UK)
Department of Health Promotion and Education,
Faculty of Public Health,
College of Medicine,
University of Ibadan, Nigeria.

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GLOSSARY OF ABBREVIATION

SCA	-	Sickle Cell Anaemia
PGT	-	Premarital Genotype Testing
WHO	-	World Health Organisation
DY	-	Dor Yeshorim
Hb	-	Haemoglobin
SCD	-	Sickle Cell Disease
DNA	-	Dyoxibonucleicacid
UN	-	United Nations

DEFINITION OF TERMS

In the course of this study, the following concepts have been liberally used. Thus, it is thought that the concepts should be clearly defined in order to enhance the reader's appreciation of the specific contexts in which they have been engaged:

Genotype: This is genetic constitution or genetic makeup of an organism or individual and usually with reference to specific character under consideration. The genotype is the genetic constitution of a cell, an organism, or an individual.

Genotype testing: This refers to the examination of the biological factors that determine inherited characteristics from the point of conception, eventual birth and throughout life. It involves a scientific process of collecting and testing the blood sample of intending couples to determine their susceptibility to biological traits (e.g. sickle cell anemia) and the extent to which the test outcome could influence their decision to get married.

Gene: This is a unit of inheritance. It is actually a sequence of DNA that is arranged linearly along a chromosome.

Alleles: This is one of two or more contrasting genes situated at the same locus in homologous chromosomes that determine alternative characteristics in inheritance.

Phenotype: This is the entire physical, biochemical and physiological nature of an individual as determine by his genotype after due interaction with his environment.

Sickle Cell Anaemia: This is a disorder where the body makes red blood cells that are shaped like a crescent moon or the letter'C' when they are depleted of oxygen.

S Beta Thalassemia: It is found in an individual who inherits thalassemia hemoglobin from one parent and the sickle cell hemoglobin from the other.

Sickle cell disease: This include all hereditary and haematological disorder in which sickle cell haemoglobin(Hb) is present. It involves two abnormal allelomorphic gene related to haemoglbin formation, at least one of which is sickle cell gene.

Sickle cell trait: This occur when a sickle cell gene is inherited from one parent and a normal gene from the other, this condition is usually without clinical significant.

Sickling test: It is used to determine the existence of sickle haemoglobin in one's blood.

CHAPTER ONE

1.1 Introduction

Genetic Testing and Screening have become parts of contemporary medicine and public health initiatives. These terms are usually used interchangeably, but the term “Testing” denotes a genetic test done on an individual on a voluntary basis, while “Screening” implies large-scale public health initiatives (Green et al, 2006).

Genetic disorder is a disease condition that occurs as a result of mutations, which could be fatal and cause varying degrees of harm (Taylor et al., 1997). It occurs as a result of a change in the nucleotide sequence in the DNA molecules in a particular region of chromosomes. The genes that have been altered are referred to as Mutant Genes. Gene mutation can cause loss, addition or rearrangement of bases in the gene. The mutation takes different forms and these include; duplication, insertion, deletion, inversion and substitution of bases (Odunlade, 2005). Examples of diseases that occur as a result of substitution mutation are sickle cell anemia, cystic fibrosis, phenylketonuria and hemophilia.

Sickle cell disease is a common genetic condition that affects hemoglobin – inheritance of mutant haemoglobin genes from both parents resulting in HbSS. It occurs at a frequency of 1 out of 1600 among black people. Another sickling variant is HbSC disease which is a milder sickling disorder. It is present in 1 of 1100 African Americans. The symptoms are similar to that of sickle cell disease but less frequent and severe. In S-beta thalassemia, individuals inherit one sickle cell gene and one gene of beta thalassemia. Sickle cell trait is the heterozygous carrier state of HbAS. These individuals are generally healthy as non-carriers. About 5% of the world population carried genes that are responsible for haemoglobin disorders (WHO, 2006). Sickle cell anemia contributes to an equivalent of 5% of under-five year old deaths and 9% in West African and up to 16% in some countries (WHO, 2006). Many also die before their reproductive age. Sickle cell anemia poses serious threat to health, especially in developing countries. Awareness on genetic understanding and screening is not a common practice and the diagnosis is usually made when it is presented

with a severe complication. Even when tragedies such as two or more miscarriages, still births, or children die in infancy, many at times, doctors do not order a blood test to take a closer look at the genetic makeup of parents or refer them to a genetic counsellor. Therefore, the most important challenge is to raise the awareness on its causes and prevention through health education (Adeyemo et al., 2007).

Sickle-cell anaemia is an autosomal recessive genetic disease and a person with the disease must have inherited a copy of the defective haemoglobin gene from each parent. Sickle-cell aneamia is caused by a defective gene that produces an abnormal form of haemoglobin, the component of red blood cells responsible for transporting oxygen from the lungs to the tissues. The abnormal haemoglobin, called Haemoglobin S (HbS), is an example of a single point mutation in the gene responsible for Haemoglobin Synthesis (Adekile, et al., 1999).

Sickle cell anaemia has been known in Africa before the twentieth century and the inhabitants have given it several names based on their understanding and trait. Some linked the disease with reincarnation such as the case of Ogbanje by the Ibo and Abiku by the Yoruba, both in Nigeria and Banyangi in Cameroon (Bazuaye and Olayeme, 2009). Thalassemia is among the most common genetic disorders worldwide. The beta thallasemia are widespread throughout the Mediterranean region, Africa, the Middle East, the Indian subcontinent and Far East (Refatllari, 2007). Sickle cell disorder (SCD) is one of the commonest but preventable inherited diseases. It is a disease that affects the red blood cells and is a lifelong ailment which has been with man since the existence of man. Sickle cell affects all races of the world; it affects the people of tropical Africa, Mediterranean Sea, Middle East and South India. It has contributed significantly to the high childhood mortality rate (Afolayan and Jolayemi, 2011).

Nigeria has an estimated population of 150 million with annual growth rate of 3.2% (Afolayan and Jolayemi, 2011). The current figure of individuals in Nigeria with this disorder is not known since the majority born in rural community do not survive childhood and the cause of death is poorly documented. However, approximately 2.3% of the Nigerian population suffers from sickle cell disorder and about 25% of Nigerians are healthy carriers of the abnormal hemoglobin gene

(Afolayan and Jolayemi, 2011). Anie et al., (2010) was also of the view that SCD is a global health problem with psychosocial implications and Nigeria has the largest population of people with SCD with about 150,000 births annually. Although over 300,000 babies are born worldwide with SCD, this is common mostly in low income countries. Since the discovery of sickle cell disease by Herrick in 1904 as published in 1910, a lot of new information has been made available about the disease. Studies have shown that the genetic basis of the disease is the substitution of valine for glutamic acid in position 6 of the globin chains (Nussbaum, 2001). This results in the sickling of the red blood cells leading to the clinical features of the disease inheritance of the gene by the Medellian Law and couples with AS will have 25% chance from each pregnancy to have Hb SS child, 50% chance of Hb AS and 25% chance of Hb AA (Bazuaye ad Olayeme, 2009).

Genetics diseases are disorders of the hereditary materials called Genes and Chromosomes. They happen to be the oldest, most widespread and probably the most burdensome of all human afflictions. The common tie among genetics diseases is that victims are born with this condition or with the susceptibility to develop the disease later in life. Some genetic diseases are inherited in a complex manner in which several genes are involved, while some others involve multiple genes together with certain environmental factors, such as the dietary, for the condition to express itself (Karmon et, al 2000). There are different types of Genotype as postulated by Brender and Leaner, (2002); and Odesina (1992); which are AA, AS, SS, SC (Sickle Cell Haemoglobin C) and sickle cell Thalassemia.

Most communities in Africa have very reliable traditional pre-marital mechanisms for ascertaining the future health challenges to which intending couples may by exposed. It basically involves an extensive investigation of the history of both families before family consent is given to the intending couples to get married. The method helps to provide information on occurrences, past or present, in any of both families of such diseases like leprosy, mental illness, or even antisocial behaviours like stealing which are considered stigmatizing among Africans (Epstein, 2001). The genotype of an individual differs subtly from his/her genomic sequence. A sequence is not an absolute measure of the base composition of that individual or is it representative of a species or group. A genotype typically measures how an individual differs or is specialized within a group of individuals or specie (Burke and Thomson, 2000).

Many religious organizations are currently requesting would-be-couples to conduct pre-marital genotype test. It is believed that marriage between two carriers of the Sickle Cell trait (HbAS) could only be described as an irrational plunge into troubles and as such, the couple risks the tendency to produce children with sickle cell anaemia in every of four children child/children that they bear. According to Mendelian's principles of inheritance, there is the tendency that two people who are carries could give birth to a sickle cell anaemia child/children. The couple could even have all their children with sickle cell anaemia irrespective of how many (Damilola, 2002). The fact that the victims of this genetic disorder suffer as a result of the ignorance or selfishness of their parents makes it quite pathetic. According to Damilola (2002), anyone who has ever witnessed the great anguish that an individual with sickle cell anaemia goes through during a period of crisis will definitely not need the eloquence of a preacher before reconsidering taking genotype incompatibility as one of the numerous risk of life.

The recognition of sickle cell aneamia as an important public health issue is necessary to ensure that young people are aware of sickle cell anaemia and how genotype test could assist them to avoid genotype incompatibility.

1.2 Statement of the problem.

From time immemorial, genotype testing has been a major problem for young intending couples in Nigeria. It is so crucial that many couples have called off their marriage plans owing to refusal or failure of a partner to undergo test prior to their marriage (Okome, 2007). The likelihood exists that there are many young people who do not believe in genotype testing before marriage. However, this does not eliminate the need for young people to know the implications of lack of genotype testing to them especially to the children they intend to raise in the future. By so doing, they can make informed decision about whether or not they would like to continue with the marriage plan or prepare in advance for the economic need to manage the offspring's from such crisis. Without doubts, the submission of intending couples to genotype testing is one of the surest means through which they could come into this vital knowledge (Omenn, 2000).

Genotype mismatch is a major problem among young people who intend to get married. In recent times, this has become a very crucial indicator for people considering marriage as many people with mismatched genotypes who got married previously without due consideration of this issues, end up having children with Sickle Cell disease who are highly maintenance kids with the additional fear that they may not live long. Thus many of such marriages with the aforementioned problems do not stand the test of time. Therefore, it has become prevalent for intending couples to conduct Genotype testing as part of their marriage plans to avoid the mistakes of earlier generations. The solution to this problem is educating intending couples on the need to go for genotype test before planning for marriage.

Poor availability of resources to the Public Health and Welfare sectors and economic inflation are severely curtailing access to appropriate medical and social services. This situation is frustrating to the families of a growing number of surviving patients in urban or middle to upper income groups. Efforts to create more awareness of SCD are paradoxically increasing frustration and stigmatization in the absence of a commensurate improvement of services (Akinyanju et al., 2005). Any measures aimed at enhancing the sensitization of health professionals, policy makers, and resource allocators to the pertinent issues in the control of SCD would seem to be at this stage an important step in the right direction.

According to Clement and Chukwuma, (2004), the level of knowledge on genotype testing among young people is about 55.5% in Nigeria according to a research conducted in a hospital to assess the knowledge of sickle cell as a tool for marriage. Like most hereditary diseases, sickle cell anaemia constitutes a burden to families when even a member suffers from it, especially as it affects the family's finances and emotions.

This study was designed to assess the awareness, attitudes and practices of selected young people towards genotype testing which is an appropriate and effective medical diagnostic tool for preventive measure against socio-economic and psychological burden that may result from marriages of genetically incompatible partner.

1.3 Justification

The burden of sickle-cell disease in the African Region and especially in Nigeria is increasing with the increase in population. This has major public health and socioeconomic implications. Despite recent high level interest in SCD, including commitment from some African First Ladies and the adoption of a UN resolution recognizing SCD as a public health problem, SCD prevention and management using effective primary prevention measures remains inadequate (UN, 2008).

Sickle cell disease is the most commonly inherited condition in Nigeria, yet it continues to be ignored. Many parents who have children born with sickle cell anemia have resorted to hiding them from the public in fear of being isolated as outcasts of the ancestors (UN, 2008). Other parents have visited traditional medical persons searching for a solution. This is because they think that their children must have been bewitched. Therefore, there is a great demand for effective awareness, sensitization and training of parents especially in those communities or parts of the country where the disease has turned out to be a night-mare. The group of people that need training and sensitization include literates, semi-literate and illiterates. This will build confidence in homes where the problem is in existence having known that sickle cell is not a curse out of a sin of the past but is a genetically inherited disease that can be handled and controlled. In the same manner, It will give a chance to those living with the disease to come out and speak in their defense thus expressing their right to life, education, family, parental care as well as jobs.

This strategy revolves around existing documents and past achievements in non- communicable diseases control (WHO 2006). The WHO resolution WHA59.20 emphasized the urgency for Member States to design, implement and reinforce in a systematic, equitable and effective manner, comprehensive national and integrated programme for the prevention and management of SCD. The SCD strategy for the WHO African Region seeks to increase individual and community awareness about SCD and strengthens primary prevention, reduces disease incidence, morbidity and mortality, and improves quality of life. The Strategy also contributes toward the achievement of the Millennium Development Goals 4 and 5.

The selection of appropriate spouse in a society like Nigeria with poor unawareness rate depends to a large extent on the quality of enlightenment campaigns undertaken for the purpose of educating and counseling the individual on the danger of having sickle cell child/children (Green et al., 2006). Such campaign will become more effective when educated and influential members of the society are used as change agents and when facilities for testing are available.

The need for this study is to identify the strength and gaps of young people's awareness, attitudes and practices to undergo genotype testing. Also, the study will also document the effects of lack of genotype testing, its effects on young people's relationships, and their willingness to undergo testing before marriage. There is need for this research because it will help to safeguard the future of the young people who intend getting married and the health of their unborn child/children. Crisis will be avoided and there will be harmony in the homes of couples if all the above conditions are considered before marriage.

The study has a potential of giving insight on awareness, attitudes and practices towards uptake of genotype test on choice of marriage partner and in prevention of complications in future.

1.4 Research Questions

The study provided answers to the following:

1. What proportion of respondents' was aware of sickle-cell anaemia and pre-marital genotype test?
2. What is the respondents' attitude towards sickle cell anaemia and genotype testing?
3. What are the respondents' practices on genotype testing?
4. What is the future intention of respondents to undergo genotype testing?

1.5 Objectives of the study

The general objective of this study was to determine the level of awareness, attitude towards sickle cell anaemia and genotype test and future intention to undergo test among the un-married students of The Polytechnic, Ibadan in Oyo State in order to obtain and provide important baseline data,

and make recommendations that could be useful in promoting the important of pre-marital genotype test. The specific objectives that guided the study were as follows:

To:

1. Determine the respondents' awareness on sickle cell anaemia /pre-marital genotype test.
2. Determine the attitudes of the respondents on sickle cell anaemia and pre-marital genotype test.
3. Determine the respondents' practices on pre-marital genotype test.
4. Assess the future intention (willingness) to undertake genotype test before marriage.

Hypotheses

The following hypotheses were tested:

Ho: There is no association between awareness about sickle cell anaemia and awareness about premarital genotype test.

Ho: There is no association between awareness about sickle cell anaemia and future intention to personally undertake genotype test.

Ho: There is no association between awareness about genotype testing and intention to personally undertake genotype test.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of Genotype and Mendelian Inheritance

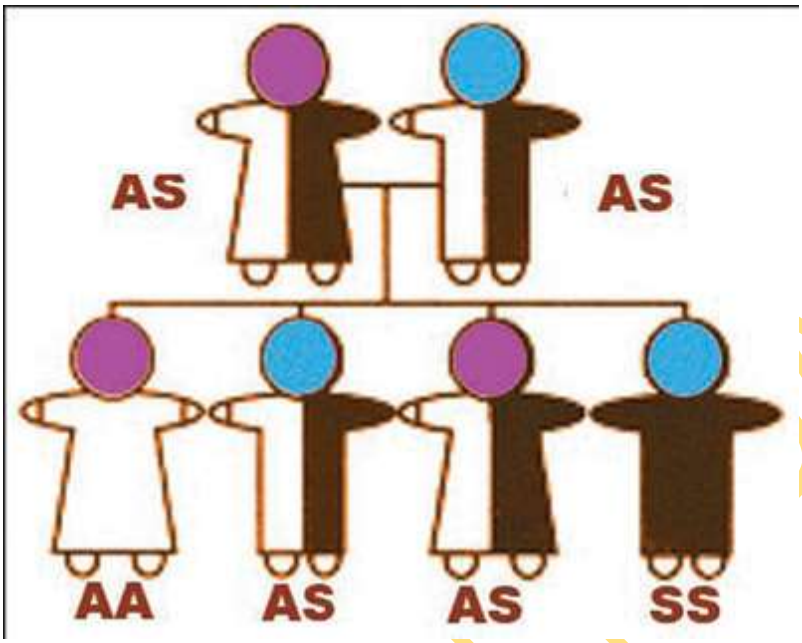
Sickle cell anaemia has been known in Africa before the twentient century and the inhabitance have given it several names based on their understanding (Onwubalili 1983). Since sickle cell anaemia was discovered by DR J.B. Herrick in 1904, from the blood of an anaemic West ldian medical student, a lot of information have been made available about the disease. It was inferred that the gene has a variable expression which is more pronounced in some individuals producing sickle cell aneamia and weaker in others, resulting in what is now referred to as sickle cell trait (Nussbaum 2001).

Genetics is concerned with some inherited characteristics. Long DNA molecules are carried on structures called chromosomes in the nucleus of each cell. Human chromosomes occur in pairs; one derived from the mother and one from the father in sexual reproduction. Humans have twenty-three pairs of chromosomes, of which twenty-two are similar in males and females. These are numbered 1 through 22; according to chromosome size. One chromosome pair is different between the females and males: XX in females, and XY in males (Nussbaum 2001).

Several key concepts put forward by Mendel have been expanded, as the science of genetics has grown. It is now known that genetic information is passed on as a series of discrete units known as Genes, each of which is associated with specific traits. Furthermore, most organisms (including humans) get two copies of their genetic information, one from each parent. This means that most living things have two copies of each gene, and that these two copies are not necessarily the same since they came from different parents (Sturtevant, 2001).

The distinction between Genotype and Phenotype is commonly experienced when studying family patterns for certain hereditary diseases or conditions. Due to the diploid of humans there are two alleles for any given gene. These alleles can be the same (homozygous) or different

(heterozygous), depending on the individual. With a dominant allele, the offspring is guaranteed to inherit the trait in question irrespective of the second allele. With a recessive allele, the phenotype depends upon the other allele. This person has a normal phenotype but runs a 50-50 risk of passing his or her abnormal gene on to offspring. A homozygous dominant individual has a normal phenotype and no risk of abnormal offspring (Holtzman and Watson, 1998). A homozygous recessive individual has an abnormal phenotype and is guaranteed to pass the abnormal gene onto offspring (See table 2.1).



Transmission of Sickle Cell Aneamia in Different Mating Types

Table 2.1 Mode of inheritance table

Mating Type	**Percentage of offspring**		
(Hb Genotype)	AA	AS	SS
AA X AA	100	-	-
AA X AS	-	50	-
AA X SS	-	100	-
AS X AS	25	50	25
AS X SS	-	50	50
SS X SS	-	-	100

A =Dominant Gene for Normal Haemoglobin A

S = the Recessive Allele Producing Haemoglobin S.

(Source: Ogundipe and Obinna 2010)

2.2 Nature of Sickle Cell Disease

Sickle-Cell Anaemia is an autosomal recessive genetic disease or blood disorder and an individual with the disease must have inherited one copy of the defective haemoglobin gene from each parent. Sickle-cell anaemia is caused by a defective gene that produces an abnormal form of haemoglobin, the component of red blood cells responsible for transporting oxygen from the lungs to the tissues. The abnormal haemoglobin, called haemoglobin S (HbS), is an example of a single point mutation in the gene responsible for haemoglobin synthesis (Ekman et al., 2007).

The term Sickle Cell Disease according to Scott (1993) refers to a group of genetic disorders characterized by the presence of sickle hemoglobin, aneamia, and acute and chronic tissue injury secondary to blockage of blood flow by abnormally shaped red cells. Normal hemoglobin, A is composed of two alpha (a) globin chains and two beta (B) globin chains. The most common type of Sickle Cell Disease is sickle cell anemia in which the affected individual is homozygous for is the B^s gene. Other common forms of sickle cell disease include the inherited B-thalassemia (Hb S B-thalassemia).

In sickle cell trait, the individual has inherited both a normal B globin gene and a B^s globin gene. Individuals with sickle cell trait produce both normal hemoglobin and Hb S and have a predominance of Hb A. Red cells from persons with sickle cell trait do not sickle except under adverse circumstances. Persons with sickle cell trait have normal hemoglobin concentrations and normal red cell morphology.

Geographical distribution of Haemoglobin S*:* Certain ethnic populations have more people who are carriers of the sickle-cell trait. The haemoglobin S gene is particularly common in western Africa and people of western African ancestry, and an estimated 8 to 12 percent of all African-Americans carry the sickle-cell gene (Ekman, 2007).

In Nigeria, the figure is about 25% while the homozygous state is found in about 3% of the population (Adekile and Azubuike, 1999). There is a wide variation in the prevalence of the gene in different parts of Africa. However, the frequency of the trait has been estimated to be as high as

25-40%. Researchers believe that the haemoglobin S gene is particularly common in these populations because carriers of the sickle-cell gene are less susceptible to malaria, once one of the leading causes of illness and death in these malaria endemic regions. The sickle cell gene confers on individuals the likelihood to resist malaria thereby sustaining the S gene in the population (Redmond, 2006; Ekman, 2007)

Distribution of Beta Thalassemia: Thalassaemia is a blood related genetic disorder which involves the absence of genes responsible for production of haemoglobin, a protein present in the red blood cells. Each red blood cell can contain between 240 and 300 million molecules of haemoglobin. The severity of the disease depends on the mutations involved in the genes, and their interplay (WHO, 2011).

According to WHO, Alpha and Beta Thalassaemias are the most common inherited single-gene disorders in the world with the highest prevalence in areas where malaria was or still is endemic. In Nigeria, the burden of this disorder in many regions is of such a magnitude that it represents a major public health concern.

The β-thalassemia is most common and caused by any of more than 200 point mutations and, rarely by deletions. Within each population at risk for β-thalassemia, a small number of common mutations are found. Population movements have led to dissemination of the gene. ß-Thalassemia is now widespread in Europe, Americas and Australia. Most affected children are born in countries with limited resources; these affected children do not receive the treatment they need, thereby dying in childhood (Refatllari, 2007).

Pathphysiology of sickling: The flexibility of the cells is decreased and they become rigid and take up their characteristic sickle appearance. These distorted cells are called sickled cells because of their resemblance to the sickle, a type of crescent-shaped cutting blade used in agriculture. The process is initially reversible but, with repeated sickling, the cells eventually lose their membrane flexibility and become irreversibly sickled. This is due to dehydration, partly caused by potassium leaving the red cells via calcium activated potassium channels (Murphy et al., 2005). Sickling can produce: A shortened red cell survival, leading to a deficiency of red blood cells, known as aneamia and is precipitated by infection, dehydration, cold.

Diagnosis/ Screening tests: These are tests that indicate the presence of HbS, but do not define the Hb genotype of the individual. The tests are based either on the morphological changes that occur in red blood cells containing HbS, when subjected to deoxygenation (sickling test). Sickle-cell aneamia is diagnosed by a procedure called Haemoglobin Electrophoresis, in which haemoglobin samples are identified by the speed of the haemoglobin when subjected to an electric field. Several different media, supporting structures and buffers have been used, but the most widely used is cellulose acetate electrophoresis (buffer pH 8.6). It is fast and generally reliable (Adekile, 1999).

2.3 Genetics and Heredity

Genetics and heredity are closely related ideas. Whereas heredity is the transmission of genetic characteristics from ancestor to descendant through the genes, genotype is concerned with hereditary traits passed down from one generation to the next. It is very hard, if not impossible, to separate the two concepts completely, yet the entire body of knowledge encompassed by these topics is so large and so complex that it is best to separate them as much as possible. For this reason, the Heredity essay is concerned with such issues as how traits are passed on and why they appear in a particular generation but not another. That essay addresses the topics of alleles, dominant and recessive genes, and so on. It also briefly discusses the history of studies in areas that encompass genetics, heredity, and the mechanics. In general, the Heredity essay is concerned with the larger patterns of inheritance over the generations, while the present one examines inheritance at a level smaller than the microscopic—that is, from the molecular or biochemical level (Omenn, 2000).

Inherited disorders of haemoglobin are among the most frequently occurring single gene disorders in humans, of which sickle-cell disease (SCD) and the thalassaemias are the most common, an inherited hemolytic aneamia with disordered red blood cell metabolism, is also common. Genetics seems to provide the answer to the basis of disease and to offer insight into the status of the health of populations. Medical genetics offers genetic testing as a tool for diagnosis and through genetic counseling, individuals will be provided with an accurate understanding of genetic inheritance and what it means to be ‘at risk’. The usefulness of genetic testing relates to the efficacy of disease

prevention and the right of a person to know his or her own genetic heredity. This will bring about a substantial impact on health improvement. Genetic screening for personal health will provide information about the health and well being (not necessarily reproductive health) while in other cases it may be used for health related reproductive risks. Testing for genetic disorder will also provide a person with relieve of the uncertainty of not knowing, especially when such a person has a previous record of any suspecting disease. Additionally, genetic testing has become a tool for parents to decide whether to have only affected and/ non-affected offspring's. When genetic testing has been carried out to establish a diagnosis of hereditary or congenial diseases in affected patients with high accuracy, it is usually accompanied with genetic counseling.

2.4 Incidence of Sickle Cell Disease

According to World Health Organisation (2010), it was reported that an average of 150,000 infants are born with SCD in Nigeria, which has an annual infant death figure of 100,000. Hence, the high incidence of sickle cell cases, experts insist on a holistic approach targeted at evolving strategies that will keep the disorder in check.

Sickle cell anemia affects millions of people throughout the world. It is particularly common among people whose ancestors come from sub-Saharan Africa; Spanish-speaking regions (South America, Central America); Saudi Arabia; India; and Mediterranean countries such as Italy.

The incidence of sickle cell anaemia in Nigeria is among the highest in the world, with more than 100,000 Nigerian children being born each year with the disorder. Those with the disease suffer a higher than average frequency of illness and premature death, especially in infancy. The condition can also cause heart attacks, kidney failure, severe infections and sudden death. Statistics available shows that over 40 million Nigerians are carriers of the S gene. Indeed, this number far exceeds the total population of every other affected African country and several of them put together (Ogundipe and Obinna, 2010). Despite the large number of people with sickle cell disorder, the Nigerian society in general still has a negative image of SCD, and reported negative perceptions and attitudes.

A study done on the "Psychosocial Impact of Sickle Cell Disorder: Perspectives from a Nigerian setting" by Akinyanju et al., (2010) showed that depressive feelings were experienced in almost half the study population even though; feelings of anxiety or self-hate were uncommon. Worse still, survival of Nigerian children beyond childhood is largely dependent on their access to appropriate care and because most of them are born into poor under-privileged families, very few of them survive childhood. With the two per cent birth incidence, the estimated population of SCD-affected persons in Nigeria is about one million, owing to a high rate of premature deaths. However, having sickle cell disease means a lifelong battle against the health problems it can cause, such as pain, infections, anemia, and stroke. But many people are able to have a very good quality of life by learning to manage the disease.

The sickling occurs because of a mutation in the haemoglobin gene. Life expectancy is shortened with studies reporting an average life expectancy of 42 for males and 48 years for females. Sickle-cell disease which is usually presents during childhood occurs more commonly in people from parts of tropical and sub-tropical regions or where malaria is common as reported by Akinyanju et al. (2010).

In the United States, it affects around 72,000 people, most of whose ancestors come from Africa. The disease occurs in about 1 in every 500 African-American births and 1 in every 1000 to 1400 Hispanic-American births. About 2 million Americans, and 1 in 12 African Americans, carry the sickle cell trait (OMIM, 2001; Bownas, 2005).

In Nigerian, the haemoglobin S and C are known to be causing serious problem. Hb S is the more common of these two, and it is evenly distributed throughout the country with reported heterozygote AS carrier's rate of 25% in Southern Nigerian, 19 to 32.6% in Northern Nigerian and overall estimated average rate of 25% (Olufemi, 2006). Analysis of the Beta S Chromosomes in a study showed the 13.0 kilobites linkage in 98.4% out of 183 Nigerians with a haplotype corresponding to the recent described haplotype. Although, Hb C is rare in Northern and Southern Nigeria but common among the Yoruba people of south western Nigeria in whom Hb AC carrier rate is between 5 and 7% and the incidence of Hb C is 20%, the highest in the world as reported by Olufemi in 2006.

2.5 Prevalence of Sickle Cell

Prevalence varies from one country to another. Sickle cell trait occurs in about 8% African Americans and 20 - 30% in Nigeria and 20 - 40% in Africa (Fleming and Wattkins, 2005) as reported by Adeyemo et al.,(2007). Many studies have shown the prevalence of sickle cell disease and these diseases are relatively high in the some countries. About 5% of the world's population carries genes responsible for haemoglobinopathies. Each year about 300, 000 infants are born with major haemoglobin disorders – including more than 200, 000 cases of sickle-cell aneamia in Africa.

Globally, there are more carriers such as healthy people who have inherited only one mutant gene from one parent of thalassaemia than of sickle-cell aneamia, but the high frequency of the sickle-cell gene in certain areas leads to a high rate of affected newborns (WHO, 2006).

In Nigeria, by far the most populous country in the sub region, 24% of the population is carriers of the mutant gene and the prevalence of sickle-cell aneamia is about 20 per 1000 births. This means that in Nigeria alone, about 150, 000 children are born annually with sickle cell aneamia (WHO, 2006). Also, Onwubalili (2009), Postulated that the prevalence rate in Nigeria is about 30,000 children who are born with the disease every year. The sickle-cell gene has become common in Africa because the sickle-cell trait confers some resistance to falciparum malaria during a critical period of early childhood, favouring survival of the host and subsequent transmission of the abnormal haemoglobin gene. Although a single abnormal gene may protect against malaria, inheritance of two abnormal genes leads to sickle-cell aneamia and confers no such protection, and malaria is a major cause of ill-health and death in children with sickle-cell aneamia. There is increasing evidence that malaria not only influences outcome but also changes the manifestations of sickle-cell aneamia in Africa.

In Nigeria the prevalence of Hb SS is 1-3% and it posses a severe burden on the affected individuals and their their families (Oyedeji, 1995). According to Adeyemi and Adekanle, (2007) reported that in general, about 5% of people of African origin carry sickle cell gene.

According to Adeyokunu and Adeyeri, (2011), a three and a half year follow up of 45 families with at least one affected child from Ibadan community was carried out to investigate the effectiveness of counseling both general and genetic when this was sought by parent of the stress and show adequate care to the child. According to World Health Organization, (2006) report shows that the public health implication of sickle cell is significant in Nigeria and its impact on human health may be assessed against the yard sticks of infant and under-five mortality of which 5% are attributed to sickle cell anaemia.

Researcher believe that the haemoglobin S gene is particularly common in these populations because carriers of the sickle cell gene are less susceptible to malaria, once one of the leading cause of illness and health in these malaria endemic regions. The sickle cell gene confers on individuals the likelihood to resist malaria thereby sustaining the S gene in the population. Hereditary diseases, especially sickle cell and thalassemia, are present with a high prevalence in Nigeria and caused great suffering of the children (Onwubalili, 2009).

In the United States of America, median survival was estimated in 1994 to be 42 years for men and 48 years for women, whereas comparable figures for Jamaica published in 2001 suggested 53 years for men and 58.5 years for women. In Jamaica, the greatest mortality occurs between 6 and 12 months old when 10% of patients die despite considerable experience in the diagnosis and therapy of the condition and absence of malaria. There are, however, no firm data on the survival of patients with sickle-cell aneamia on the African continent.

According to Ekman and Redmond (2006), there is a wide variation in the prevalence of the gene in different parts of Africa. However, the frequency of the trait has been estimated to be as high as 25-40%.

2.6 Importance of Pre-Marital Genotype Testing.

The role of genetics and the environment in the onset of many major non-communicable diseases particularly monogenic diseases is well established. Consequently, genotype testing is gaining recognition for the many advantages it has to offer in the prevention, management and treatment of disease. Among their many uses, genotype tests most commonly present an opportunity for

individuals to become informed about their genetic predisposition to disease, and for couples to be aware of the possible genetic characteristics of their unborn child/children. Stemming from the informative potential of genetic testing some critical ethical, legal and social issues come to the forefront (WHO, 2010).

According to Adewuyi, (2011) in a seminar that was organised to sensitise the students on the importance of knowing their genotype and its compatibility with others emphasizes the need for genotype testing to prevent sickle cell anaemia and the significance of the Haemoglobin Genotype, which enable us to know that sickle cell patient cannot perform certain duties that non-sickle cell patients can perform.

2.7 Knowledge/Awareness on sickle cell anaemia/Genotype testing

Though there has arguably been an "explosion" of awareness in genetic medicine, there exist an increasing gap between the genotype testing that could be provided and the resources that are available. The provision of such resources will probably require support by State and Federal governments, as well as the private sector, and there are a number of models of service provision that could be developed (WHO, 2010).

Awareness of genetic risks can lead to potential social and psychological consequences for the individual. Socially, knowledge from genotype tests may lead to stigmatization and discrimination within the community (WHO, 2010). Refusing to undergo genotype testing as well as choosing to undergo genotype testing can both lead to discrimination and stigmatization depending on the prevalent social norms regarding acceptance and use of the technology. Furthermore, awareness of the test results may lead to the marginalization of the individual from mainstream society by virtue of the health risks identified. Discrimination can be in the form of denial of health insurance, employment or simply social acceptance. In particular, knowledge of risk of disease may be used by health insurance providers and employers to deny individuals employment, benefits and allowances and medical coverage or health insurance. This is worrisome in communities in Nigeria especially where people rely heavily on private insurance systems as a source of funding for necessary medical treatments. On the other hand within the context of a well informed

community integrated clinical and social support systems which include counseling services for patients and their families, knowledge of genetic disease or predisposition can lead to better care and management of the patient and ultimately to improved quality of life (WHO, 2010).

In a study carried out in Nigeria, to determine the extent of awareness of sickle cell anaemia and its heterozygous state among undergraduate students of the University of Nigeria, Enugu Campus, A total number of 452 students were respondents. Eighty-six percent of the students knew their haemoglobin genotype while 14% did not. Six percent (6%) of the students did not know that individuals with the homozygous state (HbSS) will come down with a clinical illness known as sickle cell anaemia and 25% do not know that someone with haemoglobin genotype AS is said to be a sickle cell carrier (Agbanusi et al., 2006).

Also in another study conducted in Nigeria amongst senior secondary school students about knowledge about sickle cell disease. The study shows that 32% of the respondent knew their Hb genotype while 55% did not. Adeyemi and Adekanle (2007), suggested the need for some legislation about premarital screening of Hb phenotype and education of the citizen which should start as early as at the level of secondary school.

Another study was conducted in Ile-Ife Nigeria, among 300 local government workers to determine the level of knowledge about SCD and the factors associated with its prevention. From the study conducted, 69% of study subjects had poor knowledge of SCD and 20% of the respondents were aware that they have sickle cell anaemia while 25.3% knew that their partners had sickle cell anaemia (Abioye-kuteyi et., al 2009).

In another study conducted among youth corpers in a Nigeria community. The study was conducted between January and March, 2009 among youth Corpers in Owo to determine the awareness of sickle cell disease among them. One hundred and sixteen out of the two hundred and fifty youth corpers in the community were selected. 97.4% were aware of sickle cell disease. About 30.1% knew of sickle cell disease through lectures and seminars. While 69% were aware of their haemoglobin genotype (Omolase et., 2010).

Also in a study conducted among university students in Nigeria to determine the awareness towards marriage in the face of haemoglobin genotype incompatibility, shows that half (50.1%) knew their haemoglobin genotype status as the time of study (Alao, 2008).

Okadiran, (1990) asserted that people of low socio-economic status have low level; while on knowledge of topical and social issues, it was noted that even among practicing nurses and nursing students, the percentage with adequate knowledge on genetic condition was low. He therefore recommended efforts geared towards improving the basic knowledge of all individuals, including health professionals, in all aspects of promoting positive behaviour. On sickle cell disease related issues, emphasis should be laid on correcting wrong beliefs, strengthening personal knowledge and addressing the structural and psychological factors that enable an individual to undertake recommended preventive measures.

2.8 Attitude towards Sickle Cell and Genotype Testing

Generally, screening provides the individual with genetic information of potential value which could assist him in making informed decisions about future reproduction. This benefit of screening notwithstanding, submission of self for the screening test has not received widespread acceptance, particularly in developing world. Among the many factors identified for this trend are doubts that accurate diagnosis is positive (Doris, 1990).

In addition to the aforementioned observation, Akinyanju and Anionwu (1990) stated that superstitious belief about genotype test is a major issue adversely affecting the willingness of the public to embrace screening. Other constraints include barriers to screening arising from undersupply of preventive counseling services in clinics and hospital. Various behavioural scientists have attempted to give explanations for the factors that militate against the acceptance and utilization of laboratory and hospital for screening programme, but perhaps the most formidable explanations were those draw from the precede model.

In a study conducted in Ilorin, Nigeria six hundred and ten new graduates of Nigerian tertiary institutions were studied for their attitude to sickle cell disorder, a sickle carrier frequency of 21.6% was found and the questionnaires revealed severely deficient knowledge of the

transmission of SCD among the 20-32 year old graduates which shows that their attitude was poor. After the seminar, there was eagerness among the graduates to know their sickle status. It is concluded that unmarried youths in, or graduating from, higher educational institutions may be a most suitable target for information, carrier detection and genetic counselling in the prevention and control of sickle cell disorders (Adewuyi, 2000).

Another study was conducted among parents of children with sickle cell disease to know their parental attitude in selected health facilities in Irepodun Local Government, Kwara State, Nigeria. Findings from the study showed that about 87% of the participants regretted having such children and gave reasons such as lack of enlightenment programme on sickle cell aneamia, no genetic counseling, ill-disposition to pre-marital genotypic screening, inadequate medical facilities for adequate test for genotype in rural areas, gross misrepresentation and wrong perception of sickle cell disease, lack of knowledge of people on sickle cell disease and nonchalant attitude to the result of screening due to love and interest in one's partners were the reasons for their attitude (Afolanyan and Jolayemi, 2011).

2.9 Practices of Genotype Testing

Generally, genotype testing is a sure way for individuals to know if they have sickle cell aneamia or not and by so doing their blood sample is been screened to detect the sickled red blood and prevent them from future complications relating to their health.

In a study conducted, virtually all the participants (98%) believed that adults generally have the right to know their genotypes. A majority of participants (63%) believed that parents generally have the right to undertake genotypes test for their children while the children are still minors. A similar majority (67%) felt that teenagers, aged 13 to 18, should have the right to undergo and know their genotype if they either have parental permission or are emancipated minors. A minority (29%), however, reported that school-aged children of 6 to 12 years have the right to undergo genotype test if they have parental permission or not (Kivipelto et al., 2004).

Otaigbe (2010), emphasized that, government should ensure that babies have their genotypes test done, and Sickle cell aneamia children registered in sickle cell clinics for proper management. Sickle cell sufferers and their parents are also encouraged to join sickle cell clubs where they can associate and learn more about the disorder and educated the general public. The genotype test should be made compulsory for all babies brought to the hospital so that their status can be detected on time, and referred them for treatment at appropriate places.

Treatment of sickle-cell anaemia is geared toward preventing crises, aggravating factors like infections and cold, thereby reducing organ damage, and minimizing pain and discomfort (Eckman, 2007; Redmond, 2006). All persons with Sickle Cell trait should be educated about the inheritance of Sickle Cell Disease (SCD) and the availability of partner testing, genetic counseling, and pre-natal diagnosis (Baron, 1994). There is need for more sensitization about this disease among students and the general populace as a step towards reducing the prevalence of hereditary disease as a result of not undergoing premarital genotype testing. Some of the possible ways to reduce the spread from intending couples to their unborn children are: Sensitization in form of rallies, advertisement on radio, television, posters and bill boards.

In conclusion, eliminating sickle cell disease in Nigeria and Africa at large is to make sure young intending couples undertake genotype test along side with their partners. If only a national program is implemented for the prevention of sickle cell anaemia. Such program will ensure that every individual knows his/her haemoglobin genotype before getting to the child bearing age, and that hospitals carry out compulsory prenatal diagnosis and diagnosis at birth properly. Its effective advocacy must be emphasized (Adeyemo and Soboyejo, 2006).

2.10 Genetic Counseling on Pre-marital Genotype Testing

Genotype Testing is a relatively new concept that is gradually becoming widespread in Nigeria. In simple terms, the process uses techniques that enable the technician to identify mutant DNA (Malformed Chromosome or genetic material that could be transferred from parents to children) in a person's genetic makeup. If a mutant is found, medical precautions can be taken. If none is found, then it can be assumed that the person does not carry the harmful gene and has the same

risk of contracting the disease as anyone else in the population (Hill and Wang, 2001), Therefore, genetic counseling is or should be a part of premarital genotype testing.

Genetic Counselor can help to decide the type of test the couple should consider. Details of the family history, medical records and conditions of family members from both sides should be provided to the counselors to have a proper advice from him. If the couple is informed of the possibility that they are at an increased risk of having a genetically abnormal child, they can choose to plan conceptions according to medical advice and can make use of the genetic counseling services available, such as: the Pre-natal Screening of the fetus at an early stage of pregnancy as well as the option of termination of the pregnancy (Eastern Biotech, 2010).

In 2006, the Genetic Counselling Task Force of the National Society of Genetic Counsellors (NSGS) provided a new definition of genetic counselling as – the process of helping people understand and adapt to the medical, psychological and familial implications of genetic contributions to disease (Resta et al., 2006). This process integrates interpretation of family and medical histories to assess the chance of disease occurrence or recurrence, education about inheritance, testing, management, prevention, resources, research and counselling to promote informed choices and adaptation to the risk or condition.

In Nigeria, genetic counselling clinic are not many compared to many developed countries, genetic testing and genetic counselling have been commonly done to identify carriers (Oyenike et al., 2007). Similarly, only few doctors in Nigeria have been trained in genetic counselling. Furthermore, genetic practice has not been given the serious attention that is needed. Access and availability to genetic services will help in referring patients to genetic counsellors, which will improve the detection of genetic risk factors. Genetics seems to provide the answer to the basis of disease and to offer insight into the status of the health of populations. Medical genetics offers genetic testing as a tool for diagnosis and through genetic counselling, individuals will be provided with an accurate understanding of genetic inheritance and what it means to be ‘at risk’. Genetic counseling will help establish a diagnosis of hereditary diseases in affected patients, take measures to alleviate the clinical manifestations of such disease, predict the probability of development of a disease in families/individuals not yet affected and possibly prevent it (Adeyemo et al., 2007).

Furthermore, in the prediction of giving birth to an offspring with a genetic disease and proffering options to take decisions, this will help to distort the general confusion about the potential benefits and risks of genetic testing. Information about genetic testing and counselling should be part of regular medical practice to achieve desired level of knowledge and a change in attitude. Public education on the hereditary nature of sickle cell disease and genetic counselling should be made regularly through teaching in schools, religious centres etc. This will aid both parents and prospective couple's access to information about child bearing risks and in the diagnosis of sickle cell disease. Hindrances to genetic counselling may arise from illiteracy, improper history record and polygamy. It is possible to take detailed family histories and provide genetic counselling advice in primary care with minimal training of clinical staff (Rose, 1999).

2.11 Preventive Measures

A premarital test is defined as a test in which couples that are going to get married are tested for genetic, infectious and blood transmitted diseases to prevent any risk of transmitting any disease to their children. Premarital testing is considered an important issue, as a result of the increasing number of children affected with genetic or blood transmitted diseases (Eastern Biotech, 2009). Pre marital screening varies from one region to another depending on the prevalence of the diseases in that region.

In an effort to reduce genetic diseases, especially those peculiar to certain populations, many communities encourage couples to perform genotype testing prior to marriage as well as on the fetus during pregnancy, to determine any risk of disease. While this strategy has effectively reduced the prevalence of some genetic diseases like thalassaemia, for which there is still no cure, it is argued by some that it limits the individual's freedom of choice. Couples may be coerced into genotype testing with little regard for obtaining their free and informed consent (WHO, 2010).

Voluntary submission of self for genotype testing and readiness to abide by the test are primary preventive health behaviors expected from people who are at risk of having sickle children or developing complication in future. In order to avoid crises and make counseling compulsory in screening centre's, both retrospective and prospective counseling and educating should be adopted

at every centre. This is particularly important because of the estimated risk of affected offspring which shows that a couple carrying the AS trait each has a 25% chance of having a SS child. Counsellors therefore, must assure that carriers of the sickle trait are made aware of this fact before making a decision on marriage partners (Coughlin 1999; Nuffield Council on Bioethics, 2006).

According to Epstein and Katzenstein (2001), the surest way to prevent sickle cell disease is by performing premarital genetic testing (PGT) and informing prospective spouses about their carrier status. Potential partners who are both carriers of a particular recessive trait are also advised not to marry or procreate if they so wish to marry. Several PGT programs have been instituted around the globe. The two most cited ones are the Dor Yeshorim (DY) program and the Cyprus thalassemia screening project. Their means of operation are different, so also their outcomes (Prainsack and Siegal, 2006).

2.12 Confidentiality towards Genotype Testing

As regards other areas of clinical medicine or science, confidentiality is important in genotype testing. If anything, the confidentiality of genetic information may need to be guarded even more stringently than in the ordinary case. Genotype tests give an assessment of an individual's inherent risk for disease and disability. This predictive power makes genetic testing particularly liable for misuse. Employers and insurance companies have been known to deny individuals essential health care or employment based on knowledge of genetic disposition. This type of discrimination can be socially debilitating and have severe socio-economic consequences. It is important, therefore, to ensure the confidentiality of test results, and to establish legislation permitting only selective access to this information (WHO, 2010).

Genetic information can have important implications not only for the one who is tested, but also for her relatives. Respecting a patient’s confidentiality by not disclosing the results of a genetic test to third parties can therefore conflict with the well-being of family members, who could benefit from this knowledge. Finding the right balance between the patient’s privacy and confidentiality of her genetic information, and what is in the best interests of family members, is an ongoing ethical and social challenge (WHO, 2010).

Generally, in the United States of America individuals consent are to be tested, while parental consent is given in cases of underage minors. Each tested individual receives a coded identification number (ID). When a proposed match is being considered, both individuals' IDs are checked in the Dor Yeshorim (DY) database. The only result that the tested individuals receive is either "advisable" or "nonadvisable" for marriage. They do not receive their specific carrier status, neither at the time of the examination nor at the time of a match test. In this way, most carriers never find out what gene they carry and thereby avoid being seen as defective. If marriage is deemed inadvisable, genetic counseling (by phone only) is available to these individuals. Couples can still get married, but the overwhelming majorities do not pursue the match and cancel their wedding plans. Fortunately, this carries a light emotional burden, as consulting the DY database transpires very early in the matchmaking. Stigmatization of individuals and their families is avoided by maintaining strict confidentiality in regard to carrier status (Prainsack and Siegal, 2006).

2.13 Management of Sickle Cell Aneamia

There is no specific treatment for individuals with sickle cell anaemia; however, there are prophylactic measures that help to limit the factors that may trigger sickling crisis episodes and complications. There are national clinical guidelines for acute and community management of children and adults with sickle cell anaemia and these set out national standards that are measurable and will go some way to improving care (UK Forum 2006; Sickle Cell Society2008).

In most countries where sickle-cell aneamia is a major public health concern, its management has remained inadequate, national control programmes do not exist, the basic facilities to manage the patients are usually absent, systematic screening is not a common practice and the diagnosis is usually made when a patient presents with a severe complication. The most important challenge is to improve the prospects for the patient with sickle cell through intervention for preventable problems with pain medication, antibiotics, nutrition, folic acid supplementation and high fluid intake. Long term treatment with hydroxyurea has reduced many of the major complications and has also improved quality of life for anaemia patients. There is evidence that the neonatal screening for sickle cell anaemia, when linked to timely diagnostic testing, parental education and comprehensive care, Even well- organized holistic care including expert counseling and access to

needed care, irrespective of patients' ability to pay, can significantly reduce illness and death and improve the quality of lives of people living with sickle-cell aneamia in developing countries (WHO, 2010).

A management approach was carried out in Nigeria hospital to know the outcome of holistic care among patients with sickle cell anaemia using hospital admission and mortality rate from April 1998 to December 1995. The percentage of admission in the holistic care in 1988 was 120.7% as several patients were admitted more than once, this percentage reduced progressively overtime and was only 2.5% in 1995. While the mortality rate during the study period reduce from 20.7% in 1988 to 0.6% in 1995 (Akinyanju et., al 2005).

Proper management of sickle cell anaemia begins with establishing the correct diagnosis early in life, ideally during the new born period. The identification of affected infants by neonatal screening programs allowed early use of prophylactic penicillin and pneumococcal immunizations which help prevent overwhelming sepsis (Patrick et., al, 2013). Periodic evaluation by trained specialists helps provide comprehensive care, including transcranial Doppler examinations to identify children at risk for primary stroke, and assessment for other parencymal organ damage as patients become teens and adults. Liberalized use of blood transfusion and early consideration of hydroxyurea treatment represent a new treatment paradigm for sickle cell anaemia management (Patrick et. al, 2013).

The introduction of alternative therapies, such as acupuncture, aromatherapy and massage are proving beneficial in relieving pain in this client group and reducing the tension inherent in the client relationship. The use of Cognitive Behavioural Therapy (CBT) is emerging as a useful therapeutic intervention is managing acute and chronic sickle cell pain and is proving a viable and effective alternate to medications, provided clients can be encouraged to sustain their efforts to learn and use the technique (Anie and Fotopoulos 2010).

Individuals should be tested for presence of the gene before pregnancy and marriage. If both partners are carriers, couples may seek genetic counselling to help them better understand sickle-cell aneamia and how it will affect children they may have. Treatment of sickle-cell aneamia is geared towards preventing crises aggravating factors like infections and cold, thereby reducing

organ damage, and minimizing pain and discomfort. Blood transfusions treat aneamia by replenishing red blood cells and preventing other complications, such as cerebrovascular accident. Bone marrow transplantation cures sickle-cell aneamia in a small number of children who are able to find an acceptable, related bone marrow donor. This is aimed at introducing stem cells that will regenerate normal red blood cell progeny. If it is diagnosed early, some of the complications, particularly severe infections, can be prevented with antibiotics and vaccinations (Hill and Wang, 2001).

CONCEPTUAL FRAME-WORK: THE PRECEDE MODEL

The PRECEDE model identifies three categories of factors influencing human behaviour, and they include; predisposing factors that provides the motivation, enabling factors which enables the motivation to be realized and reinforcing factors which subsequently provides incentives for persistence (*Oladepo, 2009).* The PRECEDE model has five phases but the fourth phase ***Educational Diagnosis*** shall be used for this study. Summarily, this phase assesses the causes of health behaviors which were identified in Phase 3. Three kinds of causes are identified - predisposing factors, enabling factors, and reinforcing factors. The critical element of this phase is the selection of the factors which if modified, will be most likely to result in behavior change. Educational and organizational diagnosis looks at the specifics that hinder or promote behaviors related to the health.

Predisposing factors: These factors motivate the individual in taking informed decision in regard to their health. This focuses on the awareness, attitude, and belief of respondents in respect to sickle cell anaemia and genotype testing that will help in behavioural change. Many of the respondents were aware and have the knowledge of sickle cell anaemia and genotype testing, this enable the respondents to make their informed decision on their choice of partner before marriage.

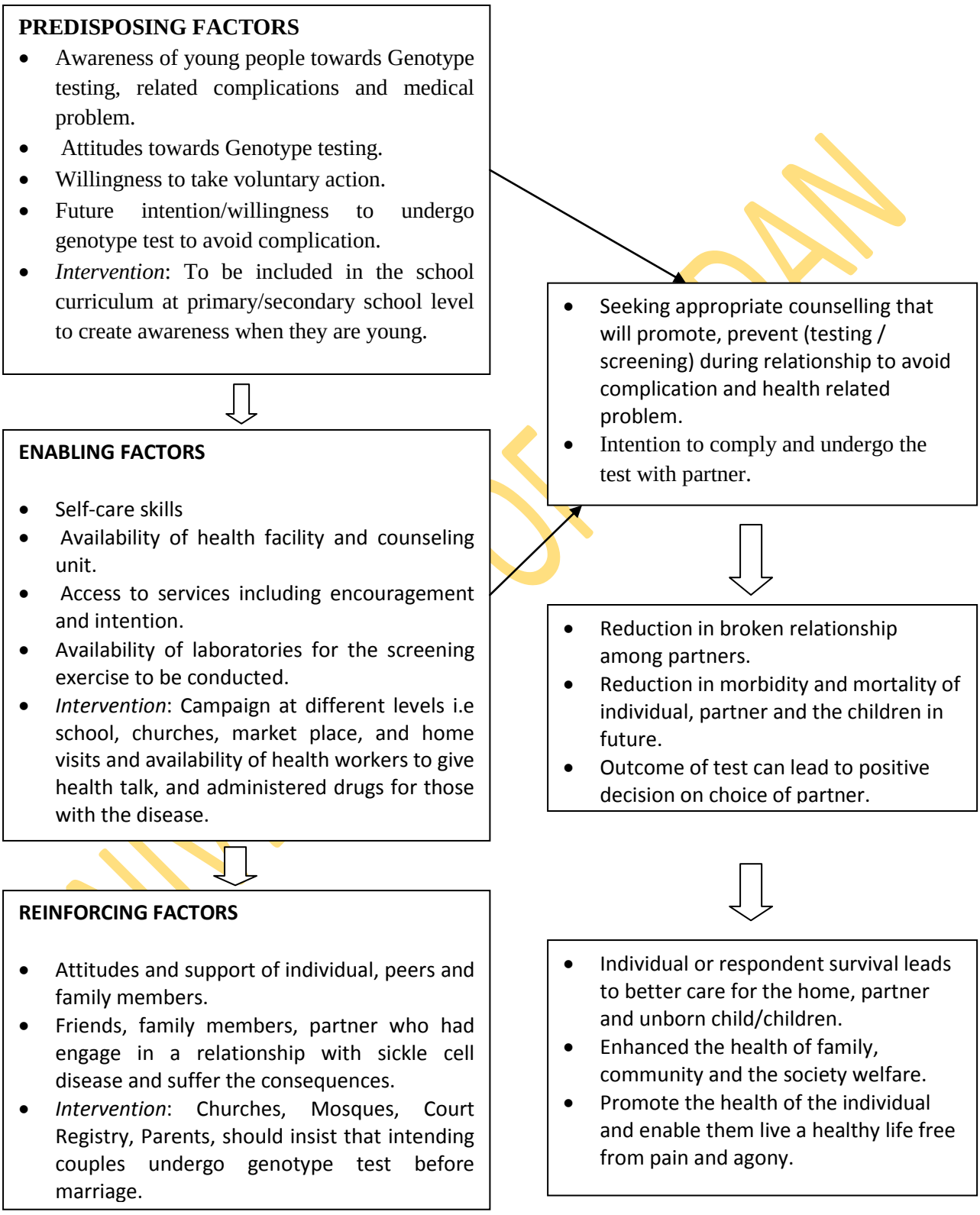
Enabling factors: These factors facilitate the individual behaviour and performance of an action on certain health issues. This involves availabilities of resources, accessibilities and skills the individual need to live a healthy life. Many of the respondents claim they have visited the hospital to undergo their genotype test to enable them know if they have sickle cell disease or not and how they can live a healthy life free of complications by not getting married to someone who have sickle cell anaemia in respective of love or emotional attachment.

Reinforcing factors: These factors deals with feedback in respect to attitude and behavior of peers, health personnel's, parents, mass media whether positive or negative change.

For the purpose of this research, the framework was adopted to identify factors that facilitate, promote and give feedback on the behavior to seek more knowledge about and undertaking genotype testing before marriage among students of the Polytechnic, Ibadan. In addition, it captures the influence that parents and peers bring to bear on individual's to undergo genotype testing to enhance the chances of their future healthy living.

The frame work help in health planning aimed at improving the health status of the respondents. Understanding the predisposing, enabling, and reinforcing factors increases people's attitude and awareness to promote healthy behaviour. The health education or counseling programme influence the predisposing, reinforcing, and enabling factors which help in the attitude that enable the individual choose to live a healthy life to promote a quality life free of complications.

APPLICATION OF THE PRECEDE MODEL



CHAPTER THREE

METHODOLOGY

3.1 Study design

The study design for this research is a descriptive design to determine the attitude and intention towards pre-marital genotype test among un-married students of The Polytechnics, Ibadan. It was design to identify characteristics of the study population that is associated with their awareness and attitude about genotype testing and practices before marriage. Independent variables are demographic characteristics example sex, age, religion and awareness towards sickle cell aneamia and genotype test and the future intention to undertake the test as a diagnostic measure.

3.2 Description of the Study Area

The study was carried out in The Polytechnic, Ibadan Oyo State. The Polytechnic Ibadan was founded in the year 1970. It is the first technical institute in Nigeria. The Polytechnic offers a wide range of specialized short courses not only for the purpose of improving the vocational competence of technical and commercial workers, but also to provide an opportunity for presenting the most recent advances in knowledge and techniques to specialist groups. It also provides opportunities for creative development and research related to the needs of teaching and industry and the business community, particularly in its service area. The Polytechnic has been producing majorly middle level manpower that has been making valuable contributions to the social and economic development of the country. It has three campuses; the main campus in Ibadan and other two satellite campuses at Eruwa and Saki in Oyo State. Each of the campus is headed by a Director who is responsible to the Rector for the Administration and Discipline of the school.

The Polytechnic of Ibadan runs mainly National Diploma (ND) and Higher National Diploma (HND). In 1975/76 session, the polytechnic adopted the faculty system of structuring the academic departments. The conception was to make for easier work co-ordination and management. At present, there are five faculties namely: Engineering, Science, Environmental

Studies, Financial and Management Studies, and Business and Communication Studies. The population of the students was about 11, 000 (at Ibadan campus) during 2010/2011 academic session when the study was conducted. There are four halls of residence in the institution.

3.3 Study Population

The study focuses on unmarried students in The Polytechnic, Ibadan, Oyo state Nigeria. Eligible respondents were unmarried male and female students between the ages of 18-35 years.

3.4 Sampling size and sampling techniques

Based on the sample size determination, the minimal sample size needed was obtained using Epi-info package. The total Population was 1,946, expected frequency was 50%, and worst precision is 55%. At 95% confidence interval, the sample size is 321. For attrition and non – response the sample size was increased to 400 for authentication of findings.

A multistage sampling technique involving four stages was used in selecting respondents for the study. The stages are described below;

Stage 1

All the four halls of residence were used during the selection of the study participants. The number of students recruited for each sex was determined proportionately based on students' population in each hall of residence.

Total population of all students in the halls of residence was **1945**

Population of male students in the halls of residence was 799.

Population of female students in the halls of residence was 1146.

$$\text{Male division} = \frac{\text{Population of males in all the halls}}{\text{Total population of all students in all the halls}} \times \frac{400}{1}$$

$$\mathbf{\frac{799}{1945} \times \frac{400}{1} = 164 \text{ Males}}$$

Female division = $\frac{\text{Population of female students in all the halls}}{\text{Total population of all undergraduate students in all the halls}} \times \frac{400}{1}$

$$\frac{\mathbf{1146}}{\mathbf{1945}} \times \frac{\mathbf{400}}{\mathbf{1}} = \mathbf{236\ Females\ (see\ table\ 3.1)}$$

Stage 2

The entire block in each halls of residence was selected.

Stage 3

Rooms were systematically selected in each block using tables of random numbers. Number of room selected in each hall was based on the number of students to be selected (proportionately) in each hall such that the number of room selected was equal to the number of participants selected.

Stage 4

A study participant was recruited for each room selected**.** Simple balloting procedure was used to select a participant if there were more than one student in the room at the time of visit (See Table 3.1).

Table 3.1: Distribution of selected respondents

Distribution of selected respondents					
Hall of residence	**Hall Type**	**Number of students in the hall**	**Number of blocks in the hall**	**Number of rooms in each hall**	**Number of respondents selected in each hall**
Ramat	Female only	329	4	192	329 / 1945 x 400 = 68
Olori	Female only	590	7	270	590 / 1945 x 400 = 121
Unity	Male	515	6	288	515 / 1945 x 400 = 106
Orisun	Mixed	511 (female:226) (male:285)	2 for female 3 for male	189	226 / 1945 x 400 = 46.4 Females 285 / 1945 x 400 = 59 Males
Total		799 males + 1146 females = **1945**	**22**	**939**	**165 males + 235 females = 400**

Inclusion criteria

Study participants were those who reside in the halls of residence in The Polytechnic, Ibadan who were unmarried.

Exclusion criteria

All unmarried students who reside in the hall of residence was excluded and married students who reside in the hall were also excluded.

3.5 Instrument for data collection

The instrument used for this study was a semi structured questionnaire, which was self administered. The design of the questionnaire was based on the research objectives, review of literature, and guidance of the research supervisor. The questionnaire consisted of five (5) sections. The first part explored the socio-demographic characteristics of the respondents. The second section explored the awareness of respondent to premarital genotype test, the third section explored the attitude of respondents towards sickle cell anaemia and PGT, and the fourth section explored the practices of PGT, while the last section was used to determine the future intention of the respondents to undergo test. Form of PGT involves knowing their genotype and making informed decision that will guide their future.

The total number of questionnaire distributed was 400, however only 382 were retrieved giving a response rate of 95.5% with 4.5% lost of attrition.

3.6 Validity

Validity can be defined as the degree to which the test measures what it is supposed to measure (Key, 1997). Approaches to the validity of test and measures include face and content validity. To ensure the validity of the data collected, several steps were taken. Group of items which are representative of the content of the trait to be measured were obtained. These include awareness, attitude, practices, intentions and demographic information. The quantitative tool was written in simple English. This was designed to aid comprehension of the respondents. The validity of the

contents of the questionnaire was strengthened through review of literature and supportive information obtained during pre-testing stage.

Furthermore, review of the instrument by the researcher's supervisor and other senior colleagues in attendance during the researcher's initial proposal presentation was extensively undertaken to provide face validity.

3.7 Reliability

The reliability of the instrument concerns the extent to which the instrument produces the same results on repeated trials. A statistical Reliability Analysis was done to test the reliability of the questionnaire and to measure its internal consistency. This involved the use of the Alpha (Cronbach) model of reliability analysis. Cronbach's Alpha model technique was employed to assess the reliability of the questionnaire. This was done by self-administering the questionnaire once to about 10% equivalent of the study participants at the site chosen for the pre-test and subsequently the coefficient reliability was determined using SPSS analytical software. A reliability coefficient of 0.943 was obtained, higher than the average correlation coefficient of 0.5 thus showing that the instrument was very reliable. The outcome of the pretest was used to correct and modify questions not adequately or appropriately answered by the respondents.

3.8 Ethical Consideration

This study followed the ethical principles guiding the use of human participants in research. Ethical approval was provided by UI/UCH Ethics Review Committee. Permission was obtained from the school authority before the distribution of the instruments. Four research assistants were trained to assist in the distribution and retrieval of the questionnaire. The data were collected in the hall of residence and it was self-completed. No identifier such as name of respondents was required and all information provided was kept confidential (See appendix I for the Informed Consent Form). Completed questionnaires were kept in secured setting where no other persons could have access to the information obtained from respondents. No harm came to the participants and they were given equal preference and treatment. All information was used for the purpose of the research only (verbal consent was obtained from respondents).

3.9 Method of Data Collection

The administration of data was done by the researcher with the help of four research assistant (two females and two males) who were recruited and trained for two days to ensure that they have adequate understanding of the instrument prior to commencement of data collection. The training focused on the objectives and importance of the study, sampling processes, how to secure respondents' informed consent, and review of questions to ensure completeness. Although the research assistants were experienced, refresher training was given on interviewing techniques. The questionnaire was discussed in detail and interviewer became familiar with it by conducting role-plays. The research assistants were also involved in pretesting of the questionnaire, which created opportunity for them to learn how to effectively collect the required data before they were allowed to start data collection on the study population.

The questionnaire was self-administered since the research participants could read and write in English language. They were distributed at the hall of residence in the evening after lectures period between the hours; 4:00pm and 6.30pm for five days. Every room selected for the data collection was visited and a participant was chosen in each room using balloting if they are more than one in a room. Consent of the participants was sought before distribution of the questionnaire by explaining to them the purpose of the research, the risk involved and time to be spent. The respondents completed the questionnaire within a period of 20 to 30 minutes. The research assistants involved in this survey went from one halls of residence to another collecting data from the unmarried male and female students; the questionnaires were retrieved immediately from the respondent after completion and cheeked for completeness.

3.10 Data management and analysis

Data generated with the questionnaires were serially numbered for control and recall purposes. It was checked for completeness and accuracy on a daily basis. It was also sorted, edited and coded manually by the investigator using a coding guide developed from the data collected. The data was entered into the computer for analysis using SPSS version 15. Frequency counts were run to detect missing cases while the data were cleaned. Descriptive statistics (Chi-square and t- test) was used

for the analysis. Chi square test was used to test the significant association between socio-demographic characteristics and awareness about genotype test. Attitudinal statements of 8 variables were awarded as follows: strongly agree-5 point, agree- 4 point, strongly disagree- 3 point, disagree- 2 point, and not sure -1 point to attitude towards sickle cell anaemia and premarital genotype test. Finally, results of findings were summarized and presented in tables.

3.11 Limitation of the study

Due to financial constrait and time factor of students during lectures hours, students who reside in the hall of residence were selected for the study. The results of the study rely solely on reported intention to undertake test as expressed by some respondents on the questionnaire. It is also possible that some of the respondents may have undertaken the genotype test much earlier in life and did not remember the event. This and memory factor place limitation on the reported distribution of genotype reported. The polytechnic Ibadan was used as the study site.

CHAPTER FOUR

RESULTS

The findings of this study are presented in this chapter. It consists of demographic characteristics, awareness on sickle cell anaemia and genotype testing, practices of genotype testing, attitude towards pre-marital genotype testing and future intention to undertake genotype test.

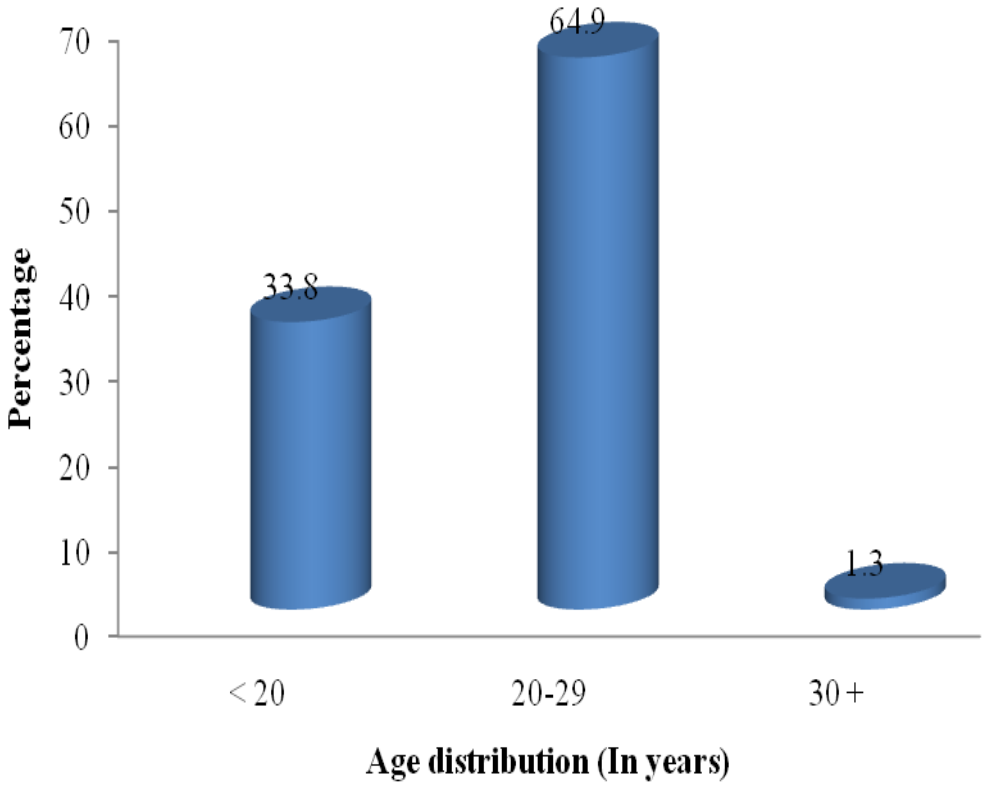
4.1 Socio-demographic Characteristics

More than half, 56.0% of the respondents were female while age ranged from 17 to 31 years with a mean of 21.6±3.1 as depicted in figure 1. Most 94.0% of the respondents were single, 68.6% were Christians whereas 84.0% were Yoruba. Slightly more than one-third, 34.0% were students in the department of Financial and management studies, 35.5% were in their first year of the National Diploma (ND) course while 31.2% resided in Olori hall of residence as presented in table 4.1.

Table 4.1: Respondent's sociodemographic characteristics (N=382)

Sociodemographic information	No	%
Sex		
Male	167	43.7
Female	215	56.3
Marital Status		
Single	359	94.0
Engaged	2	0.5
No response	21	5.5
Religion		
Christian	262	68.6
Islam	114	29.8
Traditional	6	1.6
Ethnicity		
Igbo	40	10.5
Yoruba	321	84.0
Hausa	2	0.5
Ijaw	19	5.0
Level		
ND1	125	35.5

ND2	77	21.9
HND1	83	23.6
HND2	67	19.0
Faculty		
Financial and management studies	129	34.0
Sciences	84	21.9
Engineering	53	13.8
Business Communication	49	12.8
Environmental Studies	49	12.8
No response	18	4.7
Hall of residence		
Olori	119	31.2
Orison	109	28.5
Unity	94	24.6
Ramat	60	15.7



Mean±SD=21.6±3.1years: Minimum=17 years; Maximun=31years

Figure 4.1: Respondents age distribution

4.2 Awareness on sickel cell disease and genotype testing

Majority, 89.0% (41.6%-male, 47.3%-female) were aware of sickle cell anaemia while 92.3% (41.4%-male and 50.9%-female were aware of genotype testing. Most 91.6% (35.9%-male and 55.8% female) were aware about the causes of sickle cell anaemia, all 100.0% (43.7% male and 56.3% female) stated that sickle cell anaemaia can be transmitted, 58.9% (23.3% male and 35.6% female) said it is an hereditory disease. About one-fifth, 20.9% (11.5% male and 9.4% female) reported that it can be cured whereas 68.6% (28.0% male and 40.6% female) stated that it can be prevented. More than half, 58.9% (21.5% male and 45.5% female) said that when a child is born with sickle cell anaemia it has effect on the family, 51.0% (19.1% male and 31.9% female) stated that sickle cell anaemia has it own symptoms while 54.5% (19.7% male and 34.8% female) reported that it is beneficial when an individual is aware of sickle cell anaemia as seen in table 4.2.

Awareness about sickle cell anaemia was compared with the sociodemographic characteristics of the respondents using cross tabulation as presented in table 4.3. It was found that 41.7% of male respondents had heard about sickle cell anaemia comapred to 47.3% of their female counterpart. The assocaition between awareness about sickle cell anaemia and sex of the respondents was not statistically significant ($p>0.05$). Also, 93.3% of respondents between 20-29 years of age were aware about sickle cell anaemia compared to 89.5% and 40.0% of those less that 20 years and 30 years and abouve respectively. The association was statistically significant ($p<0.05$). Likewise, 89.4% of respondents who were christtians were aware of sickle cell anaemia compared to 88.3% of those who practice Islam and 66.7% of those attached to traditional religion. The association was not statistically significant ($p>0.05$). Association between level and faculty of the respondents and awareness about the sickle cell anaemia was not statistically significant ($p>0.05$).

Similarly, awareness about genotype testing was compared with sociodemographic characteristics of the respondents as shown in table 4.4. Most 41.4% of the male and 50.9% of the female participants were aware of genotype testing. A significant association did not exist between awareness about genotype testing and the sex of the respondents. Likewise, 93.3% of respondents between 20-29 years of age were aware about genotype testing compared to 91.2% and 00.0% of those less that 20 years and 30 years and abouve respectively. The association was not

statistically significant (p>0.05). Also, 92.4% of respondents who were christtians were aware of genotype testing compared to 91.8% of those who practice Islam and 50.0% of those who believed in traditional religion. The association was not statistically significant (p>0.05). Statistically not significant association existed between level and faculty of the respondents and awareness about the genotype testing (p>0.05).

Table 4.2: Awareness on sickle cell anaemia and gynotype testing

Awareness	Male		Female		Total	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Heard about sickle cell anaemia	159 (41.6)	8 (2.1)	181 (47.3)	34 (8.9)	340 (89.0)	42 (11.0)
Heard about gynotype testing	158 (41.4)	9 (2.4)	194 (50.9)	21 (5.3)	352 (92.3)	30 (7.7)
Aware about the causes of sickle cell anaemia	137 (35.9)	30 (7.9)	213 (55.8)	2 (0.5)	350 (91.6)	32 (8.4)
It can be transmitted	167 (43.7)	0 (0.0)	215 (56.3)	0 (0.0)	382 (100.0)	0 (0.0)
It is an hereditary disease	89 (23.3)	78 (20.4)	136 (35.6)	79 (20.7)	225 (58.9)	157 (41.10
It can be cured	44 (11.5)	123 (32.2)	36 (9.4)	179 (46.9)	80 (20.9)	302 (79.1)
It can be prevented	107 (28.0)	60 (15.7)	155 (40.6)	60 (15.7)	262 (68.6)	120 (31.6)
Has effect on family when a child is born with sickle cell anaemia	82 (21.5)	85 (22.2)	173 (45.5)	42 (10.9)	225 (58.9)	157 (41.1)
It has its own symptoms	73 (19.1)	94 (24.6)	122 (31.9)	93 (24.3)	195 (51.0)	187 (48.9)
It has benefit when individual is aware of sickle cell anaemia	75 (19.7)	92 (24.0)	133 (34.8)	82 (21.5)	208 (54.5)	174 (45.5)

Table 4.3: Association between respondents' socio-demographic characteristics and awareness about sickle cell anaemia

Socio-demographic information	Awareness about sickle cell anaemia		Total	χ^2 (*p* value)
	Yes (%)	No (%)		
Sex				
Male	70 (41.7)	97 (58.3)	167	3.312 (0.05)
Female	102 (47.3)	113 (52.7)	215	
Age				
< 20 yeasr	115 (89.5)	14 (10.5)	129	10.620 (0.01)
20-29 years	231 (93.3)	17 (6.7)	248	
30 years plus	2 (40.0)	3 (60.0)	5	
Religion				
Christian	234 (89.4)	28 (10.6)	262	0.056 (0.82)
Islam	101 (88.3)	13 (11.7)	114	
Traditional	4 (66.7)	2 (33.3)	6	
Level				
ND1	110 (87.9)	15 (12.1)	125	0.045 (0.93)
ND2	68 (88.0)	9 (12.0)	77	
HND1	73 (87.5)	10 (12.5)	83	
HND2	62 (92.1)	5 (7.9)	67	

Faculty				
Financial and Mgt studies	117 (90.5)	12 (9.5)	129	0.028 (0.86)
Sciences	75 (89.2)	9 (10.8)	84	
Engineering	46 (86.0)	7 (14.0)	53	
Business Communication	44 (89.6)	5 (10.4)	49	
Environmental Studies	43 (87.5)	6 (12.5)	49	

Table 4.4: Association between respondents' socio-demographic characteristics and awareness about genotype testing

Socio-demographic information	Awareness about genotype testing		Total	χ^2 (*p* value)
	Yes (%)	No (%)		
Sex				
Male	69 (41.4)	98 (58.6)	167	2.925 (0.05)
Female	109 (50.9)	106 (49.1)	215	
Age				
< 20 yeasr	118 (91.2)	11 (8.8)	129	1.615 (0.39)
20-29 years	231 (93.3)	17 (6.7)	248	
30 years plus	4 (80.0)	1 (20.0)	5	
Religion				
Christian	242 (92.4)	20 (7.6)	262	0.179 (0.76)
Islam	105 (91.8)	9 (8.2)	114	
Traditional	3 (50.0)	3 (50.0)	6	
Level				
ND1	108 (86.1)	17 (13.9)	125	0.457 (0.26)
ND2	73 (94.7)	4 (5.3)	77	
HND1	79 (94.8)	4 (5.2)	83	
HND2	65 (96.8)	2 (5.2)	67	

Faculty				
Financial and Mgt studies	119 (91.9)	10 (8.1)	129	0.015 (0.99)
Sciences	78 (92.7)	6 (7.3)	84	
Engineering	49 (93.9)	4 (6.1)	53	
Business Communication	45 (91.5)	4 (8.5)	49	
Environmental Studies	45 (91.5)	4 (8.5)	49	

Major source of information on sickle cell anaemia reported by the respondents were television, 67.9% (29.9% male and 38.0% female); friends, 54.9% (20.8% male and 34.1% female) and health workers, 47.7% (19.0% male and 28.7% female). More than half, 59.8% (33.7% male and 25.5% female) mentioned television/radio as the major source of information about genotype testing, 50.6% (30.4% male and 20.2% female) stated friends while 59.8% (28.5% male and 31.3% female) said their major source of information about genotype testing was parents as shown in table 4.5. Majority, 66.5% male and 69.8% reported secondary school as the other sources of information about sickle cell anaemia and gynotype testing while 8.9% male and 5.1% female mentioned polythechnic as their other source of information on sickle cell anaemia and genotype testing as depicted in figure 4.2.

Table 4.5: Major source of information on sickle cell anaemia and genotype testing

Sources of information	Male		Female		Total	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Information on sickle cell anaemia						
Television/radio	99 (29.9)	31 (9.3)	126 (38.0)	75 (22.8)	225 (67.9)	106 (32.1)
Friends	69 (20.8)	77 (23.2)	113 (34.1)	72 (21.9)	182 (54.9)	149 (44.1)
Parents	72 (21.9)	113 (34.1)	77 (23.2)	69 (20.8)	149 (44.1)	182 (54.9)
Health workers	62 (19.0)	78 (23.3)	95 (28.7)	94 (29.0)	157 (47.7)	172 (52.3)
Information on genotype testing						
Television/radio	115 (33.7)	97 (28.8)	87 (25.5)	35 (11.4)	202 (59.8)	136 (40.2)
Friends	103 (30.4)	58 (17.5)	68 (20.2)	108 (31.9)	171 (50.6)	166 (49.4)
Parents	96 (28.5)	82 (24.3)	106 (31.3)	54 (15.9)	202 (59.8)	136 (40.2)
Health workers	101 (30.1)	60 (17.8)	68 (20.2)	107 (31.9)	169 (50.3)	167 (49.7)

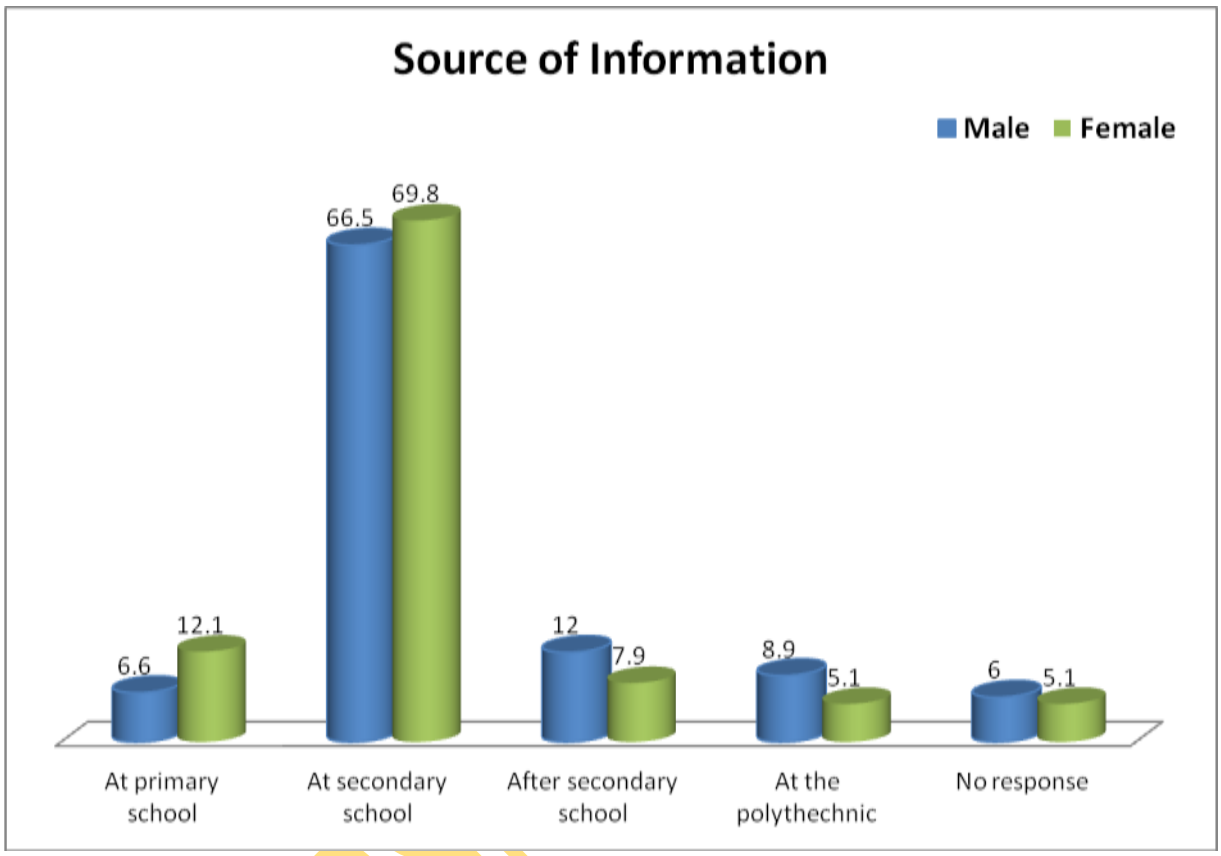


Figure 4.2: Other sources of information on sickle cell anaemia

Several, 45.2% (20.6% male and 24.6% female) described sickle cell anaemia as a killer disease/genetic diseases, 13.1% (6.2% male and 6.9% female) said it is a diseases that is transmitted from parents to offspring while 20.1% (6.8% male and 13.2% female) defined sickle cell anaemia as disease of the blood or when the gene is sickled in shape as shown in table 4.6. Slightly more than half, 51.0% (17.4% male and 33.6% female) described sickle cell trait as an hereditary disease of the blood whereas 48.3% said it is a carrier of the sickle cell gene. Information on the severity of sickle cell anaemia is presented in table 4.6. About forty-three percent (12.6% male and 31.2% female) stated that sickle cell anaemia is a severe disease while 9.7% said it is not severe.

Concerning the benefit that might be derived when an individual knows his/her sickle cell anaemia status is presented in table 4.7. About thirty-eight percent male and 53.1% female said genotype test can enable couple to decide the risk of having a child with genetic makeup, 52.3% female and 38.1% male stated that genotype testing helps predetermine the carrier status of couple planning marriage while 35.8% male and 47.5% female reported that premarital genotype testing help determine the compatibility of couples.

Table 4.6: Description of sickle cell anaemia, sickle cell trait and severity of sickle cell anaemia

Description	Male (%)	Female (%)	Total (%)
Description of sickle cell anaemia			
It is a killer diseases/genetic disease	36 (20.6)	43 (24.6)	79 (45.2)
It is a disease that is transmitted from parents to offspring's	11 (6.2)	12 (6.9)	23 (13.1)
It is a disease of the blood or when the gene is sickled in shape	12 (6.8)	23 (13.2)	35 (20.1)
When someone has abnormality in the blood	12 (6.8)	26 (14.8)	38 (21.7)
Total	**71 (40.6)**	**104 (59.4)**	**175**
Description of sickle cell trait			
A carrier of the sickle cell gene	24 (16.1)	48 (32.2)	72 (48.3)
A hereditary disease of the blood	26 (17.4)	50 (33.6)	76 (51.0)
Having normal blood concentration and normal red cells morphology	0 (0.0)	1 (0.7)	1 (0.7)
Total	**50 (33.6)**	**99 (66.4)**	**149**

Severity of sickle cell anaemia			
Severe	48 (12.6)	119 (31.2)	167 (43.8)
Not severe	26 (6.8)	11 (2.9)	37 (9.7)
Not certain	44 (11.5)	44 (11.5)	88 (23.0)
No response	49 (12.8)	41 (10.7)	90 (23.5)

Table 4.7: Benefit of knowing an individual has sickle cell anaemia

Benefits	Male			Female		
	Yes (%)	No (%)	No Idea (%)	Yes (%)	No (%)	No idea (%)
Genotype test can enable couple to decide the risk of having a child with genetic makeup	146 (38.1)	8 (2.2)	11 (2.8)	203 (53.1)	2 (0.6)	12 (3.3)
Genotype testing helps predetermine the carrier status of couple planning marriage	146 (38.1)	3 (0.8)	11 (2.9)	100 (52.3)	4 (1.1)	18 (4.8)
Premarital genotype testing help determine the compatibility of couples	136 (35.8)	12 (3.1)	15 (3.9)	181 (47.5)	10 (2.5)	28 (7.3)
Genotype testing can indicate if the individual will develop a disease or a trait	120 (31.4)	15 (4.0)	28 (7.3)	168 (44.1)	21 (5.6)	29 (7.6)

4.3 Practice of genotype testing

Majority, 58.4% (34.6% male and 23.8% female) had undergone genotype test as illustrated in figure 4.3, about thirty-seven percent (15.5% male and 21.8% female) were AA genotype group, and 17.1% (4.5% male and 12.6% female) were AS. Only 0.9% SS genotype group were female while 3.1% (2.2% male and 0.9% female) were AS genotype group as seen in table 4.8. Several, 43.3% (20.0% male and 23.3% female) reported that their parents decided the test for them, 36.5% (14.8% male and 21.5% female) said they took the decision themselves while 6.9% (3.3% male and 3.6% female) stated that their partners decided the genotype test. Majority 72.7% did the test in the hospital while 20.7% did so in laboratory.

The major reasons mentioned by the respondents to undergone genotype test were done by parent, 41.2% (15.9% male and 25.3% female); admission, 22.9% (11.5% male and 11.4% female) and when donating blood, 10.3% (7.2% male and 3.1% female). Only 42.0% (21.5% male and 20.5% female) received counseling before genotype test while 44.4% (18.2% male and 26.2% female) informed their partner of the test result. Majority 73.9% (30.2% male and 43.7% female) resported that their partners had done genotype test, 45.5% (17.3% male and 28.2% female) of the respondents partner result were AA while 30.9% (14.7% male and 16.2% female) were SS genotype group as shown in table 4.8.

Less than half of the respondents 47.3% (32.6% male and 14.7% female) were not ready to marry AS if they have sickle cell anaemia, 23.0% (13.8% male and 9.2% female) reported that they will marry a partner with sickle cell anaemia if they are AS while 16.3% (8.9% male and 7.4% female) wanted to avoid giving birth to sickle cell children as presented in table 4.9.

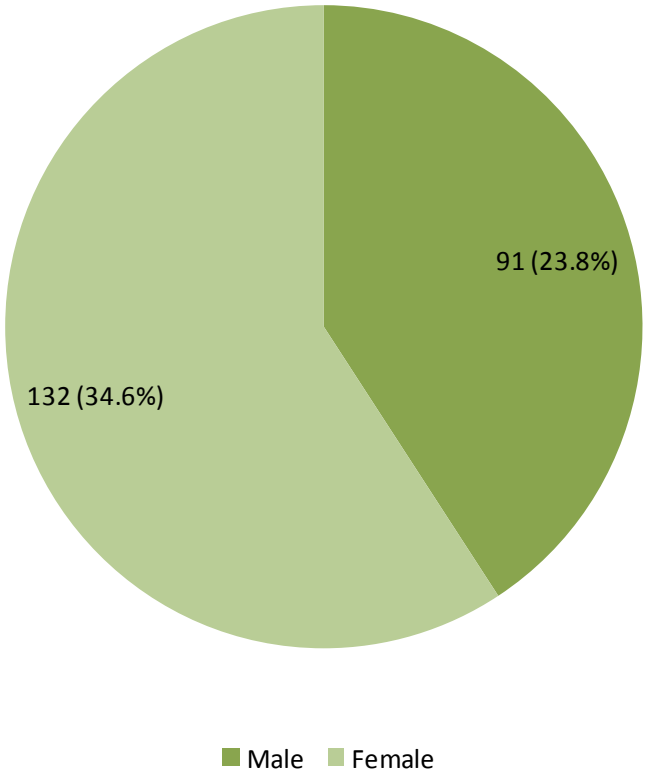


Figure 4.3: Respondents that had undergone genotype testing

Table 4.8: Practice of genotype testing

Practice of genotype testing	Male (%)	Female (%)	Total (%)
Respondents genotype group			
AA	69 (15.5)	97 (21.8)	167 (37.3)
AS	10 (4.5)	28 (12.6)	38 (17.1)
SS	0 (0.0)	2 (0.9)	2 (0.9)
AC	5 (2.2)	2 (0.9)	7 (3.1)
Can't remember	7 (3.1)	3 (1.3)	10 (4.4)
Who decided genotype testing			
Parents	45 (20.0)	52 (23.3)	97 (43.3)
Self	33 (14.8)	48 (21.5)	81 (36.3)
Mosque	6 (2.7)	24 (10.8)	30 (13.5)
Partner	7 (3.3)	8 (3.6)	15 (6.9)
Place of genotype testing			
Hospital	60 (26.7)	102 (46.0)	162 (72.7)
Laboratory	19 (8.3)	27 (12.4)	46 (20.7)
Health centre	8 (3.4)	5 (3.3)	14 (6.7)

Reasons to undergone genotype test			
Admission	26 (11.5)	25 (11.4)	51 (22.9)
Done by parent	35 (15.9)	57 (25.3)	92 (41.2)
Clinical research	5 (2.2)	5 (2.2)	10 (4.4)
Curiosity	3 (1.5)	11 (4.8)	14 (6.3)
Guide on choice of partner	10 (4.8)	12 (5.1)	22 (9.9)
When donating blood	16 (7.2)	7 (3.1)	23 (10.3)
No Response	7 (3.1)	4 (1.8)	11 (4.9)
Counseling before testing			
Received counseling before testing	48 (21.5)	46 (20.5)	94 (42.0)
Informed partner of the test result	41 (18.2)	58 (26.2)	99 (44.4)
Partners gone for Genotype test			
Gone for the test	74 (30.2)	107 (43.7)	181 (73.9)
Not gone for the test	13 (5.3)	6 (2.5)	19 (7.8)
Had no idea	27 (11.0)	18 (7.4)	45 (18.4)
Respondents partners' result			
AA	31 (17.3)	51 (28.2)	82 (45.5)

AS	14 (7.9)	22 (12.0)	36 (19.9)
SS	27 (14.7)	29 (16.2)	56 (30.9)
AC	2 (1.1)	1 (0.5)	3 (1.6)
Can't remember	0 (0.0)	4 (2.1)	4 (2.1)

Table 4.9: Reasons for not marrying a person suffering from Sickle cell

Reasons*	**Male (%)**	**Female (%)**	**Total (%)**
Not ready to marry AS if they have sickle cell anaemia	187 (32.6)	84 (14.7)	271 (47.3)
Will marry a partner with sickle cell anaemia if AS	23 (4.0)	35 (6.1)	58 (10.1)
Will not marry partner with sickle cell anaemia	78 (13.8)	53 (9.2)	132 (23.0)
Want to avoid giving birth to sickle cell children	51 (8.9)	43 (7.4)	94 (16.3)
Want to avoid financial wastage	7 (1.2)	13 (2.1)	20 (3.3)
Total	**343 (60.1)**	**228 (39.9)**	**571**

***=Multiple response**

4.4 Attitude towards pre-marital genotype testing

About fifteen percent male and 22.3% female agreed strongly that sickle cell anaemia should not be hindrance to marriage, 15.0% male and 23.2% female stated that they have the right to know their partner genotype before marriage while 10.1% male and 17.2% female said they cannot marry anybody with sickle cell anaemia as seen in table 4.10. About ten percent male and 17.4% female agreed strongly that genotype testing is neither necessary nor compulsory for intending couples, 11.8% male and 13.9% female disagreed that people with sickle cell anaemia should not be allowed to get married whereas 12.1% male and 17.3% female agreed that sickle cell anaenia is a killer disease. Slightly more than one-quarter 26.5% male and 35.5% female agreed strongly that the fair of stigmatization can prevent an individual from going for genotype testing while 18.2% male and 22.7% female agreed strongly that time cannot be a constraint to my going for genotype testing (see table 4.10 for detail)

Respondents mean attitude towards premarital genotype testing score was 20.4±3.7 (ranged 9-37) while 54.0% of the respondents had good attitude towards attitude towards premarital genotype testing as presented in table 4.11. The mean attitude score of the respondents was compared by demographic characteristics as shown in table 4.12. Mean knowledge score by sex revealed that male had an attitude mean score of 20.5±2.5 while female had 20.3±2.7 as their mean attitude score with no significant difference ($p>0.05$). Respondents in the age category of < 20 years had a mean attitude score of 20.0±2.6 compared to mean attitude score of 20.4±2.3 and 20.2±2.9 for age group 20-29 years and 31 years and above respectively with no significant difference ($p>0.05$).

Comparison of the respondent's mean attitude score by religion shows that those who were christians had mean attitude score of 20.6±2.5 compared to those who practiced Islam (20.8±2.4) and engaged to traditional religion (20.6±2.9) respectively. Mean attitude score by religion showed that no significant difference existed ($p>0.05$). The mean attitude score of 20.5±3.1 was obtained for those who were Igbo compared to the mean of 20.3±3.0, 20.7±2.9 and 20.0±2.1 for those who were Yoruba, Hausa and Ijaw respectively with no significant difference ($p>0.05$). Respondents in ND1 had mean attitude score of 20.5±3.4 compared to those in ND2 (21.9±3.0),

HND1 (20.6±2.9) and HND2 (19.9±2.6) respectively with no significant difference (p>0.05). Comparison of the respondent's mean attitude score by faculty revealed that those who were in the faculty of financial and management studies had mean attitude score of 20.0±2.9 compared to those who were in sciences (21.1±3.0), engineering (20.8±3.4), business communication faculty (20.9±2.5) and environmental studies (20.8±2.6) respectively. No significant difference existed between mean attitude score and faculty of the respondents (p>0.05). Mean attitude score about premarital genotype testing was compared between respondents hall of residence. It was found that respondents in Olori hall had a mean attitude score of 21.2±2.4 compared to 20.5±2.9, 21.6±2.8 and 19.7±3.2 of those in Orisun, Unity and Ramat hall of residence respectively with no significant difference (p>0.05).

Table 4.10: Attitude of respondents towards sickle cell anaemia

Statements	Male					Female					Total
	AS (%)	A (%)	D (%)	SD (%)	NS (%)	AS (%)	A (%)	D (%)	SD (%)	NS (%)	
Sickle cell anaemia should not be hindrance to marriage	56 (15.3)	28 (7.6)	37 (10.1)	16 (4.4)	21 (5.7)	82 (22.3)	52 (14.2)	38 (10.4)	28 (7.6)	9 (2.5)	**367**
I have the right to know my partner genotype before marriage	55 (15.0)	27 (7.4)	29 (7.9)	40 (10.9)	8 (2.2)	85 (23.2)	36 (9.8)	26 (7.1)	54 (14.8)	6 (1.6)	**366**
I cannot marry anybody with sickle cell anaemia	41 (11.2)	18 (4.9)	37 (10.1)	38 (10.4)	25 (6.9)	52 (14.2)	30 (8.2)	63 (17.2)	46 (12.5)	17 (4.6)	**367**
Genotype testing is neither necessary nor compulsory for intending couples	37 (10.1)	41 (11.2)	23 (6.3)	25 (6.8)	33 (9.0)	64 (17.4)	48 (13.1)	37 (10.1)	45 (12.3)	14 (3.8)	**367**
People with sickle cell anaemia should not be allowed to	35 (9.6)	28 (7.7)	43 (11.8)	20 (5.5)	30 (8.2)	40 (10.9)	47 (12.9)	51 (13.9)	49 (13.4)	22 (6.0)	**365**

get married											
Sickle cell anaenia is a killer disease	49 (11.2)	42 (12.1)	20 (5.8)	10 (2.9)	27 (7.8)	60 (17.3)	60 (17.3)	35 (10.1)	17 (4.9)	26 (7.5)	**346**
The fair of stigmatization can prevent an individual from going for genotype testing	82 (26.5)	24 (7.7)	15 (4.8)	4 (1.3)	11 (3.5)	110 (35.5)	26 (8.4)	14 (4.5)	9 (2.9)	15 (4.8)	**310**
Time cannot be a constraint to my going for genotype testing	24 (18.2)	16 (12.1)	6 (4.5)	1 (0.8)	8 (6.1)	30 (22.7)	24 (18.2)	12 (9.0)	3 (2.8)	8 (6.1)	**132**

Note: AS=Agree strongly; A=Agree; D=Disagree;

SD=Strongly Disagree; NS=Not Sure

Table 4.11: Attitude score grade of the respondents

Practice score grade	Frequency	Percentage
Positive (≥20)	206	54.0
Negative (<20)	176	46.0
Total	**382**	

Mean±SD=20.4±3.7; Minimum=9, Maximum=37

Table 4.12: Comparison of respondents attitude score on sickle cell anaemia and genotype testing by demographic characteristics

Socio-demographic information	No	Mean±Sd	F/t-test	p-value
Sex				
Male	167	20.5±2.5	1.044	0.750
Female	215	20.3±2.7		
Age grade (in years)				
< 20	129	20.0±2.6	1.272	0.21
20-29	248	20.4±2.3		
30 +	5	20.2±2.9		
Religion				
Christian	262	20.6±2.5	0.146	0.33
Islam	114	20.8±2.4		
Traditional	6	20.6±2.9		
Ethnicity				
Igbo	40	20.5±3.1	0.464	0.48
Yoruba	321	20.3±3.0		
Hausa	2	20.7±2.9		
Ijaw	19	20.0±2.1		
Level				

ND1	125	20.5±3.4	1.252	0.55
ND2	77	21.9±3.0		
HND1	83	20.6±2.9		
HND2	67	19.9±2.6		
Faculty				
Financial and management studies	129	20.0±2.9	0.045	0.25
Sciences	84	21.1±3.0		
Engineering	53	20.8±3.4		
Business Communication	49	20.9±2.5		
Environmental Studies	49	20.8±2.6		
Hall of residence				
Olori	119	21.2±2.4	1.476	0.08
Orison	109	20.5±2.9		
Unity	94	21.6±2.8		
Ramat	60	19.7±3.2		

4.5: Future intention to undertake genotype test

About thirty-five percent (16.8% male and 18.5% female) reported that they will personally undertake genotype testing before getting married, 76.1% (30.6% male and 45.5% female) stated that they will not prefer if their partner takes genotype testing without their involvement while 11.0% (5.0% male and 6.0% female) will undergo genotype testing without my partner as seen in table 4.13. Majority 85.3% (34.6% male and 50.7% female said genotype testing is an important factor for marriage, 41.1% (19.0% male and 22.1% female) mentioned that genotype testing should be a condition for marriage whereas 76.4% (28.6% male and 47.9% female) reported that parents should influence young unmarried people on genotype testing before marriage. Only 18.3% (7.0% male and 11.2% female) said they can marry without undergoing genotype testing while 75.7% (30.8% male and 44.9% female) advised that government should legislate compulsory premarital genotype testing before marriage.

Respondents' future intention to undergo genotype testing was compared with the sociodemographic characteristics using cross tabulation as presented in table 4.14. the table revealed that 50.8% of male respondents had intention to personnaly undertake genotype testing before marriage comapred to 47.3% of their female counterpart. The assocaition was not statistically significant ($p>0.05$). likewise, 88.4% of respondents who were less that 20 years old had intention to personnaly undertake genotype testing before marriage compared to 49.5% and 50.0% of those between 20-29 years old and 30 years and abouve respectively. The association was not statistically significant ($p>0.05$). Also, 34.1% of respondents who were christtians had intention to personnaly undertake genotype testing before marriage compared to 14.5% of those who practice Islam. The association was statistically significant ($p<0.05$). Association between level and faculty of the respondents and intention to personnaly undertake genotype testing before marriage was not statistically significant ($p>0.05$).

More than half 58.1% (41.4% male and 16.7% female) suggested that the best time to undertake genotype testing was the beginning of a relationship, 19.4% (6.0% male and 13.4% female) suggested when dating, 13.9% said during courtship while 1.3% reported immediately the partners meet each other as presented in table 4.15.

Table 4.13: Future intention to undergo genotype testing

Future intention	Male (%)	Female (%)	Total (%)
Will personally undertake genotype testing before getting married	64 (16.8)	71 (18.5)	135 (35.3)
Will not prefer if my partner takes genotype testing without my involvement	117 (30.6)	174 (45.5)	291 (76.1)
Will undergo genotype testing without my partner	19 (5.0)	23 (6.0)	42 (11.0)
Genotype testing is an important factor for marriage	132 (34.6)	194 (50.7)	326 (85.3)
Genotype testing should be a condition for marriage	73 (19.0)	84 (22.1)	157 (41.1)
Should parents influence young unmarried people on genotype testing before marriage	109 (28.6)	183 (47.9)	292 (76.4)
Can marry without undergoing genotype testing	27 (7.0)	43 (11.2)	70 (18.3)
Advises that government should legislate compulsory premarital genotype testing before marriage	117 (30.8)	172 (44.9)	289 (75.7)

Table 4.14: Relationship between respondents' intention to personally undertake genotype testing before marriage and demographic characteristics

Socio-demographic information	Intention to personally undertake genotype testing before marriage			Total	χ^2 (*p* value)
	Yes (%)	No (%)	No Idea (%)		
Sex					
Male	64 (50.8)	54 (42.9)	86 (6.3)	126	2.109 (0.35)
Female	71 (47.3)	74 (49.3)	5 (3.3)	150	
Age					
< 20 years	68 (91.2)	73 (8.8)	4 (2.8)	145	5.731 (0.68)
20-29 years	60 (49.5)	49 (40.6)	9 (9.9)	118	
30 years plus	2 (50.0)	2 (50.0)	0 (0.0)	4	
Religion					
Christian	94 (34.1)	94 (34.1)	5 (1.8)	193	22.154 (<0.001)
Islam	40 (14.5)	33 (12.0	6 (2.0)	79	
Level					
ND1	47 (53.4)	38 (43.2)	3 (3.4)	88	2.102 (0.91)
ND2	29 (50.0)	26 (44.8)	3 (5.2)	58	
HND1	33 (56.9)	23 (39.7)	2 (3.4)	58	
HND2	22 (44.9)	24 (48.9)	3 (6.1)	49	

Faculty					
Financial and Mgt studies	27 (56.3)	17 (35.4)	4 (8.3)	48	10.98 (0.15)
Sciences	30 (60.0)	20 (40.0)	0 (0.0)	50	
Engineering	13 (52.0)	15 (48.0)	0 (0.0)	25	
Business Communication	14 (40.0)	20 (57.1)	1 (2.9)	35	
Environmental Studies	20 (62.4)	10 (31.3)	2 (6.3)	32	

Table 4.15: Suggested best time to undergo genotype test

Suggested best time	Male (%)	Female (%)	Total (%)
Beginning of a relationship	158 (41.4)	64 (16.7)	222 (58.1)
When dating	23 (6.0)	51 (13.4)	74 (19.4)
During courtshinp	19 (4.9)	34 (9.0)	53(13.9)
Immediately the partners meet each other	4 (1.0)	1 (0.3)	5 (1.3)
No response	19 (4.9)	9 (2.4)	28 (7.3)
Total	**223 (58.4)**	**159 (41.6)**	**382**

Test of Hypothesis

Hypothesis One

Awareness about sickle cell anaemia and awareness about genotype testing were cross-tabulated to determine if awareness about sickle cell anaemia had an influence on the awareness about genotype testing. The level of significance was set at 0.05. Table 4.16 revealed that there was a significant association between awareness about sickle cell anaemia and awareness about genotype testing ($p<0.05$). This is an indication that awareness about sickle cell anaemia has role to play in the awareness about genotype testing. The null hypothesis which stated that there is no significant relationship between awareness about sickle cell anaemia and awareness about genotype testing was therefore rejected.

Hypothesis Two

The second hypothesis which stated that there is no significant relationship between awareness about sickle cell anaemia and future intention to personally undertake genotype testing was tested. Table 4.17 shows the cross tabulation of awareness about sickle cell anaemia and future intention to personally undertake genotype testing using Chi-square test statistics. There was no significant relationship between awareness about sickle cell anaemia and future intention to personally undertake genotype testing ($p>0.05$). Awareness about sickle cell anaemia has no role to play in the respondents' future intention to personally undertake genotype testing, thus the null hypothesis was not rejected.

Hypothesis Three

Association between awareness about genotype testing and future intention to personally undertake genotype testing was verified using chi-square test statistics. It is evidently shown that no significant relationship existed between awareness about genotype testing and future intention to personally undertake genotype testing at 95 percent confidence interval ($p>0.05$) as seen in table 4.18. Awareness about genotype testing has no role to play respondents future intention to personally undertake genotype testing. The null hypothesis which stated that there is no relationship between the awareness about genotype testing and future intention to personally undertake genotype testing was therefore not rejected.

Table 4.16: Relationship between respondents' awareness about sickle cell anaemia and awareness about genotype testing

Awareness about sickle cell anaemia	Awareness about genotype testing			χ^2 (*p* value)
	Yes (%)	No (%)	Total	
Yes	314 (94.9)	17 (5.1)	**331**	
No	24 (48.8)	27 (51.2)	**51**	97.602 (<0.001)
Total	**338 (88.5)**	**44 (11.5)**	**382**	

Table 4.17: Relationship between respondent's awareness about sickle cell anaemia and future intention to personally undertake genotype testing

Awareness about sickle cell anaemia	Intention to personally undertake genotype testing before marriage				χ^2 (*p* value)
	Yes (%)	No (%)	No idea (%)	Total	
Yes	116 (35.0)	109 (32.6)	106 (32.1)	**331**	
No	19 (37.3)	19 (37.3)	13 (25.4)	**51**	6.498 (0.689)
Total	**135 (35.3)**	**128 (33.5)**	**119 (31.2)**	**382**	

Table 4.18: Relationship between respondents' awareness about genotype testing and future intention to personally undertake genotype testing

Awareness about genotype testing	Intention to personally undertake genotype testing before marriage				χ^2 (*p* value)
	Yes (%)	No (%)	No idea (%)	Total	
Yes	117 (35.3)	112 (33.8)	102 (30.8)	**331**	
No	18 (35.3)	16 (31.4)	17 (33.3)	**51**	6.086 (0.731)
Total	**135 (35.3)**	**128 (33.5)**	**119 (31.2)**	**382**	

CHAPTER FIVE

5.0: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The finding from this study were discussed in this section and covers the following areas: Socio-demographic characteristics; level of awareness of sickle cell anaemia and genotype testing; attitude towards genotype testing; practice of genotype testing; and intention to undertake the test among some selected students of The Polytechnic, Ibadan. The chapter also includes conclusion, and recommendations for further research.

5.1: Socio-demographic characteristics of respondents

Most of the respondents were between 18-30 years with a mean age of 21.6 (SD 3.1) years and a range of 18-35 years. This age range was expected as they were still undergraduates. Previous studies among undergraduates' students have shown age range by the following authors; Chukwuma et al., (2007); Jumana Al-Aama, (2010); Omolase et al., (2010); Alao, (2008); and Moran et'al., (2007). This is expected as young adults pursuing tertiary education and most are still unmarried as this age.

5.2: Awareness on sickle cell anaemia and genotype testing

The level of awareness on Sickle cell aneamia and genotype testing was high among respondents. Secondary school was the first source of information for the respondents since majority heard about it from this point in life. This might be due to the fact that they were taught or learnt about the disease while they were in secondary school. This is in consonance with the study reported by Adeyemi and Adekanle (2007), on a study on knowledge amongst senior secondary school students in Nigeria about sickle cell disease, suggesting the need for some legislation about premarital screening and the education of the citizens which should begin at the secondary school level. This was also similar to a study conducted among undergraduate student in a Nigeria university by Agbanusi et al., 2006 to determine the extent of awareness of sickle cell disease and its heterozygous state and it shows that more than half of the students knew about sickle cell

anaemia. This is also similar with the study reported by Alao (2008), on the study conducted to determine the attitude towards marriage in the face of haemoglobin genotype incompatibility and it shows that about half of the students knew their genotype status.

The foregoing is in line with the opinion of Agbanusi at al., (2006), which affirmed that many of the respondents knew their genotype in a study conducted. This is also similar to those of (Suliman et al., (2008; Bazuaye and Olayeme, 2009) in their studies which discovered that most respondents knew their genotype as at when the study was conducted to find out if young people actually knew their genotype before marriage.

5.3: Practices of genotype testing (Those who had undergone genotype test)

More than half of the respondents had already undergone genotype test as at the time of the interview, due to the fact that almost all the respondents reported that their genotype tests were done by their parents when they were still very young. This statement is similar to findings of Kivipelto *et al*, (2004) of which majority of the respondents says parents should test and know the genotype of their children while they are still young. This is also similar to findings of Otaigbe (2010), with emphasis that genotype test should be done when still minors. This view is also supported by Adeyemo and Soboyejo ((2006).

5.4: Attitudes toward genotype testing

The attitude of the respondents towards genotype testing was encouraging, half of the respondents had good attitude towards genotype testing it help them make informed decision on choice of partner so as not to end up marrying a sickle cell anaemia person, and due to some factors in acceptance and utilization of medical laboratories and hospital for testing. This view is supported by Akinyanju and Anionwu (1990). This view is also similar to that of Adewuyi (2000) in a study conducted among new undergraduate in Nigeria tertiary institution to determine their attitude towards sickle cell anaemia. This is also supported by Arasomwa and Leigh (1990) in a study conducted in a community in Nigeria to determine the attitude towards adopting traditional way of verifying diseases in family prior to acceptance of marriage which however militate against screening through blood test.

The respondents also believed that they have the right to know their genotype and that of their partner before marriage to enable them make informed decisions. This is similar to the view of Kivipelto, *et al* (2004) who reported that adults generally have the right to know their genotype and that of their spouse and they have the right not to marry persons with sickle cell disease so as to avoid giving birth to sickle cell anaemia children. This view is also supported by Adeyemi and Adekanle (2007).

5.5: Future intention to undertake genotype test

Some of the respondents who had not undergone genotype test, had the future intention of undertaking the test before marriage to avoid getting married to sickle cell anaemia person. This will help reduce the chances of giving birth to children with sickle cell anaemia. This finding was similar to that of World Health Organization (2010), that is of the view that premarital genotype testing should be performed to enable those who are carriers of the traits or have the sickle cell disease make informed decision about their future with their partners. This was also similar to that of Moronkola (2007) in a study conducted among Nigeria undergraduates who were willing to undergo genotype testing.

5.6: Importance of genotype testing

Of the respondents that were interviewed, more than half knew the importance of genotype testing as a tool for partner selection. This finding was similar to that World Health Organisation 2010 which says genotype testing is gaining recognition for the many advantages it has to offer in the prevention, management and treatment of disease. Among their many uses, genotype tests most commonly present an opportunity for individuals to become informed about their genetic predisposition to disease, and for couples to be aware of the possible genetic characteristics of their unborn child/children. This view was also supported by Adewuyi (2011,) which emphasized sensitizing the students in Nigeria on the importance of genotype test and its compatibility with others and also the significance of haemoglobin genotype test.

This view was also supported by Eastern Biotech (2010), which emphasis that genotype tests may provide individuals, who seek them freely, with information, needed to make important decisions about their future, therefore supporting their right to make an informed choice.

In this finding, many of the respondents were of the opinion that government should legislate a compulsory premarital genotype test for all intending couples as it is done in the United States of America. This view is also supported by WHO (2010), which stresses that individuals who wish to marry should present documentation of testing to obtain marriage license. This view was also supported by Adebayo (2011), that the government should adopt the policy of new-born screening for early diagnosis of sickle cell disorder. Thereby reducing some health complications and neo-natal screening which was a capital intensive project that also required a multidisciplinary approach, which will only be beneficial to Nigerians if done in government-owned hospitals.

This was supported by Otaigbe (2011) which is of the opinion that genotype test should be made compulsory for all babies brought to the hospital. If their status is detected on time they can be treated by referring them to the appropriate quarters. If students and intending couples know their genotype status and take wise decision on marriage.

This will help in reducing the spread of sickle cell anaemia or disease among future generations due to the reason that many people are sufferers of sickle cell disease today which is a hidden problem. In Africa, children with sickle cell disease are usually first diagnosed following an acute illness and not by screening. Sickle cell anemia is a preventable health problem that is commonly occurring in couples who are not aware of their genotypes. The high incidence of sickle cell disease in Africa makes it a public health problem but it is often not recognized as such because so many cases go undiagnosed before they die WHO (2010).

5.7: Genetic counseling on genotype testing

Of the respondents that were interviewed, less than half received counseling on premarital genotype test before undergoing the test. This is similar to similar to the view of Oyenike et al., ((2007) which says genetic counseling have been commonly done to identify carriers. This view is also supported by Adeyemo et al., ((2007) which emphasis that genetic counseling will help establish a diagnosis of hereditary disease in affected patient. This is also supported by Hill and

Wang, ((2001). Also Resta et al., ((2006) which says the process of counseling help people understand and adapt to the medical implications.

5.8: Preventive measure towards sickle cell anaemia

More than half of the respondents stated that sickle cell anaemia can be prevented and this can be done through genotype test. This finding is similar to that of Eptein and Katzenstein ((2001) which states sickle cell anaemia can be prevented by performing premarital genotype test. This is also supported by World Health Organization ((2010). This is supported by Coughlin (1999). This is similar to the view of Eastern Biotech authors ((2009) which states that the risk of transmitting genetic disease can be prevented.

Conclusion

The finding from the study shows that there was high awareness rate among respondents about sickle cell anaemia and genotype testing and this should be maintained. The major source of information among these groups is the media (television) and this enable the respondents know the importance of genotype test before marriage. Orientation programme during admission as students into the school should be encouraged.

Respondent partner results contributed to the decision of respondents thereby enabling them make informed decision concerning the safety of their future.

Health implication of findings

The finding of this study is high awareness and practice of genotype testing. Given this recent strategy to sustain and surpass the implication of couples doing genotype testing need to be implemented. These include awareness and the use of community based campaign programme.

The use of mass media, text messages to intending couples, use of E-mails and electronic bill boards. Use of faith based organizations to disseminate genotype testing information to their congregation at least on a monthly basis.

Others include the use of youth based organizations to include it as part of their outreach programme regularly.

Recommendation

1. More awareness programmes should be created by the stakeholders during fresher's orientation programme by educating the students on premarital genotype test and the consequences of actions guiding their choice of partner.

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APPENDIX 1

AWARENESS, ATTITUDE AND PRACTICES OF PRE-MARITAL GENOTYPE TEST AMONG UN-MARRIED STUDENTS OF THE POLYTECHNIC, IBADAN, NIGERIA

Greeting, my name is---------- a postgraduate student of department of Health Promotion and Education, Faculty of public health, University of Ibadan. I am carrying out a study to obtain information on the attitude and intention towards pre-marital genotype testing among un-married students of the Polytechnic, Ibadan. As part of the requirements for the M.P.H programme.

Your participation in this study will contribute to recommendations, programmes and policies that will address the issue of pre-marital genotype testing among young people. I assure you that the information provided in this questionnaire will be kept strictly confidential and used solely for the purpose of research. Please note that you do not need to write your name on the questionnaire. Please draw my attention to any unclear question in the questionnaire. Thank you for your cooperation.

Serial Number----------

SECTION A: SOCIO – DEMOGRAPHY INFORMATION

Please tick (√) or fill as applicable

1. Age (As at last birth day) ----------
2. ***Sex*** (1) Female [ ] (2) Male [ ]
3. Department ----------
4. Present level ----------
5. Hall of residence: (1) Unity Hall [ ] (2) Ramat Hall [ ] (3) Orisun Hall [ ] (4) Olori Hall [ ]
6. Marital status (1) Single [ ] (2) Married [ ] (3)Engaged [ ]

7. Religion(1) Christian(specify denomination)---------- (2) Muslim [ ] (3) Traditional [ ] (4) Others (specify) [ ]

8. Ethnicity (1)Igbo [ ] (2) Yoruba [ ] (3) Hausa [ ] (4) Ijaw [ ] (5) Others(specify)----------

SECTION B: RESPONDENTS' AWARENESS ON SICKLE-CELL DISEASE AND GENOTYPE TESTING.

(Please indicate Yes or No in the following Questions 9-10)

		YES	NO	NO IDEA
9.	Are you aware of what Sickle cell aneamia/disease is?			
10.	Are you aware of what genotype testing is?			

11. Please **tick ( )** all sources of information from where you heard about sickle cell anaemia/genotype testing and underline the **most major** source.

SICKLE CELL ANEAMIA	YES	NO	**GENOTYPE TESTING**	YES	NO
Friends			Friends		
Parents			Parents		
Television/Radio			Television/Radio		
Health worker			Health worker		
Posters			Posters		
Church			Church		
Seminars			Seminars		
Others (specify)			Others (specify)		

12. Where out of the following did you hear about genotype testing/sickle cell aneamia?

(1) At primary school [ ] (2) At secondary school [ ] (3) After secondary school but before post secondary school [ ] (4) At the Polytechnic [ ] (5) Others (specify) ---

13. If YES to question 9, describe sickle cell anaemia ---

14. What is sickle cell trait? ---

15. What causes sickle cell anaemia/disease? ---

16. How is sickle cell anaemia/disease transmitted? ---

17. List symptoms of sickle cell anaemia/disease known to you.

---

18. Is sickle cell aneamia/disease hereditary? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

19. Can sickle cell aneamia/disease be cured? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

20. Can sickle cell aneamia/disease be prevented? (1) Yes [ ] (2) No [ ](3) No idea [ ]

21b. If YES, list ways by which it can be prevented. ---

22. List effect of having a child born with sickle cell disease on the family. ---

---

23. How severe is Sickle cell aneamia/disease? (1) Not severe [ ] (2) Not certain [ ]

(3) Severe [ ].

24. What are the benefits of knowing whether an individual has sickle cell disease/traits?

PLEASE TICK YES OR NO TO QUESTIONS 23-28

	QUESTIONS	YES	NO	NO IDEA
25.	Genotype testing helps predetermine the carrier status of couple planning marriage.			
26.	Genotype test can enable couple to decide if the risk of having a child with certain genetic makeup is advantageous.			
27.	Pre-marital genotype testing can help determine the compatibility of couples.			
28.	Genotype testing can indicate if the individual is predetermined to develop a disease or trait.			

SECTION C: RESPONDENTS PRACTICES ON GENOTYPE TESTING

29. Have you undergone genotype test? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

If No? GO TO QUESTION 33

30. If YES, Where? ----------

31. What year ----------

32. Which of this group do you belong? (1) AA [ ] (2) AS [ ] (3) SS [ ] (4) SC [ ]

(5) S-Beta-Thal [ ] (6) others (specify) ----------

33. Who decided that you should have genotype testing done? (1)Self [ ] (2) Partner [ ] (3) Parents [ ] (4) Church [ ] (5) others (specify) ----------

33 (b) WHY? (1) Admission requirement [ ] (2) Done by parent [ ] (3) When donating blood [ ]

(4) Clinical research [ ] (5) Curiosity [ ] (6) Guide on choice of partner [ ]

(7) Others (SPECIFY) ----------

(c) Were you counseled before the test? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

(d) If YES, by who? ----------

34 (a) Have you informed your partner (person you intend to marry) of the result of your genotype test? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

(b) Has your partner gone for genotype testing? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

If YES, What is the result? ----------

(c) Does your partner genotype influence your selection as a spouse? (1)Yes [ ]

(2) No [ ] (3) No idea [ ]

35. Did your parent undergo genotype testing before their own marriage? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

36. Did your parent behaviour of undergoing genotype testing affect your own decision to go for genotype testing? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

(a) If Yes to question 34. Why? ----------

(b) If No, why? ----------

37. When do you think is the best time to undertake genotype test before marriage?

(a) At the beginning of the relationship [ ]

(b) When dating [ ]

(c) During courtship [ ]

(d) Few weeks or month to the marriage [ ]

(e) Others (specify) ----------

SECTION D: ATTITUDE TOWARDS PRE-MARITAL GENOTYPE TESTING

38. What will be your attitude to the outcome of your partners' result?

(A) If result is positive (AA, AS)? ----------

(B) If result is negative (SS, SC)? ----------

39. If you are a carrier of the sickle cell trait (but not a sickler) will you marry a spouse who refuses to undergo genotype screening? (1) Yes [ ] (2) No [ ] (3) No idea [ ]

Give reasons ----------

40. Will you marry a partner with sickle cell aneamia (SS) if you are AS? (1) Yes [ ]

(2) No [ ] (3) No idea [ ]

(a) If Yes, Give reason ----------

Please indicate whether you AGREE STRONGLY, AGREE; DISAGREE, STRONGLY DISAGREE, NOT SURE in the following questions 41-48.

S/No	STATEMENT	AGREE STRONGLY	AGREE	DISAGREE	STRONGLY DISAGREE	NOT SURE
41.	Sickle cell anaemia should not be a hindrance to marriage.					
42.	I have the right to know the genotype of my partner before marriage.					
43.	I cannot marry anybody with sickle cell aneamia/disease.					

44.	Genotype testing is neither necessary nor compulsory for intending couples.					
45.	People with sickle cell aneamia/disease should not be allowed to get married.					
46.	Sickle cell aneamia is a killer disease.					
47.	The fear of stigmatization can prevent an individual from going for genotype testing.					
48.	Time cannot be a constraint to my going for genotype testing at the hospital.					

SECTION E: FUTURE INTENTION TO UNDERTAKE GENOTYPE TEST

(Please complete this section if you have not undertake genotype testing)

49. Will you personally undertake genotype testing before getting married? (1) Yes [ ]

(2) No [ ] WHY? ----------

(b) Will you prefer if your partner takes genotype test without involving you?

(1) Yes [ ] (2) No [ ] (3) No idea [ ]

(c) Would you undergo genotype testing without your partner? (1) Yes [ ] (2) No [ ]

(3) Not necessary [ ]

(PLEASE TICK (YES) OR (NO) TO THE FOLLOWING OPINIONS ON PRE-MARITAL GENOTYPE TESTING FROM QUESTION 50-54)

S/No	OPINIONS	YES	NO	NO IDEA
50.	Is genotype testing an important factor for marriage?			
51.	Do you think that genotype testing should be a condition for marriage partner selection?			
52.	Should Parents influence young unmarried people on genotype testing before marriage?			
53.	Can you marry without undergoing genotype testing?			
54.	Would you advice that the government legislate compulsory pre-marital genotype testing to all un-married people before marriage.			

APPENDIX 2

CONSENT FORM

My name is Veronica .E. OTEVWOYERE an M.P.H. student in the department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan.

I am carrying out a study on Awareness, attitude and practices of premarital genotype test among unmarried students of The Polytechnic, Ibadan.

I am therefore requesting for your participation in the study.

You will not need to mention your name but you will be given a serial number. Any information given will not in any way be used against you but rather will be used to protect you as an autonomous person who has the right to decide issues concerning his/her life.

Your honest responses/opinion is expected. You are free to accept to participate in the study or not.

You are free to withdraw from the study during the course without victimization.

CONSENT: Now that the details information about the study has been explain to me and I fully understood, I am ready to participate in the study.

---------- .....

Signature of participants/ Date Signature of interviewer