TRNC

NEAR EAST UNIVERSITY

INSTITUTE OF HEALTH SCIENCES, DEPARTMENT OF MEDICAL BIOLOGY AND GENETICS

Attitudes and Understanding of the Risks of Consanguineous Marriages in Nigeria, Jordan and Libya.

A THESIS SUBMITTED TO THE GRADUATE INSTITUTE OF HEALTH SCIENCES

NEAR EAST UNIVERSITY

BY

ZURKI IBRAHIM

In Partial Fulfillment of the Requirements for the Degree of Master of Science in Medical Biology and Genetics

NICOSIA 2017

TURKISH REPUBLIC OF NORTHERN CYPRUS

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ZURKI IBRAHIM
Master of Science in Medical Biology and Genetics

Advisor

Prof. Dr. NedimeSerakinci

NICOSIA, 2017

The Director of Graduate School of Health Sciences,

This study has been accepted by the thesis committee in Medical Biology and Genetic Program as Master Thesis.

Examining Committee in Charge:

Chair: Prof. Dr. Nedime Serakinci

Near East University, Cyprus

Member: Doc. Dr. ResimeKalkan

Near East University, Cyprus

Member: Yrd. Doc. NahitRizaner

Cyprus International University, Cyprus

Approval:

According to the relevant articles of Near East University Postgraduate Study Education and Examination Regulations, this thesis has been approved by the above mentioned members of the thesis committee and the decision of the Board of Directors of the Institute.

Prof. Dr. Husnu Can Baser

Director of Graduate School of Health Sciences

Declaration

I Zurki hereby declare that all the information in this document has been obtained and presented in line with academic rules and ethical conduct, I also declare that, as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this study:

Zurki Ibrahim

Signature

Date

To my mother and late father…

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Zurki Ibrahim

zurkiibrahim@yahoo.com

List of Abbreviations

S/N	Abbreviations	Meaning
1.	**IPC**	**Inter Personal Communication**
2.	**WHO**	**World Health Organization**
3.	**UNICEF**	**United Nation Children's Fund**
4.	**NEU**	**Near East University**
5.	**U.S**	**United State of America**
6.	**UK**	**United Kingdom**
7.	**CHD**	**Coronary Heart Disease**
8.	DNA	**Deoxyribonucleic acid**
9.	**RNA**	**Ribonucleic Acid**
10.	**A,G,C,T**	**Adenine, Guanine, Cytosine, Thymine**
11.	**NHS**	**National Health Service**
12.	**TRCN**	**Turkish Republic of Northern Cyprus**
13.	**NGS**	**Next Generation Sequencing**
14.	**PCR**	**Polymerase Chain Reaction**

Abstract

Consanguinity can be defined as the marriage between biologically related individuals who shared the same ancestor. Marriage between cousins is associated with genetic risks such as the birth defects and other autosomal recessive diseases, and is usually practiced among Muslims population. The aim of this research was to study the knowledge and attitudes of foreign students from some developing countries (Libya, Nigeria and Jordan). Descriptive analytic study was carried out on 500 students, one hundred papers questionnaires each were administered to the students of the three respective countries which are the study group, and students from Northern Cyprus have served as control of the study where a total of 200 hundred questionnaires were administered to them. The result was analyzed using chi-square method in SPSS version 18. Majority of the participants are between the age of 20-29 (81%) and they are mostly Muslims (88.29%), moreover, male participants constitutes the highest percentage (70.8%). From the result, 69% of the students from Libya, 71% Nigeria,64% Jordan and 16.5% from North Cyprus respectively have expressed poor knowledge about the genetic risks associated with consanguineous marriage meanwhile most of the students had positive attitudes toward consanguinity, and the chi-square value is 27.677 while the P-value is 0.000. Furthermore, 32% of Libyan students, 23.0% of Nigerian students, 29% Jordan and 0.5% of the participants from North Cyprus said they were able to notice/see some birth defects from the children of consanguineous marriage and the P-value is 0.000. This outcome has demonstrated the need for awareness about the risks associated with marriage between cousins.

Keywords – Consanguineous marriage, genetic, risks, awareness, attitudes, knowledge

OZET

Akrabaevliliğibiyolojikolarakbağlantılıveaynıatayasahipkişilerinevliliğiolaraktanımlanabilir.Kuzenlerarasıevlilikdoğumksuurlarıvediğerotozomalresesifhastalıklargibi genetic risklertaşırveözelliklemüslümanpopülasyonlardagörülür.Bu araştırmanınamacıgelişenülkelerdengelenyabancıöğrencilerin (Libya, NijeryaveÜrdün) burisklerhakkındakibilgisivetutumunuçalışmaktır. 500 öğrencide (her yabancıülkeden 100ve KKTC den 200 öğrenci) anketsorusuylatanımlayıcıanalitikbirçalışmayapıldı. Yabancıöğrencilerçalışmagrubunu, KKTC'liöğrencilerise control grubunuoluşturdu.Sonuçlar SPSS 18.versiyonkullanılarak chi square yöntemiyleanalizedildi. Katılımcılarınçoğunluğu (%81) 20-29 yaşaralığındaveçoğunlukla(%88.29) müslümandı. Katılımcıların %70.8'i erkeköğrencilerdenoluşuyordu.SonuçlarLibyalıöğrencilerin %69'unun, Nijeryalıöğrencilerin %71'inin, Ürdünlüöğrencilerin %64'ünün veKKTC'liöğrencilerin %16.5'inin akrabaevliliğiileortayaçıkabilecek genetic risklerhakkındayeterlibilgiyesahipolmadığınıgösterdi. Tümgruplardaakrabaevliğinekarşıpozitifbirtutumgörülürken chi square değeri 27.677 iken p-değeri 0.000 oldu.Libyalıöğrencilerin %32'sinin, Nijeryalıöğrencilerin %23'ünün, Ürdünlüöğrencilerin %29'unun veKKTC'liöğrencilerin %0.5'inin çevrelerindeakrabaevliliğisonucudoğumkusuruolançocuklarolduğunufarkettiklerinibelirttiler. Bu sonuç, kuzenlerarasıevliliklerdeki genetic risklerhakkındakifarkındalığınartırılmasıgerektiğinigösterdi.

Anahtarkelimeler– Akrabaevliliği, genetikc, riskler, farkındalık, tutum, bilgi

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INTRODUCTION

1.1 Overview

Consanguinity is described as the relationship between two individuals who have the same family background or blood. Consanguineous marriage can also be defined as the unions of biologically related people (Ghazi et al., 2009). In clinical genetics, marriage that exists between second cousin and closer couples is regarded as consanguinity (Ghazi et al, 2009).

Often infants demise prior, during or immediately after birth, increased rate of congenital malformations, genetic diseases comprising of cancer of the blood (acute lymphatic leukemia), apnea (breathing difficulties for infants at birth), and increased vulnerability to diseases are said to be associated with consanguinity according to several findings (Fatma et al., 2013), as such couples married within a family should be enlightened about its risk. Autosomal recessive disease is usually the additional risk seen in child who belongs to the first cousins and the percentage is about 1.7-2.8 % Modell et al., 2002). The practice of consanguinity started since the early existence of modern human. Currently, about

20% of world inhabitants reside in communities with a preference for marriages within family (Modell et al., 2002).

The prevalence of marriage within family varies greatly between countries, such as North Africa, Middle East and South Asia have the highest incidence of consanguinity, migrant communities in North America, Europe and Australia are also said to have high cases of it as well.In Central, South and West Asia as well as North Africa, about 20-50% of all marriages are between biologically related individuals. Marriages between first cousins, double first cousins (in a situation whereby the couples or spouses share both sets of grandparents) are usually the most widespread type of consanguineous marriages (Mubasshir et al., 2015. In North America and Europe for instance, only 1% of marriages is between biologically related individuals, but in contrast about 10% of marriages in West and East Africa as well as South America are between kin (Mubasshir et al., 2015).

Countries with greatest incidence of consanguinity usually have poor public enlightenment regarding the genetic effect of cousin marriage (Hammy et al., 2011). Only the minority ethnic groups in the nine western countries, communities have a penchant for marriage within family. Information and counseling to partners in respect to their reproductive risk was recently drawing the attention of quite number of organizations (Bennet et al., 2002). The ongoing development in regards to genetic diagnostic methodologies such as the next generation sequencing mainly, is possibly going to provides partners in near future a great significance of information in respect to carrier status of autosomal recessive diseases (Bittles et al., 2010).

There are a high proportion of migrants from South Asia, Middle East as well as sub-Saharan Africa living in UK who practice consanguinity and this makes consanguinity relevant to UK health care (Ahmad 1994; Bittles 2009 and Teebi 1996). The slight decrease of consanguineous marriages across the globe today are said to be associated with the changes in culture and the influence of western civilization (Mubasshir et al., 2015).Information regarding the attitudes and understanding will be obtained from foreign students mainly from Nigeria, Libya and Jordan studying at Near East University.

1.2 Aims and Objectives

The genetic effect of consanguinity is avoidable when there is a proper awareness; this is why the study is aimed to gain more insight into;

1. The attitudes and understanding toward consanguinity among developing country students will be investigated.

2. The data will be obtained from international students mainly from Libya, Nigeria, and Jordan studying at Near East University.

3. Whether responses differs between countries which will be defined by socio-demographic characteristics (such as age, gender, religion, education etc.), personal experience with consanguineous couples, and familiarity with genetic diseases and whether there is any significance differences of understanding between those that are acquiring higher education and those with lower education.

1.3 Significance of the Research

1. This study will provides an additional information regarding consanguinity in developing countries

2. This study will point out the need for proper awareness on the genetic effect of consanguinity in developing countries

3. This study outcome will be used to propose national awareness raising education program to reduce the consequences of consanguineous marriages in developing countries.

CHAPTER TWO

BACKGROUND

2.1 Consanguinity

The word “con” which stand for common, or of the same and the word “ sanguineous” which means blood are , are the two Latin terms that give rise to the word “ consanguinity” (Alwan et al.,1999). Consanguinity simply means marriages within biologically related individuals or persons with the same family background (Modell, et al., 2002). In clinical genetics, marriage that exists between second cousin or closer couples is regarded as consanguinity (Ghazi et al, 2009). Marriages between biologically related individuals have been in existence as early as first century or since the early existence of modern humans.

Consanguinity increase the chance of giving rise to homozygous children as a result of the union or mating that occurs within biologically related persons (Rudan et al., 2003). Inbreeding has been displayed in nearly all species to be associated with deficiency of function due to homozygosity of recessive alleles (Charlesworth et al., 2001).

This happens across an extensive range of traits and proposes a huge number of harmful alleles in the genome of human (Wright et al., 2001). This has been predicted from the reduced early survival of children in first cousin marriages and from similar results in

other species (Bittle et al., 1991). Inbreeding in humans is possibly result in the influence of great or wide range of complex disorders, as most identified genetic variants causing complex disease in human are partially recessive(Rudan et al., 2003).

2.1.1 Religious Background of Consanguineous Marriage

There seems to be no specific justification for the sub division of human populace in to contrasting types of marriage penchant.

However, certain Muslims practice cousins marriage currently, two out of the four prominent schools of thought in Sunni Islam, such as Imam Shafi' I(with about 33.33% of Sunni followers or 29% of the whole Muslims believers) and Imam Ahmad Al'Hambal see it as Mahruh (disliked. According to some unauthenticated Hadiths of the Prophet Muhammad (S.A.W), Muslims are advised to marry outside their families.

Nevertheless, some Islamic scholars such as Ibn Qudamah anal-Ghazali as well prefer marriage away from the family, this is because, in case of divorce between the partners the family ties- which is regarded as sacred in Islam, might be weakened or broken as result of that, and some Islamic scholars like Ibn Baz, suggested that one should marry within the family with the aim of making family ties much more stronger (Abdulrazak et al., 1997).

All forms of first cousins marriage is banned by Hindu Marriage Act, but it permit these kinds of relationships when permitted by local tradition. Marriage among the same gotra is not allowed in Hinduism, where gotra is known as the set of progenies of a sage who resided in the remote past (Kapadia, 1958).

Holy Bible did not include cousin's marriage in the list of prohibited marriages, particularly in the book of Leviticus as well as Deuteronomy (Hammy et al., 2011). Numerous examples of married cousins are available in the Old Testament. Two most popular are contained in Genesis. Meanwhile, Leah and Rachel were all said to be cousins of Isaac's son Jacob. Almost all relationships or marriages more distant than first cousin are permitted in Roman Catholicism, and first-cousin marriages can be reached with a dispensation.

2.1.2 Legal Regulations of Consanguineous Marriage

A related deficiency of consistency exists in legislation enacted in various nations to govern allowed forms of consanguineous marriages. For instance, first cousin marriage is regarded as legal in certain countries like United Kingdom and Australia as well.

However, they are regarded as criminal offences in about eight respective state of the United State of America (Ottenheimer. 1990).

Nevertheless, exemptions can be unified into state laws for instance, to consent uncle-niece marriage among the Jewish population of the Island of Rhode (Bratt, 1984). Legislation permitted and embraced at the national level may also ascertain to be unworkable in practice, as demonstrated by Hindu Marriage Act of 1955 which comprises a sanction on uncle –niece marriage. Though in a finding carried out from 1980 and 1989 in Bangalore and Mysore respectively, key cities of the state of Karnataka in southern India, 21.3% of Hindu marriages was uncle-niece mating (Bittles et al., 1992).

2.2 Global Epidemiology of Consanguinity

There is considerable variation of consanguinity across the globe, for instance: in the United State of America as well as Canada, consanguinity is mostly practiced in isolated group of people or community (Hammond and Jackson, 1958;Jackson et al., 1968), issue of incent, inbreeding as well as the banning of consanguinity in some states are some of the specific legal challenges faced by the isolated communities practicing consanguinity (Ottenheimer, 1996); marriage between biologically related couples in Asia is usually seen through genetic pint of view or perspective in China, industrialization play a vital role in the decrease of consanguinity rate (Bittles, 1998).

Majority of the population in North Africa are believed to be practicing consanguinity(Brick, 1991; Gowri et al., 2011),in Israel only the minority Arab group residing there are believed to be practicing consanguinity and some specific Jewish groups or sects (Zlotogora and Shalev, 2010).

Lack of accurate and reliable data from Central African populations makes it difficult to describe the level or rate of consanguinity there (Bittle et al., 2012), even though, both exogamy and endogamy were practiced within certain African populations based on some evidences (Mubasshir, 2015), the practice of consanguinity in South Africa (Tanner, 1958), Europe (Stoltenberg et al., 1997) and South America is mostly seen in small group of people, mainly migrants from countries where the practice is high (Mubasshir et al., 2015)) , while in West and East Africa, consanguinity is mostly practiced by Muslims population.

2.2.1 Consanguinity among Middle East Population

Many factors are said to be the reasons why the rate of consanguineous marriages are high in the Middle East population, and these are; maintenance of family ties, easiness in respect to marital engagements or activities, good and understandable relations with in laws as well as easiness in respect to the payment of dowry (Ghazi et al., 2009). Even though there is no reliable information on whether the high number of divorces in Middle East is associated with non-consanguineous marriages, but it is generally thought that, there is considerable stability in consanguineous marriages compare to marriages that are not within family (Khlat, 1992).

It is a general belief that the husband's relatives would back the consanguineous wife when resolving marital understanding because she is regarded as part of the extended family, and when there are children with malformations, more family members chip in and gives their maximum support in catering for the malformed children (Alwan et al., 1995).

Several other populations in Middle East such as Lebanese, Palestinians and Christian communities also involve in consanguineous marriages but to a smaller extent, so, it is not only confined to the Muslims population (Hammy, 2005). There are considerable variations of consanguineous marriages among Arab Nations and also within the same

country (Jabeer, 1995. Marriages between third cousins or far relatives are also among consanguineous marriages in Middle East according to some reports (Ghazi et al., 2009).

Even though, this divergence does not distinctly change the average inbreeding coefficient (F), (Bittles, 2008). Furthermore, for contrast of the prevalence of consanguinity, two important parameters are usually adopted; the mean inbreeding coefficient (F) and marriage that exist among first cousins (Alwan et al., 1997). Nevertheless, Arab Populations have a long custom of marriage within biologically related individuals, and the cumulative estimate of (F) may surpass the estimated value which is calculated for a single cohort (Khoury, 1988).

Secular changes in the prevalence of consanguinity have been observed in some Arab communities (Ghazi et al, 2009).The increase of higher education among female, the decrease of fertility leading to lower numbers of suitable to marry, migration of people from rural to urban areas and the increase of the financial status of the family are some of the playing factors why consanguinity is declining in Jordan, Lebanon, Bahrain as well as Palestine (Hafeez, 1995). Furthermore, there is much fear of genetic disorders, because effort is being made to eradicate infectious diseases which were believed to be the major cause of malformations before (Hammy, 2005).

In the case of Morocco (Modell et al., 2002), there is contrasting figures regarding the current status of consanguinity in the country, the first shows that the prevalence of consanguinity increases with about (24.4%) compare it with the previous which is (21%) while on the other hand, another finding shows that, there is a decrease in the rate (Bennet et al., 2002).

The incidence of consanguineous marriages is not decreasing in most of the Arab countries; simply because, it is generally believed that, marriage within biologically related individuals has more benefits (Ghazi et al., 2009).

2.3 Multifactorial Inheritance and Consanguinity

Francis Galton who is also the Charles's Darwin cousin was the first person or scientist to study multifactorial, therefore in contrast to Mendel, Galton examined what he described as "blending" characters (Ingrid L. 2008). Blending is presently regarded as continuous variation, demonstrating a gradation in expression where by a phenotypes (like human height) do not fall into discrete categories.

There are numerous other diseases that expressed multifactorial pattern of inheritance in humans such as cancer, diabetes, asthma, sclerosis and many birth defects as well. The complex interactions of many genetic elements or factors such as copy number variation, epistatic interaction modifier as well environmental factors can results to those disorders (Clark L. 1995). For multifactorial traits, thus, the chance of recurrence with the frequency of the family members involved, for instance if a marriage partners has an offspring with spina bifida, the risk or the chance for their subsequent child will double to about 10% (Carter C.O 1969).

The recurrence chance in a multifactorial diseases increases as the marriage between biologically related individuals who shared the same ancestor increases, this is because, close consanguinity union couples have high tendency of sharing predisposing genes (i.e. a genetic association), for instance if the union are between the first cousins the chance or risk of having a child with a birth deformation is 3% to 5% (Ingrid L. 2008).

2.3.1 Consanguinity and its Negative Effects on Reproductive Health

About 3-5% of all live infants have medically congenital defects. The latest studies carried out by March of Dimes assessed congenital malformations to be around >69.9/1000 in live born, in majority of Arab nations, as contrast to <52.1/1000 live births in European countries, North American states as well as Australia (Jabeer et al.,1998). In Kuwait and United Arab Emirate, a less observed incidence of 7.92/1000 births and 12.5/1000 births were said to be registered in respective countries (Al-Hosani et al., 2005).In about 21,988, births, 24.6 per 1000 are said to possessed major defects in Oman. The variations seen in the rates of birth malformations in diverse nations could be

associated with the true variations among different societies, different methodologies and different time for establishment. Variances in birth malformations and the risk of birth anomalies in first-cousin marriages may be assessed to be 2-2.5 times the overall populace proportion, mostly as a result of the expression of autosomal recessive disorders (Bennet et al., 2002).

A new assessment places the progeny of first cousin couples at a 1.7-2.8% improved risk for birth malformations beyond the populace background risk (Clark et al., 2009). Though, these risk records need authentication for Arab nations over more well measured proof based and consistent research (Jabeer et al., 1998). After adjusting for confounders, consanguineous marriage that has to do with first cousins continued to be significantly related with an increased risk of congenital heart anomaly (CHD), where children born to consanguineous couples had a greater risk of devouring a CHD diagnosed at birth in contrast to those born to non-consanguineous couples in Lebanon, Saudi Arabia, Egypt, and Arabs residing in Israel (Bennet et al., 2001).

Equally, the general frequency of CHD between 140,000 newborns in Oman, a kingdom with greater consanguineous marriages, was alike to that seen from advanced nations in Europe and America as well, implying that consanguineous marriage is not a risk cause for CHD (Sawardeker, 2005).It could be debated, though, the general rate is not amplified, the proportions between consanguineous and non-consanguineous marriages may varies, an element that was not explored in so many findings (Christianson et al., 2006). Consanguinity proportions were believed to be greater between biological parents of newborns with congenital hydrocephalus and neural tube anomalies than in the overall populace in certain findings, but not in other (Christianson et al., 2005).

2.3.2 Consanguinity and Postnatal Mortality

Countries with higher prevalence of consanguineous marriages usually reports low effects on mortality, than societies with less prevalence of consanguineous marriages (Ghazi et al., 2009). This point is not surprising looking at the limited control for

concomitant differences, like maternal education, socioeconomic status and availability of health centers and practices in most consanguineous findings.

The recent estimate on mortality retrieved from a multinational findings of more than 600,000 pregnancies and live births is that the offspring's of first cousin marriage experience about 4.4% of pre reproductive deaths comparing with the progeny of non-consanguineous partners who have less than that (Ghazi et al., 2009). Very few findings have not recognized this increase in regards to the postnatal mortality. The prevalence of autosomal recessive gene and "multigene" complexes" inherited from the same ancestors may be associated with higher rate of postnatal mortality in the progeny of consanguineous parents (Ghazi et al., 2009).

The greater parity incidence within consanguineous parents counterbalances the greater infant mortality and due to this there may be equality in the rate of live children among non-consanguineous and consanguineous parents (Bennet et al., 2001)

2.4 Genetic Consequences of Consanguinity

In the nineteenth century, several scientific findings or investigations had started to influence the consanguinity discourse by the likes of Mitchel and Darwin (Ottenheimer, 1996), and in nineteenth century Mendel explored and outlined laws of inheritance, furthermore in the middle of twentieth century, genetics become a key field of knowledge which pave way in understanding consanguinity after the discovery of DNA double helix.A frequent used debate about the health consequences of consanguinity is that the biological children of consanguineous partners are at greater risk of developing genetic diseases than children of non-consanguineous partners (Darr, 1997).

However, some have debated that the exact numbers or numerical values when taken in perspective that the risk is only 2-3% for couples whose their marriage is not within the family and up to 4.6 % for couples whose their marriage is within family, the remaining 95% chance to have a healthy or normal child for a couples whose their marriage is between cousins, barring the other factors, so according the value is not significance

(Bennet et al., 2002). These reported risks are greatly different depending on the finding and not all the studies ought to be equally measured as a result of its imbalance in controlled parameters (Bennet et al., 2002).

A very good insight into the basics of genetics is required in order to understand the impact of genetics in the way and manner the world defines consanguinity (Bittles, 2010). The understanding of genetics is actually crucial in trying to express the genetic risk of consanguinity to someone who propose to involve in it, and also understand the role of genetics may play in the next generation in giving more insight about consanguinity and healthcare as well (Bittle, 2010).

Genetic can simply be defined as the study of hereditary and the inheritance of traits (Speicher et al., 2009). The cells of the human body compriseof significance organelles part of them is the nucleus which is situated at the center, the nucleus composed of chromosomes that consist of DNA (a genetic material), genes are generally known as the units of inheritance which are also segments or parts of DNA where they most of the time determine human traits right from phenotypic features such as the color of the eye to the features that are not visible such as predisposition to diseases and intelligence depending on the protein they encode (Elaine, 1995).

There are usually about 46 numbers of chromosomes in humans, but they are in pairs (23), comprising of both sex and autosomal chromosomes, and the sum total of the genetic makeup is regarded as the genome. Damage or error can change genes or change its function is referred to as mutation; this sudden change can either be positive, neutral or negative (Elaine, 1995).

Various sequences of the DNA containing both beneficial and deleterious copies of genes determine the various variants of the same gene in different individuals, and these respective variants or alternative forms of genes are called alleles, and humans are said to possess two copies of that alleles, one is paternal (from the father) and the other from the mother (maternal). Therefore, some of these alleles appear to be dominant, meaning, the

appearance of that particular allele overshadow the other allele. And the other allele appears to be recessive, meaning, there is only possible when the other allele is not dominant (Elaine, 1995).

2.4.1 The Mode of Mendelian Inheritance

Genetic defects are characterized based on the type of genetic malformation. However, the malformation occurs or takes place on single gene. This single gene abnormality is the form of genetic malformation known as the Mendelian inheritance (Sandler I, Sandler L. 1986). They are characterized into autosomal dominant, autosomal recessive as well as X-linked or sex linked.

Genes that are situated on the chromosomes, numbered from one to twenty two are known as autosomal. Therefore, in order to give an autosomal dominant inheritance, only single copy of the defective or abnormal gene is needed, and the progeny of the affected persons have about 50% risk of being affected, even though the progeny of unaffected persons are not affected. Majority of the autosomal dominant characters involves structural abnormalities, and both male and females may equally be affected (Elaine J, Arthur P. 1993).

The word “recessive” means masked. It is believed that, a person can have a one or single copy of a diseased gene without expressing any clinical manifestations. Metabolic diseases like diabetes and hypertension can be associated with autosomal recessive Traits. Offspring who have two parents carriers are said to acquire about 25% theoretical risk or chance of developing the disease (Mathebula S. 2012).

Males are usually affected while females are unaffected carriers in X-linked inheritance, therefore, the father must release his Y chromosome in order to have a son, so, there is no male to male transmission. If the mother is a carrier the risk for the male child to have it is 50% chance. In the context of consanguinity, is the autosomal recessive inheritance that is involved (ten Kate, 2012).

2.4.2 Changes in the Gene Expression

The events that convey the information content of the gene into the synthesis of a functional product is known as the process of gene expression. The genes encoding the ribosomal RNAs, tRNA and some other minor RNAs are genes whose functional product as ribonucleic acid, thus, the vast majority of genes inside the cell are protein-encoding genes.

The first stage in gene expression is the transcription of deoxyribonucleic acid molecule into a distinctive RNA copy. The conveyance or transfer of genetic information into the ultimate production of a protein is followed through an RNA intermediate known as messenger RNA. The messenger RNA material contains the exact same sequence of nucleotides as seen in the deoxyribonucleic acid molecule (where U is replaced for T), this happens via the mechanism or process known as transcription and this is achieved by an enzyme called DNA-dependent RNA polymerase. The product of transcription is a ribonucleic acid material that is similar in sequence content to one of the DNA strand (called sense strand) and the other strand known as antisense strand which are complementary to the one another (Elaine 1995).

Furthermore, during the process of translation, transfer RNA which is charged with amino acid moves the ribosome and aligns or settles with current mRNA triplet. Protein chain continues to grow with ribosome addition of amino acid. Therefore, in general gene expression is regarded as the fundamental level where the genotype lead to the formation of phenotype (known as observable traits. Changes in the gene has a consequences on the body depending on the level it changes the resulting protein, for example, recessive mutation may go away part of all the gene from the chromosome, disrupt expression of the gene or change the encoded protein structure thereby disrupting its normal function.

2.4.3 Consanguinity and the Population Genetics

Population genetics is used in analysing the pattern of inheritance in regards to changes and alleleic frequency variation at a grater or macro level, looking at the effect of

potentially harmful diseases arising from mutated alleles, so population genetics is playing a key role here (Speicher et al., 2009). Hardy-Weinberg is one of the significant principles of population genetics, it propose that the allelelic frequencies remain the same in a randomly reproductive population of infinite size (Bittle, 2010). When determining the allelic frequency, this method is not accurate some times (Bittle,2010). The exception arise in the form of genetic drift, assortment mating or non-random and others (Young, 2007).

Random mating is a phenomenom which is applied to humans inappropriatly , this is because, usually there some sort of selection procedures involved in selecting a partner. Assortment matting occur, when the selection depend on the specific phenotype such as eye color, height weight or is based on race and ethnicity as well (Bittles, 2010).

Consanguinity is also a form of assortive mating where by the selection of a partner is based on family background. On the other side, genetic drift is the impact whereby chance has an allele frequency and is usually occcur in smaller population, in which non-random mating happens as a matter of chance due to small choosing sample (Bittle, 2010).Population stratification and endogamy can also have an influence on allelic distribution, so is not only consanguinity, and also mating is confined to choose a set of partners on the background of behaviour and geopraphy. The outcomes is the same from the sum total of the above, which has a variation in allelic frequencies away from the law of Hardy-Weinberg. Therefore, in order to examine if a harmful imbalance is about to happen in a population such as an increase in recessive homozygosity can led in increased disorders, as a results of the factors above other methodologies of calculation were needed.

2.4.4 Inbreeding and Coefficient of Relatedness

In order to quantify genetic relationships, the co-efficient of relatedness (r) and the co-efficient of inbreeding are used (Bittles), and also be adopted to make risk assesment and the genetic diagnosis of diseases as well. Genes shared by two persons can be measured

using relatedness co-efficient, while the proportion of gene locations (locus) where the persons will be homozygous can be measured by the inbreeding co-efficient (Young, 2007).

This is in effect a new and also more efficient approach in defining consanguinity and assessing any likely affcets than the degrees used under the canomic and civil approch in decades ago.

The following table, explain the most frequent consanguineous relationship.

Relationships	F	R
Siblings/Parents-child	¼	½
Half Sibs/Uncle-niece/Aunt/Nephew	1/8	¼
First Cousins	1/16	1/8
First cousin once Removed	1/32	1/16
Second Cousins	1/64	1/32
Double First Cousins	1/8	¼
Double second Cousins	1/32	1/16

Table 2.1: Indicates of the frequent consanguineous relationships .“ f ” stand for the inbreeding co-efficient showing the proportion of the locations of genes where the partners will become homozygous, and “ r “ stand for the co-efficient of relatedness showing the proportion of genes the partners will have in common. *recreated from (Young, 2007).

Furthermore, something very interesting about the scientific names linked or associated with consanguinity is that, they are making use of language that can actually denote negative meaning of the phrase, like inbreeding co-efficient. This shows that consanguinity is in fact inbreeding, which is genetically it is, but is a serious problematic interaction or association in sociocultural terms.

As seen in table 1, it can be deduced that, first cousins will share $1/8^{th}$ of their respective genes and will be homozygous at $1/16^{th}$ of their gene loci, this explanation can be applied to examine the genetic risk of diseases and is extensively used as method in genetic counselling together with pedigree analysis, which also permit the analysis of inheritance pattern (Bennet et al., 2002). Another approach adopted in consanguinity analysis or studies is the genetic load theory based on the credence that a human populace is heterozygous for some specific genes that if expreesed could be harmful.

Genetic load is a decrease in the fitness of populace as a result of the expression of harmful genes that decrease the survival of the population (Bittle, 2010).By comparing the rate of death in the offsprings of both non-related and related people, it is possible to examine the harmful gene in a particular community or sub population (Bittles, 2010), indicating again how consanguinity has been significant and important in extending genetic science.

2.4.5 Medical Genetic Services

Genetic services comprise of simple history of the family up to the laboratory diagnosis and this also involves genetic counseling and predictive screening. It is good to understand the services rendered by geneticists that are available in health facilities, this is because, they can have implications for the selections available for those in need of the services, and in regards to consanguineous partners, the implication can have an impact on their understanding of genetic diseases, treatment, services and consanguinity in particular (Bennet et al., 2002).

Genetic diagnosis and screening is adopted to examine, if a specific gene mutation is present in a particular person, ethnic, population susceptibility (screening or family history). The method most of the time start by asking the patient referred by a medical expert to provide a sample of blood which will subsequently be taken to a diagnostic laboratory for examination. When the suspected disease is caused by a mutation which is known in a gene, then the diagnosis is most of the time straightforward.

A gene or DNA sequencing is required, if the disease is caused by a number of mutation in a gene, as stated A, G, C, and T, represents the genetic code in the gene and these letters represents, Adenine, Guanine, Cytosine and Thymine respectively. A base pair is made when two respective strands of DNA unite (Elaine, 1995) and numerous of these base pairs are said to be existent, resulting sequencing to take longer time, but now a days, with the introduction of next generation sequencing lengthy sequencing can be done within short period of time or within hours unlike before where sequencing take days.

2.5 Sociocultural Factors

The sociocultural factors are regarded as the third area of knowledge that explain the present understanding of consanguinity and they comprise of issues associated with social norms, religious cultures or traditions around marriage, sexual relationships and sociocultural responses to variations in ethnicity as well.

The topic of marriage is important in regards to sociocultural awareness of consanguinity, not only in respect to how it is explained but also in regards how consanguinity is associated to other sociocultural factors such as cultural tradition, social classification, laws that has to do with immigration and ethnic strife as well. As stated earlier the meaning of consanguinity comprise of relationships deemed ancestors, where they may contribute in attributing at label to all relationships that has to do with consanguinity (Katon and Kleiman, 1981).

Furthermore, consanguinity in the public areas, particularly in the UK, is usually synonymous with cousin marriage. Marriage has contributed in modifying societies from agricultural era to industrial or even in civilized or modern societies. Religious addicts, civil laws, social ideologies and cultural divides have been defined marriage. Westermack (1891) had tried to map out the beginning of human life through his

publication “the history of human marriage” even though, the bases are the initial written or spoken accounts and may not show a correct origin.

It is suffice to state that past societies did not consider giving an acceptance to marriage or even monogamy as both sexes in certain populations inclined to mate non-exclusively and theoffspring’s would less commonly know their respective fathers of origin (Westermarck, 1891). The advent of a family in fact may have resulted in having the idea of marriage, as both parentsattained sense of duties towards their offsprings, providing the idea of tasks and a form of marriage as well as providing the shape to the family (Goody, 1983).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Participants and Procedures

Reviewed developed questionnaires were administered from March to April 2017. The intended target populations for this research were people in which their cultures, traditions or costumes favor consanguineous marriages.

The descriptive-analytic study was carried out on five hundred students, studying at Near East University. The study group of this research are foreign students, specifically from Libya, Nigeria and Jordan, these study groups were selected as they have cases of marriage between close relatives and also for easy access to the participants, where 100 questionnaires was administered to the participants of each selected country, making a total of three hundred(300) paper questionnaires.

Students from Turkish Republic of Northern Cyprus (TRCN)has served as control group of the researchin order to make comparisons with the study groups as the country has less cases of marriage between close relatives, where a total of two hundred (200)

questionnaires were administered to them. The ethical approval for this research was received, from the Near East University ethic committee of medical sciences.

3.2 Measures

The questionnaire was designed after consulting many related studies. The questions being asked were based on the findings in the literature. Furthermore, the questions comprised of three sections or parts. The first section included variables of the socio-demographic characteristics which comprised of age, the educational status of the respondents, gender, nationality, as well as the marital status.

The other parts were about the knowledge or understanding (seven questions) and attitudes toward consanguineous marriage (five questions).A rehearsal or free test was carried out among about 16 people selected for demographic differences such as education, age as well as descent (Jordanian, Libyan and Nigerian respectively), with the aim of determining the difficulty or easiness of the questions, they were urged to answer the questions appropriately and write where necessary which resulted in some changes in the questionnaire before the final survey.

3.3 Data Analysis

Descriptive analysis was carried out to define the general demographic characteristics of the participants, Pearson chi-square test was used to determine the associations between the variables. Questions in regards to the understanding of consanguineous marriages were summarized in two point scale such as Yes and No. while the questions regarding the attitudes of the participants toward consanguineous marriages were summarized on three point scale, for instance the question on how the respondents can rate the level of consanguineous marriages in their respective countries (1) low (2) moderate (3) high, the question about whether consanguineous couples should seek information about the risk of hereditary or congenital disorder in their children since they have the right to do so (1) agree (2) uncertain (3) disagree, etc.

All the information or data were analyzed using SPSS version 18 and P value less than or equal to 0.05 is considered significant.

The paper questionnaires were written in Turkish, Arabic and English language respectively.

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CHAPTER FOUR

RESULTS

4.1 Participants Demographic Characteristics

Table 2 showed the general demographic characteristics of the participants, participants between the ages of 20-29 constitute the highest percentage (81.0%), Male participants (70.8), and undergraduate students (54.2%), single (not married) 81.4%, Islam (88.2%).

Table 4.2: Demonstration of Demographic Characteristics Frequency and Valid Percentage

Demographic Factors	**Range**	**Frequency**	**Valid Percentage**
Age	20-29	405	81.0
	30-39	89	17.8
	40-49	6	1.2
Total		500	100.0
Gender	Male	354	70.8
	Female	146	29.2
Total		500	100.0
EducationalStatus	Undergraduate	271	54.2
	Postgraduate	229	45.8
Total		500	100.0

MaritalStatus	Single	407	81.4
	Married	92	18.4
	Divorced	1	0.2
Total		500	100.0
Religion	Islam	441	88.2
	Christianity	56	11.2
	Others	3	0.6
Total		500	100.0
Nationality	Libya	100	20.0
	Nigeria	100	20.0
	Jordan	100	20.0
	North Cyprus	200	40.0
Total		500	100.0

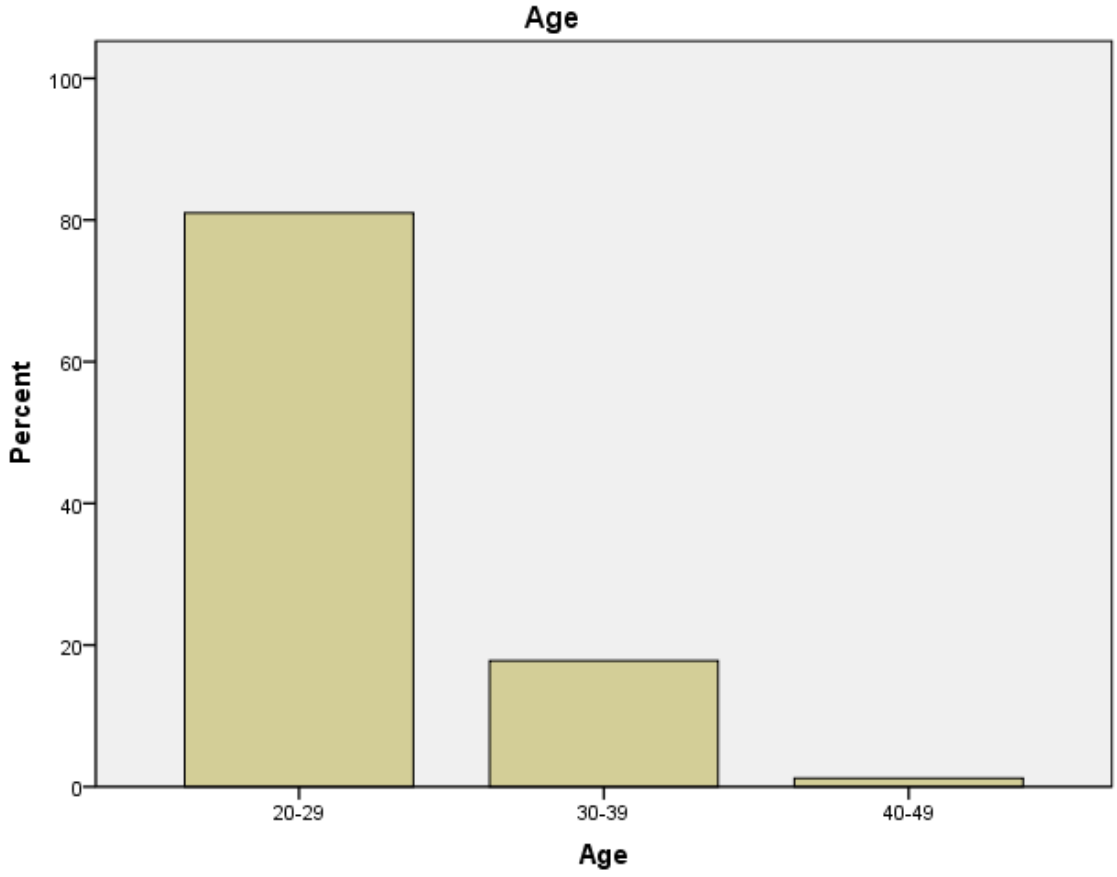

Figure 4.1: Figure 1 showed the age distribution of the participants. It indicates that most of the participants are between the age of 20-29 (405) and about 81.0%, followed by the participants which are between the age of 30-39 (84) and constitutes about 17.8%, also the participants that are between the age of 40-49 constitute about 1.2%.

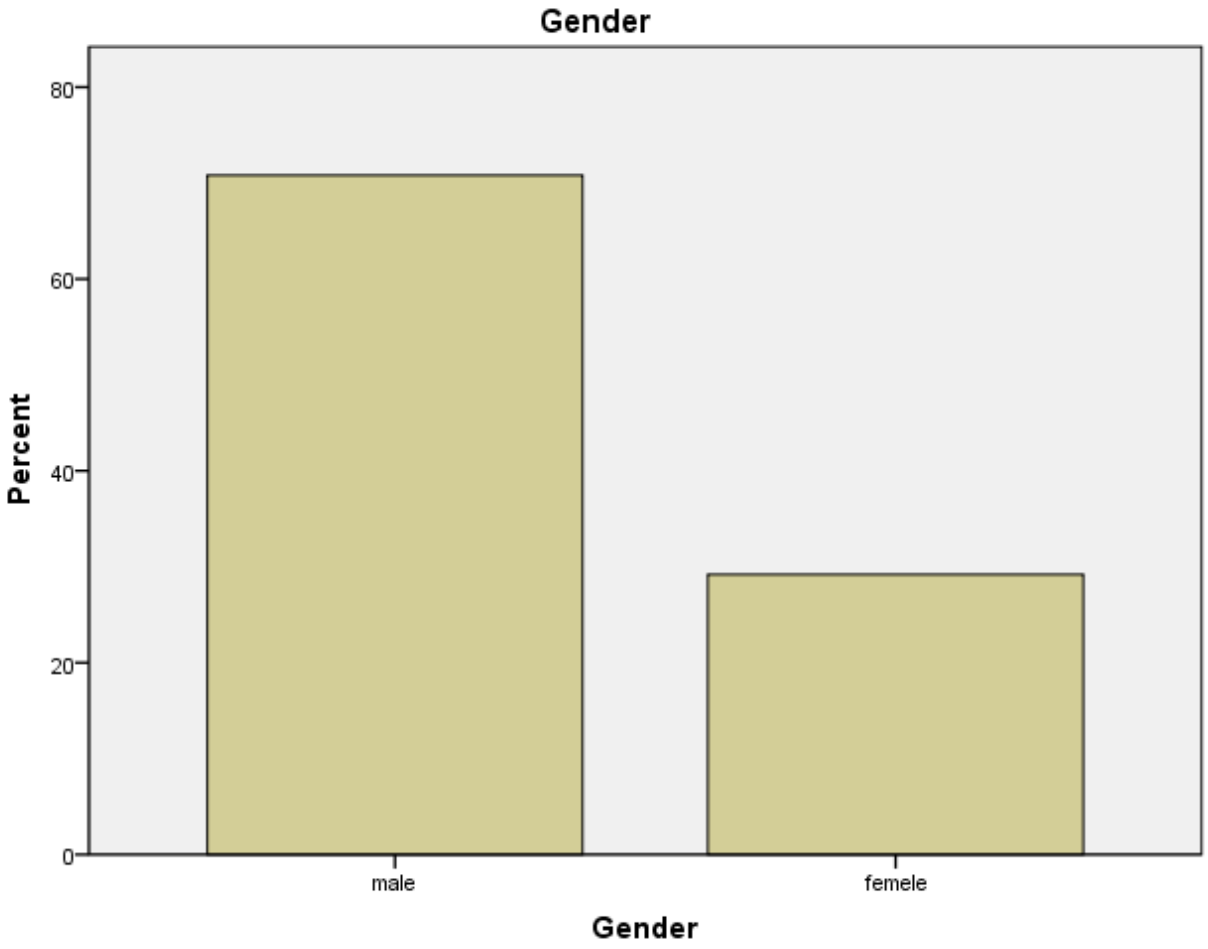

Figure 4.2: Figure 2 showed thedistribution of male and female participants, 354 male students participated in this research and they constitutes the highest percentage of about 70.8 while the opposite sex constitutes about 29.2 %.

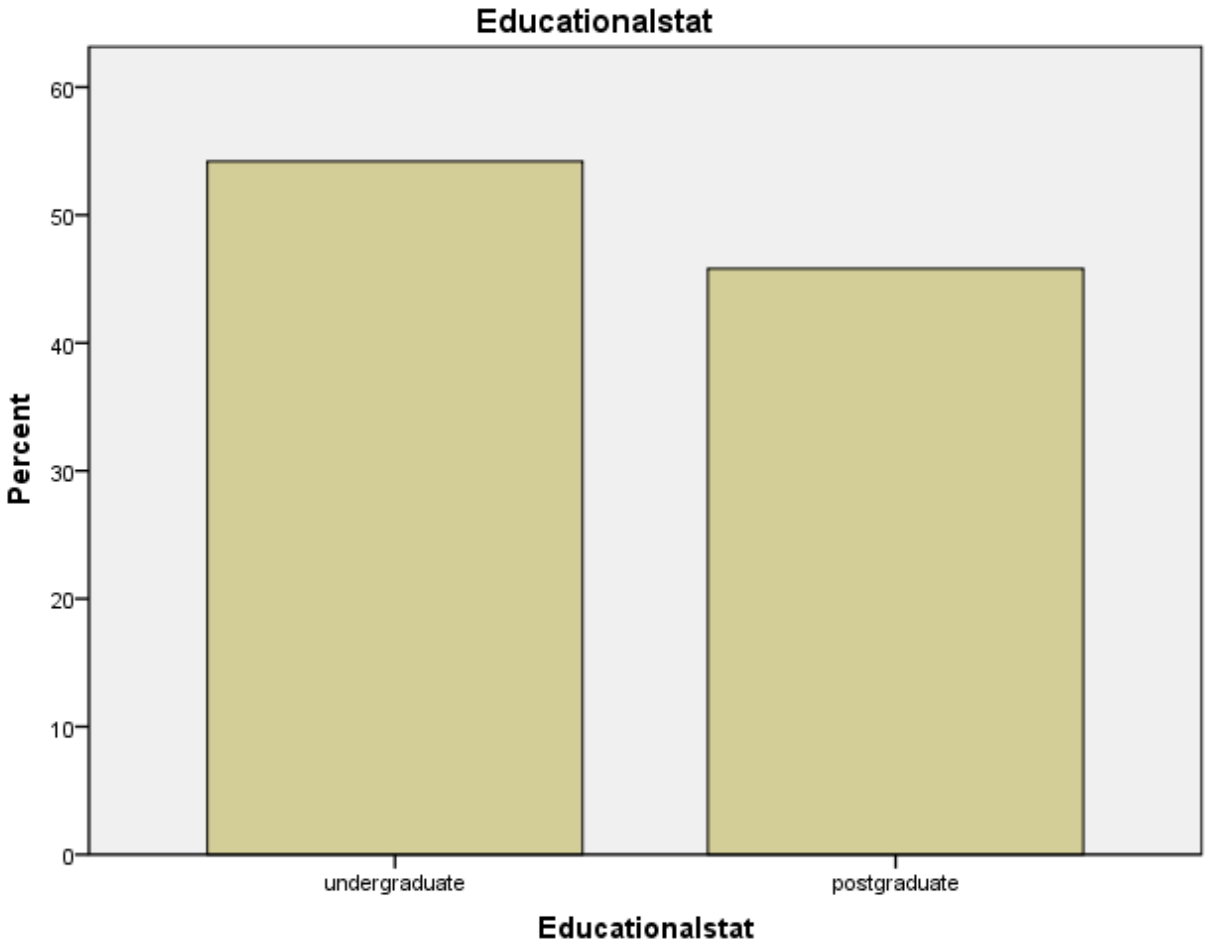

Figure 4.3: figure 3 showed the educational status of the total participants, it indicates that undergraduates students carries the highest percentage of about 54.2 while the postgraduate students constitutes of about 45.8%.

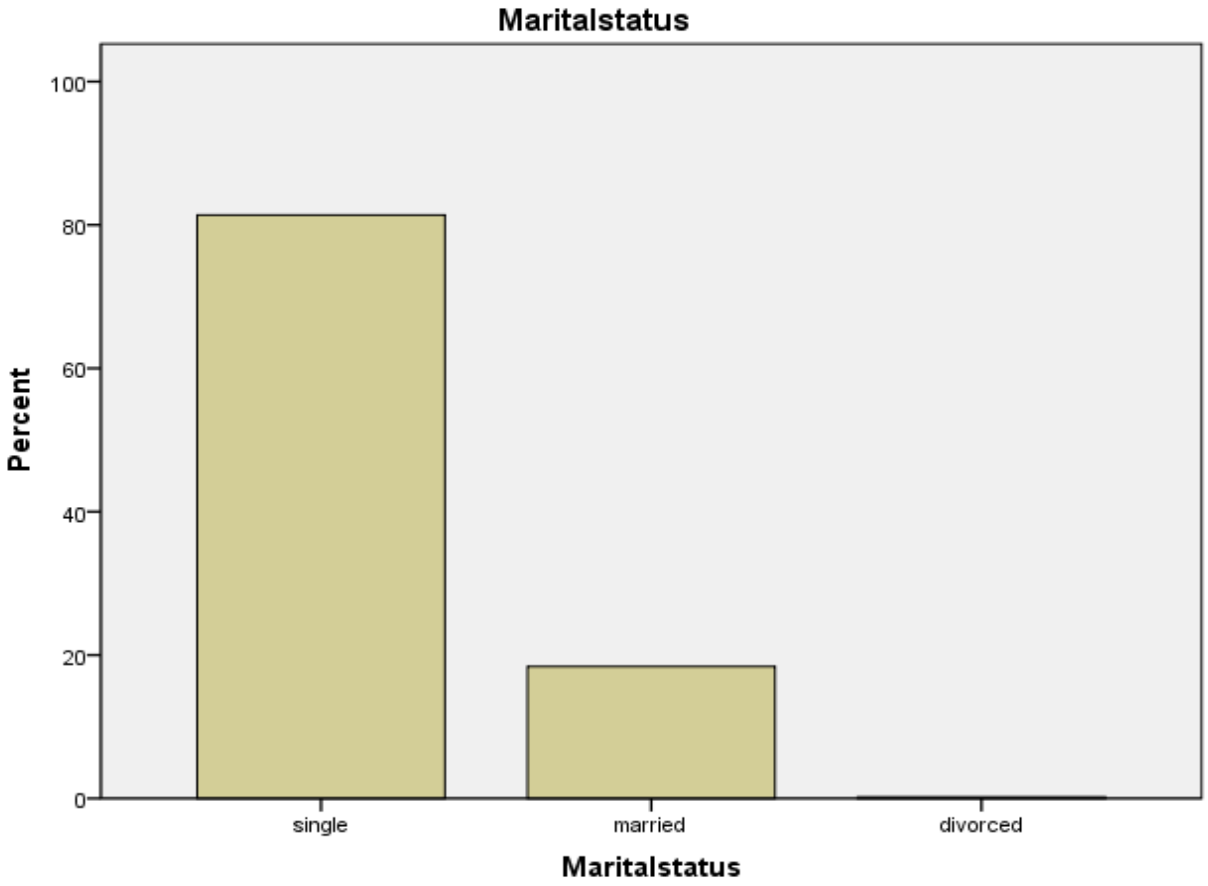

Figure 4.4: Figure 4 showed thedemonstration of the participants marital status, 407 students (81.4%) whose are single (not married) participated in this research while a total of 92 married students (18.4%) participated, and also one divorced individual participated as well.

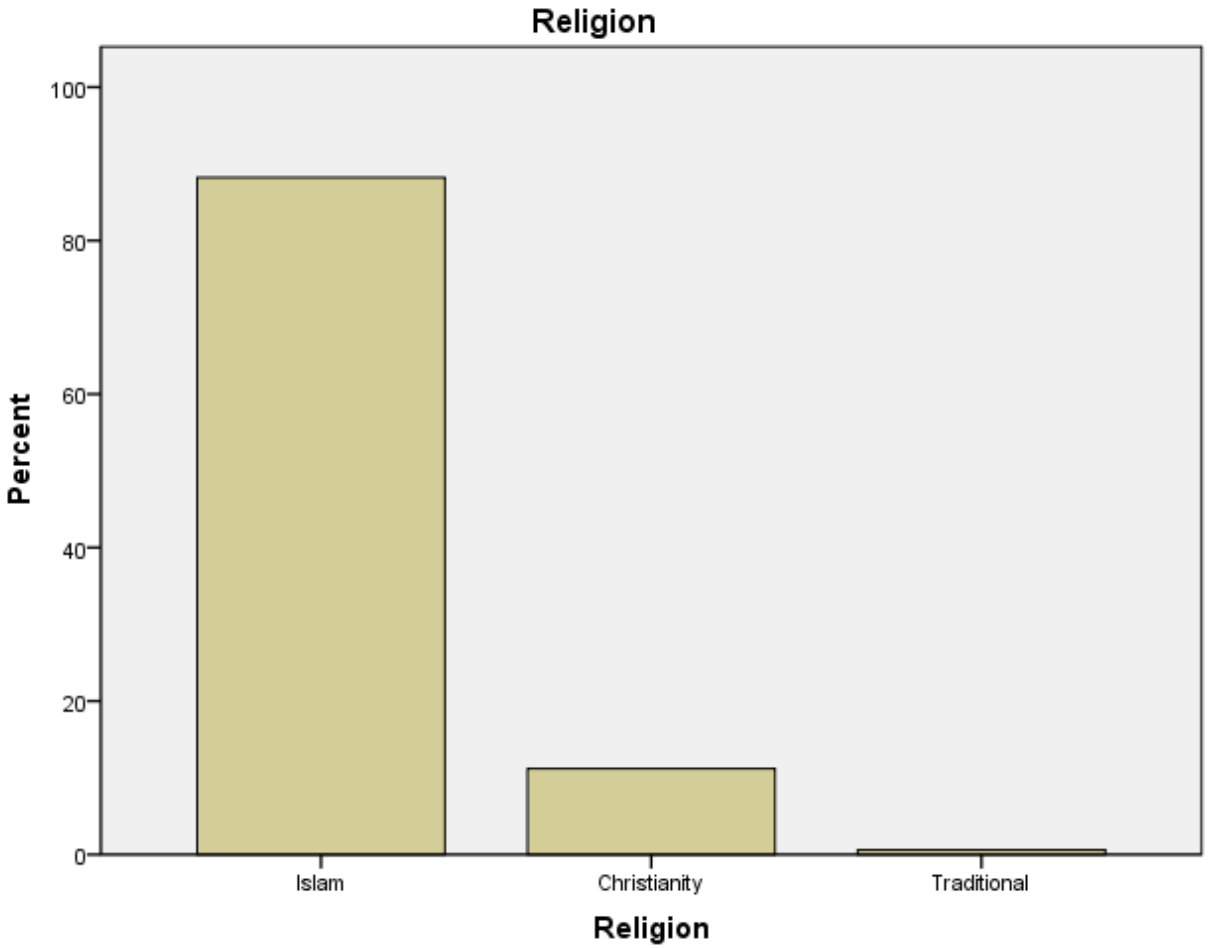

Figure 4.5: Figure 5 showed that, Muslims participants constitute the highest percentage which is 88.2% (n = 441) while Christians carries 11.2% (n = 56) and participants that adopt traditional religion as their way of worship constitutes about 0.6 percent.

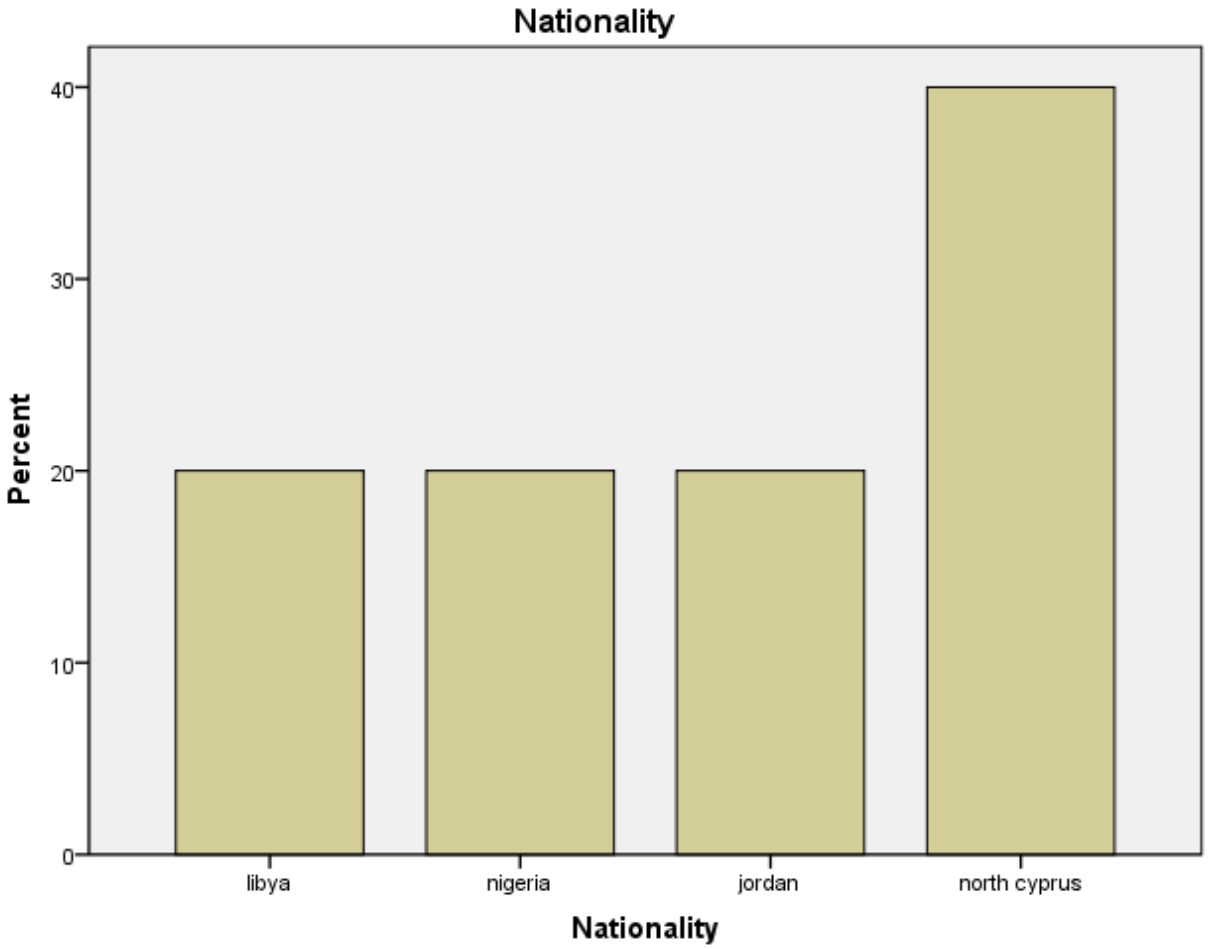

Figure 4.6: Figure 6 showed the percentage of the participant's nationality that one hundred students each from Libya (20%), Nigeria (20%) and Jordan (20%) participated in this study and a total of two hundred male and female students from Northern Cyprus (40%) participated in this research as well.

4.2 Participants Knowledge and Understanding toward Consanguinity

Table 3 showed the comparison of understanding on the term consanguinity between the study groups and the control group. 53% of Libyans, 38% of Nigerians, 56% of Jordanians answered yes, while 92.5% of Northern Cypriots participants (control group) answered yes. P - Value 0.000 (less than 0.05).

Table 4.3: Knowledge on the Term Consanguinity among the Participants

			Yes	**No**	**Total**
Nationality	**Libya**	Count	53	47	100
		% Within Libyans	53%	47%	100%
	Nigeria	Count	38	62	100
		% Within Nigerians	38%	62%	100%
	Jordan	Count	56	44	100
		% Within Jordanians	56%	44%	100%
	North Cyprus	Count	185	15	200
		% Within Northern Cypriots	92.5%	7.5%	100%

Table 4 showed that there is no association between the participant's age and their understanding regarding consanguinity. 66% of the participants between the ages of 20-29 answered yes, 65% of the participants between the ages of 30-39 answered yes, while 100% of the participants between the ages of 40-49 answered yes. P value = 0.215 (greater than 0.05).

Table 4.4: Association between the Participants Age and the Knowledge on the Term Consanguinity

			Yes	**No**	**Total**
Age	**20-29**	Count	268	137	405
		% Within Age Category	66.2%	33.8%	100%
	30-39	Count	58	31	89
		% Within Age Category	65.2%	34.8%	100%
	40-49	Count	6	0.0	6
		% Within Age Category	100%	.0%	100%

Table 5 indicates the participants responses on whether their tradition encourage people to get married between close relatives, 97% of the participants from Jordan, 48% of the respondents from Nigeria, and 98% of the Jordanians Participants answered yes respectively, while only 10.5% of North Cyprus participants (control group) answered yes. P value = 0.000 (less than alpha 0.05)

Table 4.5: Participants Answers on whether their Tradition Favors/Encourage Marriage between Close Relatives

			Yes	**No**	**Total**
Nationality	**Libya**	Count	97	3	100
		% Within Libyans	97.0%	3.0%	100%
	Nigeria	Count	48	52	100
		% Within Nigerians	48%	52%	100%
	Jordan	Count	98	2	100
		% Within Jordanians	98%	2.0%	100%
	North Cyprus	Count	21	179	200
		% Within Northern Cypriots	10.5%	89.5%	100%

Table 6 showed the participants knowledge on whether they have ever seen someone who marries his first, second or double cousins, 97% of the Libyan participants, 52% of the Nigerian participants and 99.0% of Jordanian participants respectively agreed that they have seen someone who marries his/her cousins, while only 8.0% of the participants in the control group (North Cyprus) answered yes. P value = 0.000 (less than alpha 0.05)

Table 4.6: Participants Knowledge on whether they have ever seen someone who marries his/her Cousins

			Yes	**No**	**Total**
Nationality	**Libya**	Count	97	3	100
		% Within Libyans	97.0%	3.0%	100%
	Nigeria	Count	52	48	100
		% Within Nigerians	52%	48%	100%
	Jordan	Count	99	1	100
		% Within Jordanians	99%	1.0%	100%
	North Cyprus	Count	8	192	200
		% Within North Cypriots	4.0%	96.0%	100%

Table 7 shows the comparison of knowledge regarding the participants understanding on the genetic risks associated with marriage between cousins. 69% of the participants from Libya, 77.0% of Nigerian participants, and 64.0% of the Jordanian participants have answered no; that they have never heard about the risks associated with marriage between close relatives, while 83 of the North Cyprus participants (control group) have answered yes. P value = 0.000 (less than alpha 0.05).

Table 4.7: Participants Knowledge Regarding the Genetic Risks Associated with Consanguineous Marriage:

			Yes	**No**	**Total**
Nationality	**Libya**	Count	31	69	100
		% Within Libyans	31.0%	69.0%	100%
	Nigeria	Count	23	77	100
		% Within Nigerians	23.0%	77.0%	100%
	Jordan	Count	36	64	100
		% Within Jordanians	36.0%	64.0%	100%
	North Cyprus	Count	167	33	200
		% Within North Cypriots	83.5%	16.5%	100%

Table 8 showed the comparison of knowledge between the study groups and the control group on whether they have ever seen/remember any form of birth defects in consanguineous couple's child, 32% of Libyan Participants, 23% of Nigerian Participants, and 29% of the participants from Jordan respectively have answered yes, while 0.5% of the North Cyprus participants (control group) answered yes. P value = 0.000 (less than alpha 0.05)

Table 4.8: Participants Knowledge on whether they have ever seen/remember any birth defects in the child of Consanguineous Couples

			Yes	**No**	**Total**
Nationality	**Libya**	Count	32	68	100
		% Within Libyans	32.0%	68.0%	100%
	Nigeria	Count	23	77	100
		% Within Nigerians	23.0%	77.0%	100%
	Jordan	Count	29	71	100
		% Within Jordanians	29.0%	71.0%	100%
	NorthCyprus	Count	1	199	200
		% Within North Cypriots	0.5%	99.5%	100%

Table 9 shows the participants responses on whether consanguinity can increase the risks of having children with intellectual disabilities. 95% of the Libyan participants, 80% of the Nigerian participants and 89% of the participants from Jordan have answered yes, while 91.0% of the participants in the control group (North Cyprus) have answered yes. P value = 0.005(less than alpha 0.05).

Table 4.9: Risk of Having Children with Intellectual Disabilities in Consanguineous Marriages

			Yes	**No**	**Total**
Nationality	**Libya**	Count	95	5	100
		% Within Libyans	95.0%	5.0%	100%
	Nigeria	Count	80	20	100
		% Within Nigerians	80.0%	20.0%	100%
	Jordan	Count	89	11	100
		% Within Jordanians	89.0%	11.0%	100%
	North Cyprus	Count	182	18	200
		% Within Northern Cypriots	91.0%	9.0%	100%

Table 10 shows the rate of marriage between close relatives in the participant's respective countries, 74% of the Libyan participants have rated as moderate, 2% low and 24% high respectively, 42% of Nigerian participants have rated it as low, 42% moderate and 16% high respectively, for the Jordanian students, 1.0% low, 68.0% moderate and 31% high respectively, while most of the participants in the control group (North Cyprus) have rated it as low (98%) and the remaining 2% moderate. P value = 0.010 (less than alpha 0.05).

Table 4.10: Level of Consanguineous marriages in the Participants Respective Countries

			Low	**Moderate**	**High**	**Total**
Nationality	**Libya**	Count	2	74	24	100
		% Within Libyans	2.0%	74.0%	24.0%	100%
	Nigeria	Count	42	42	16	100
		% Within Nigerians	42.0%	42.0%	16.0%	100%
	Jordan	Count	1	68	31	100
		% Within Jordanians	1.0%	68.0%	31%	100%
	NorthCyprus	Count	196	4	0	200
		% Within Northern Cypriots	98.0%	2.0%	.0%	100%

Table 11 shows that, majority of the participants agree that consanguineous marriages can increase the risks of having more children with birth defects in a community, 99% of Libyans answered yes and 1.0% answered no, 89.0% of Nigerians answered yes and 11.0% answered no, 97% of Jordanians answered yes and 3.0% answered no, while 94.8% of the control group participants (North Cyprus) answered yes and 5.5% answered no. P value = 0.24 (Greater than alpha 0.05).

Table 4.11: Consanguineous Marriage and its Possible Risks of Increasing Children with Genetic Abnormalities in a Community

			Yes	**No**	**Total**
Nationality	**Libya**	Count	99	1	100
		% Within Libyans	99.0%	1.0%	100%
	Nigeria	Count	89	11	100
		% Within Nigerians	89.0%	11.0%	100%
	Jordan	Count	97	3	100
		% Within Jordanians	97.0%	3.0%	100%
	North Cyprus	Count	189	11	200
		% Within Northern Cypriots	94.8%	5.5%	100%

Table 12 showed that there is no any association between the participant's sex and their understanding regarding the genetic risks associated with marriage between close relatives, 51.1% of male participants answered yes and 48.9% answered no, while 52.1% of the female participants answered yes and the remaining 47.9% answered no respectively. P value = 0.69 (Greater than alpha 0.05).

Table 4.12: Association between Gender and Participant's Knowledge toward Genetic Risks Associated with Consanguinity

			Yes	**No**	**Total**
Gender	**Males**	Count	181	173	354
		% Among Male Respondents	51.1.0%	48.9%	100%
	Females	Count	76	70	146
		% Among Female Respondents	52.1%	47.9%	100%

Table 13 showed that there is no any significance association between the participants educational level and their understanding toward consanguinity, 67.2% of the undergraduate participants answered yes and 32.8% answered no respectively, 65.5% of the postgraduate participants answered yes and 34.5% answered no. P value = 0.69 (greater than alpha 0.05).

Table 3.13: Association between Educational Status and Understanding of consanguinity

			Yes	**No**	**Total**
Educational Status	**Undergraduate**	Count	182	89	271
		% Within Undergraduate	67.2%	32.8%	100%
	Postgraduate	Count	150	79	229
		% Within Postgraduate	65.5%	34.5%	100%

Tables 14 shows the responses of the Muslims, Christians and Others on whether their religions allows consanguineous marriage, and it indicates the significance differences, 92.3% of the Muslims participants answered yes, 94.6% of the Christian participants answered no, while 100% of the participants in the other religion answered yes. P value = 0.000 (less than alpha 0.05).

Table 4.14: Participants Responses on whether their Religion has Encourage Marriage between Close Relatives:

			Yes	**No**	**Total**
Religion	**Islam**	Count	407	34	441
		% Within Muslims	92.3%	7.7%	100%
	Christianity	Count	3	53	56
		% Within Christians	5.4%	94.6%	100%
	Others	Count	3	0	3
		% Within Other Religions	100%	.0%	100%

4.3 Participants Attitudes toward Consanguinity

Table 15 shows that there is no significance differences on the participants responses regarding ; if it is wise or not for the consanguineous couples to seek information about the possible risks of producing children with some birth defects, 88% of Libyans agreed, 10% uncertain and 2.0% disagree respectively, 99% of Nigerians agreed, 1.0% uncertain and .0% disagreed respectively, 93% of Jordanians agreed, 5.0% uncertain and 2.0% disagreed respectively, 91% of the participants in the control group (North Cyprus) agreed, 9.0% uncertain and none of them disagreed. P value = 0.20 (greater than alpha 0.05).

Table 4.15: Participant's Attitudes toward if it is Wise or not for the Consanguineous Couples to Seek Information about the Risks of Hereditary or Congenital Defects in their Children

			Agree	**Uncertain**	**Disagree**	**Total**
Nationality	**Libya**	Count	88	10	2	100
		% Within Libyans	88.0%	10.0%	2.0%	100%
	Nigeria	Count	99	1	0	100
		% Within Nigerians	99.0%	1.0%	100%	100%
	Jordan	Count	93	5	2	100
		% Within Jordanians	93.0%	5.0%	2.0%	100%
	North Cyprus	Count	182	18	0	200
		% Within Northern Cypriots	91.0%	9.0%	.0%	100%

Table 16 showed the comparison of the study groups and the control group on how they see marriage between close relatives, 29% of the Libyan Participants has described it as good, 31% old fashion, and 40% not good respectively, 28% of Nigerian described it as good, 16% old fashion and 56% not good respectively, 49% of Jordanian participants has described as good, 17% old fashion and 34% not good respectively. P value = 0.000 (less than alpha 0.05)

Table 4.16: Participant's Responses toward how they see Marriage between Close Relatives

			Good	**Old Fashion**	**Not Good**	**Total**
Nationality	**Libya**	Count	29	31	40	100
		% Within Libyans	29.0%	31.0%	40.0%	100%
	Nigeria	Count	28	16	56	100
		% Within Nigerians	28.0%	16.0%	56.0%	100%
	Jordan	Count	49	17	34	100
		% Within Jordanians	49.0%	17.0%	34.0%	100%
	North Cyprus	Count	9	134	57	200
		% Within Northern Cypriots	4.5.0%	67.0%	28.5%	100%

table 17 shows the association between the participants religions and how they see consanguineous marriage, there is a significance between differences between Muslims, Christians and others responses on how they see marriage between close relatives, 25.9% of Muslims described it as good, 42.4% old fashion and 31.7% not good respectively, 1.8% of Christians has described it as good, 16.1% old fashion and 82.1% not good respectively, none of the participants other religions has described as good, 66.0% old fashion and 33.3 not good respectively. P value = 0.000 (less than alpha 0.05).

Table 4.17: Religion and Participants Responses on how they see Marriage

			Good	**Old Fashion**	**Not Good**	**Total**
Religion	**Islam**	Count	114	187	140	441
		% Within Libyans	25.9%	42.4%	31.7%	100%
	Christianity	Count	1	9	46	56
		% Within Nigerians	1.8%	16.1%	82.1%	100%
	Others	Count	0	2	1	3
		% Within Jordanians	.0%	66.7%	33.3%	100%

Table 18 shows the participants responses on the reasons behind consanguineous marriages in their respective nationalities, 28% of Libyans has relate it to religion, 23% poverty and 49% sustaining family ties, 60% of Nigerians has relate it to religion, 2.0% poverty and 38% sustaining family ties respectively, Majority of the participants in the control group (North Cyprus) has relate to sustaining family ties (53%), 14% religion and the remaining 39% has relate it to poverty. P value = 0.000 (less than alpha 0.05).

Table 4.18: Consanguineous Marriages and Reasons behind it in the Participants Respective Countries:

			Religion	**Poverty**	**Sustaining Family Ties**	**Others**	**Total**
Nationality	**Libya**	Count	28	23	49	0	100
		% Within Libyans	28.0%	23.0%	49.0%	.0%	100%
	Nigeria	Count	60	2	38	0	100
		% Within Nigerians	60.0%	2.0%	38.0%	.0%	100%
	Jordan	Count	44	18	38	0	100
		% Within Jordanians	44.0%	18.0%	38.0%	.0%	100%
	North Cyprus	Count	14	79	107	0	200
		% Within Northern Cypriots	7.0%	39.50%	53.0%	.0%	100%

Table 19 shows the respondents responses on whether marriage between close relatives can reduce the rate of divorce, 38% of Libyans agreed, 9.0% uncertain and 53.0% disagree respectively, 27.0% of Nigerians agree, 10.0% uncertain and 63% disagreed, 56% of Jordanians agreed, 6.0% uncertain and 38.0% disagree respectively, 22.5% of the participants in the control group agreed, 8.0% uncertain and 69.5% disagree respectively, therefore there is significance differences. P value = 0.000 (less than alpha 0.05).

Table 4.19: Participants Responses on whether Consanguineous Marriage can reduce the Rate of Divorce

			Agree	**Uncertain**	**Disagree**	**Total**
Nationality	**Libya**	Count	38	9	53	100
		% Within Libyans	38.0%	9.0%	53.0%	100%
	Nigeria	Count	27	10	63	100
		% Within Nigerians	27.0%	10.0%	63.0%	100%
	Jordan	Count	56	6	38	100
		% Within Jordanians	56.0%	6.0%	38.0%	100%
	North Cyprus	Count	45	16	139	200
		% Within Northern Cypriots	22.5%.0%	8.0%	69.50%	100%

Table 20 showed that there is no significance difference between male and femaleparticipants' responses on how they see consanguineous marriage. P value = 0.173 (greater than alpha 0.05).

Table 4.20: Male and Female Responses on how they see Marriage between Close Relatives:

			Good	**Old Fashion**	**Not Good**	**Total**
Gender	**Males**	Count	89	139	126	354
		% Among Male Respondents	25.1%	39.3%	35.6%	100%
	Females	Count	26	59	61	146
		% Among Female Respondents	17.8%	40.4%	41.8%	100%

4.4 Results Summary

A total of five hundred respondents participated in the research (n= 500), where male participants constitute the highest percentage (70.8%), most of those that responded the questions were Muslims (88.2%), and also majority of the participants are between the ages of 20-29 (81.0%), moreover, the undergraduate students carried the highest number (54.2) compared to their counterpart postgraduate students (table 2). The level understanding between the nationalities toward the term consanguinity varies with 53% of Libyan participants answered yes, 56% of Jordanian students answered yes, 38.0% of Nigerian students answered yes while 92.5% of Northern Cyprus students answered yes (table 3). There is no any significance association with age of the participants and knowledge toward what consanguinity is (table 4).

On the participants responses on whether their tradition has favored/encouraged marriage between close relatives, most of the participants from Libya and Jordan have answered yes (97%) and (98%) respectively, 48.0% of Nigerian students have answered yes, while most of the participants from Northern Cyprus answered no, 89.5% (table 5). Meanwhile, divergent responses were observed regarding the question which asked the participants whether they have ever seen someone who marries his/her first, second or double cousin, most of the participants answered yes, particularly those from Libya, Jordan and Nigeria, while majority of the respondents from Northern Cyprus answered no (table 6).

Regarding the most significance question which asked the participants whether they have ever heard about the genetic risks associated with marriage between close relatives, majority of the participants from Libya, Jordan and Nigeria have expressed poor understanding on it, while result from Northern Cyprus varies where most of them expressed better knowledge on it (table 7). The respondents were asked; whether they have ever seen/remember any birth defects in the child of consanguineous couples, 32% of Libyan participants answered yes, 29% Jordan, 23.0% Nigeria, and 0.5% North Cyprus (table 8).

Furthermore almost all the participants have answered yes, on whether they agree about the association between intellectual disability and marriage between close relatives (table 9). The respondents were asked to rate the level of marriage between biologically related individuals in their countries, majority of the participants from Libya and Jordan have rated it as moderate (74.0%) and (68.0%) respectively, while 42.0% of Nigerian students have rated as moderate and 42.0% have rated it as low, most of the respondents from Northern have rated it low 98.0% (table 10). Significant number of the entire participants has answered yes, on the question which says: do you agree that consanguineous marriage can increase the rate of children with genetic defects in your community (table 11).

The results shows, there is no any significance differences between the participants sex and educational status on their knowledge toward consanguinity (table 12 and 13). Thus, significance difference was observed between Muslims and Christian participants, regarding the question which asked whether their tradition has encouraged or favored marriage between close relatives, majority of the participants from Islamic faith has answered yes, while Christian participants has answered no (table 14). Furthermore, majority of the participants has shown positive attitudes toward consanguinity; they agreed that consanguineous couples should seek information about the possible genetic risk in their children (table 15).

On the participants attitudes toward how they see consanguineous marriage, 67% of the respondents from Northern Cyprus are seeing consanguineous marriage as old fashion, 56% of Nigerian students has described it as not good, 49.0% of Jordanian sees it as good and the remaining percentage are between old fashion and not good, while 40% of Libyans are seeing it as not good, 31% old fashion and 29% good (table 16). There is a significance difference between the Muslims and Christian's participants on how they see marriage between close relatives, most of the Christian students are seeing it as not good while significant numbers of Muslim participants is seeing it as good (table 17).

A significant differences was observed regarding the participants views on why people get married between close relatives, most of the participants from Libya revealed that; sustaining the family ties is the reasons why consanguineous marriage is practiced, religion is behind marriage between biologically related individuals according to the participants from Nigeria, so also Jordanian participants, while about 53% of the participants from Northern Cyprus has relate sustaining family ties behind consanguineous marriages (table 18). In regards to the participants attitudes on whether consanguineous marriage can reduce the rate of divorce, majority of the participants from Libya, Nigeria and Northern Cyprus has disagreed, while participants from Jordan agreed 56% (table 19). There is no significance association between the participants sex on how they see marriage between close relatives (table 20).

CHAPTER FIVE

DISCUSSION AND STUDY LIMITATIONS

5.1 Discussion

Consanguinity is regarded as the marriage between biologically related individuals (Bittles, 2012). Many factors are suggested to be associated with the practice of consanguineous marriage, and prevalence of it is seen in the Middle Eastern countries and communities (Ghazi et al., 2015).

Our research investigated knowledge, understanding and attitudes toward consanguinity among developing countries students studying at Near East University (TRCN), and whether responses differs between countries which was defined by demographic characteristics such as age, religion, marital status etc. 100 Reviewed developed questionnaires were administered to the participants of each selected country in the study group i.e. Libya, Nigeria and Jordan, these countries were selected as a results of reported cases of consanguineous marriages and also for easy access to the participants. Students from Turkish Republic of Northern Cyprus studying at Near East University have served as control for the research and a total of 200 questionnaires were administered to them, the country was selected in order to make a comparison of their knowledge, understanding and attitudes with the participants in the study group (p.25).

Most of the participants ages in our study are between the ages 20-29 and are mostly single (not married), Muslim constitutes the greatest percentage with male respondents constitutes the highest percentage in the overall samples (table 2).

Our result showed that the participants in the study group have expressed poor understanding and knowledge on what consanguinity is all about (Table 3). This finding is in agreement with the work of Khoury and Massad, who found in their study that there was a poor knowledge among Jordanian Youths. Countries with greatest incidence of consanguineous marriage have poor public enlightenment (Hamamy et at., 2011).

There was no significance association between the participant's age and their knowledge on what consanguinity is (Table 4). There was no any significance association between the age of the students and their knowledge on consanguinity (Fatma et al., 2013). However, this result disagreed with Nazarbadi et al., 2006 who carried out a research by examining the knowledge and attitudes of some youths in Northern Iran about consanguinity, their result showed the significance association between the participant's age and their understanding on consanguinity.

Majority of the participants in the study group have stated that their tradition has favored/encouraged marriage between close relatives and they were able to see someone who marries his/her cousins, but this outcome is not the same with the study group (table5 and 6).

Our result has revealed the poor knowledge of the participants (particularly those in the study group) regarding the genetic risks associated with marriage between biologically related individuals who shared the same ancestor particularly (table 7). Some of the participants have agreed that, they were able to notice some birth defects in the consanguineous couple's child (table 9) There was no significance differences between male and female participants responses on the genetic risks associated with marriage between close relatives (table 12). This result disagreed with Fatma et al., 2013, who found that there was a significance difference between student's sex and knowledge. Countries with greatest incidence of consanguinity usually have poor public enlightenment regarding the genetic effect of cousin marriage (Hammy et al., 2011).

Also in a related research carried out by Al-ghazali H, and Hammy H. (2006) on the genetic abnormalities and consanguinity among Arabs, their results indicates the poor knowledge on the genetic risks associated with consanguinity among Arabs populace including Libya. There is no much research on consanguinity in Nigeria.

Occurrence of consanguineous marriages was greater between parents of children with birth defects compared with the statistics for the overall populace in all findings stated among Arabs, such as in the United Arab Emirates, Kuwait, Oman, Iraq, Jordan, Egypt,

Lebanon, Tunisia, Arabs in Jerusalem as well Saudi Arabia also (Jabeer et al., 1998). Guz et al., 2003 and Khoury have shown that marriage between relatives produced a great number of miscarriages and stillbirths. Moreover, this finding agreed with Ray and Sushanta can result to child mortality, neonatal death and postnatal mortality.

According to some findings consanguinity is said to be associated with lower fertility (Assaf et al., 2009, consanguineous marriage is said to be linked to higher reproductive infants mortality (Bittle,2013), early childhood morbidity such as congenital anomalies are also said to be associated with consanguineous marriage (Guz et al., 2004), others are intellectual disability, higher adult mortality and morbidity as well, all these occurred through autosomal recessive disorders (Bittles et al., 2012).

In the case of infertility, there are contrasting findings on whether consanguinity increase the risks of it or not (Abdulrazak et al., 1997); furthermore, some of these findings lacks adequate controls in place for sample size and socio-economic heterogeneity, and in the other hand, some of these findings are contradicting leading to have variable results (Bittles, 2012). However, no matter how variables the findings or the results have and also despite the poor quality control of some of the findings, the fact remain constant, that consanguinity is associated with the increase risks of genetic disorders (Gowri et al., 2011).

The recent estimate on mortality retrieved from a multinational findings of more than 600,000 pregnancies and live births is that the offspring's of first cousin marriage experience about 4.4% of pre reproductive deaths comparing with the progeny of non-consanguineous partners who have less than that (Ghazi et al., 2009).

In a finding in Saudi Arabia, total prenatal demises were essentially equal among non-consanguineous and consanguineous partners (Abdulrazak et al., 1997). Among 1867 married partners in Jordan, the prevalence of abortion was not affected by consanguinity. Other findings have stated alike results. Fewer findings observed a greater rate of prenatal fatalities between consanguineous partners (Assaf, 2009).

Our result showed that, most of the students from Libya and Jordan have rated the level of consanguineous marriages in their respective countries as moderate. Students from Nigeria have variable responses toward the rate of consanguineous marriages in their country, Christian students rated it as low while Muslims students rated it as moderate and high (table 10). Majority of the participants from Northern Cyprus have rated the level of marriage between biologically related individuals as low (table 10).Lack of accurate and reliable data from Central and other African populations makes it difficult to describe the level or rate of consanguinity there (Bittle et al., 2012), even though, both exogamy and endogamy were practiced within certain African populations based on some evidences (Mubasshir, 2015), the practice of consanguinity in South Africa and South America is mostly seen in small group of people, mainly migrants from countries where the practice is high (Mubasshir et al., 2015)) , while in West and East Africa, consanguinity is mostly practiced by Muslims population.

Our result from table 16 and 17 respectively has showed the student's responses on how they see marriage between close relatives and their reasons on why people get married within family, majority of the Libyan participants described it as not good and they pointed out that sustaining the good family relationship can be the reason why their people are engage in consanguineous marriage, for the Jordanian participants most of them still see consanguineous marriage as good and they described religion as key player on why people in their country get married between their relatives, for the Nigerian students most of the Christian students described consanguineous marriage as not good and they relate religion as the reason why people do it in Nigeria, thus some of the Muslims participants see it as good and some see it as old fashion. Majority of the students from Northern Cyprus believes that marriage between relatives is an old fashion costume and sustaining the good relationship between the family members can be the reason why people do it according to majority of them. Many factors are said to be the reasons why the rate of consanguineous marriages are high in the Middle East population, and these are; maintenance of family ties, easiness in respect to marital engagements or

activities, good and understandable relations with in laws as well as easiness in respect to the payment of dowry (Ghazi et al., 2009). Even though there is no reliable information on whether the high number of divorces in Middle East is associated with non-consanguineous marriages, but it is generally thought that, there is considerable stability in consanguineous marriages compare to marriages that are not within family (Khlat, 1992).

Majority of the participants from Jordan and Libya believed that marriage between close relatives can reduce the rate divorce, there was variable responses from Nigerian participants and the study group as well (table 19). It is a general believe that the husband's relatives would back the consanguineous wife when resolving marital understanding because she is regarded as part of the extended family, and when there are children with malformations, more family members chip in and gives their maximum support in catering for the malformed children (Alwan et al., 1995).The incidence of consanguineous marriages is not decreasing in most of the Arab countries; simply because, it is generally believed that, marriage within biologically related individuals has more benefits (Ghazi et al., 2009).

Regardless of predominant legislation, a future degeneration in the rate of consanguineous marriages or relationships can be predicted, complementary the projected decrease in family sizes. It is likely that this decrease will not be universal in consequence across populace, but will be mainly seen in urban areas and within partners who possessed greater educational qualifications and later get married. The particular forms of consanguineous relationships contracted may also ascertain to be a significant defining factor. As the size of the family decrease, double first cousin as well as uncle-niece relationships specifically will become greatly difficult to prepare among or within the accepted norms of couples age variation at marriage (Ghazi et al., 2009).

At the same time, there may be lesser focus engaged on the prerequisite to marry within the prescribed consanguineous marriage pattern, for instance, mother's brother's daughter in Southern part of India in order to make sure that marriage among the family can be

negotiated. With advancement in regards to socioeconomic conditions, the cases that has to do with environmental diseases is decreasing in majority of the countries that are developing, basically as a result of improved measures in public health and the innovative programs for deleterious infectious diseases (Bennet et al., 2002). Now, genetic diseases results for an increased rate of morbidity and deaths. This epidemiological changeover has since been recognized over the path of the last two generations in countries that are developed, lesser mortality rate is been observed in Gulf nations, where conducive socioeconomic circumstances have been translated into improved diagnostic and healthcare centers. In developing countries limited knowledge, awareness and understanding regarding consanguinity is poor, particularly since Western countries the information that is accessible is likely to be overly focused on the unwanted clinical results of biologically related marriage, which unfavorably have a consequence to a minority of relatives and individuals.

This poor balance runs to the detriment of greater rate of consanguineous partners whose offspring do not express recognizable harmful biological effects and also to whom the economic as well as social benefits of a consanguineous relationship become obvious. It is greatly important that tangible efforts should be made such as establishing a survey which will engage various fields in order to evaluate the extent of the cases, followed by the innovating a community-based counseling initiatives for the benefits of those relatives or families and societies with one or many harmful recessive genes that are segregating (Bennet et al., 2002).

Looking at the rate of consanguineous marriages in the countries with higher population in the world, and the fact that genetic or inherited diseases which are presently deleterious in countries that are less developed may linked with lifetime care under well-developed treatment facilities, initiatives and programs of this kind would clearly be helpful to the human population generally.

5.2 Study Limitations

As it is observed in most of the research questionnaire, this study has many limitations among which are the inability to retrieve the desired information from the respondents, because some students just tick the answers without thoroughly reading the contents.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Conclusively, most of the participants particularly from Nigeria, Libya and Jordan have expressed poor knowledge about the genetic risks associated with marriage between close relatives. There was no significance association or differences between the participant's age, sex or marital status and their understanding toward consanguinity.

Meanwhile, from the result, the target population has shown divergent attitudes regarding consanguineous marriage as well as the offer of risk or consequences information reflecting the heterogeneity of the population. The finding has pointed out the significance or importance of educational and social programs for the adolescent and youth regarding the genetic consequences associated with marriage between close relatives.

6.2 Recommendations

Based on the findings of this study, the following are the recommendations:

1. Social Mobilization Programs: Societies with cases of consanguineous marriage should consider social mobilization programs through inter personal communication (IPC) where some selected people with better training on the genetic risks associated with consanguineous marriage will reach people in their respective residences (particularly those living in rural areas) and be having a one on one conversations on the consequences associated with cousin's marriage, also community sensitization activities such as drama can be adopted, information about the genetic or reproductive risks associated with marriage between biologically related individuals can be channeled via TV stations and Radio as well.
2. Educational Programs: Students should be informed about the consequences of cousin's marriage right from primary school level , high school level and university level as well

3. Others: More studies on consanguinity should be strengthen in regards to cross culture to explore costume and deeply rooted rural population.

REFERENCES

Al-Gazali LI, Bener A, Abdulrazzaq YM, Micallef R, Al-Khayat AI, Gaber T (1997). ConsanguineousmarriagesintheUnitedArabEmirates**.** *J Biosoc Sci*, 29**:**491-497.

Al-Gazali L, Hamamy H, Al-Arrayad S (2006). GeneticdisordersintheArabworld**.** BMJ, 333**:**831-834

Abdulrazzaq YM, Bener A, Al-Gazali LI, al-Khayat AI, Micallef R, Gaber T (1997). A studyofpossibledeleteriouseffectsofconsanguinity**.** ClinGenet,51**:**167-173.

Al-Kandari YY, Crews DE (2011). The effect of consanguinity on the congenital disabilities in the Kuwaiti population. *J Biosoc Sci*; 43, 65–73.

Alper OM, Erengin H, Manguolu AE, Bilgen T, Cetin Z, Dedeolu N (2004). Consanguineous marriages in the province of Antalya, Turkey. Ann Genet, 47(2):129-38.

Assaf, S., Khawaja, M., Dejong, J., Mahfoud, Z. & Yunis, K (2009). Consanguinity and reproductive wastage in the Palestinian Territories. *Paediatric and Perinatal Epidemiology*, 23**,** 107-115.

Bittles AH, Savithri HS, Murthy G, and Baskaran G, Wang W (2011). Consanguinity: a familiar story full of surprises. In: Macbeth H, Shetty P, eds. Health and ethnicity. London: Taylor and Francis.

Bittles AH (1988). Empirical estimates of the global prevalence of consanguineous marriage in contemporary societies. In: Morrison Institute for Population and Resource Studies Working Report 74. Stanford: Stanford University..

Bittles AH, Mason WM, Greene J, Rao NA (1991). Reproductive behavior and health in consanguineous marriages. Science; 252:789–94.

Bennett RL, Motulsky AG, Bittles A (2002). Genetic counseling and screening of consanguineous couples and their offspring: recommendations of the National Society of Genetic Counselors. J Genet Counseling; 11: 97–119.

Bell CJ, Dinwiddie DL, Miller N (2011). Carrier testing for severe childhood recessive diseases by next-generation sequencing. Sci Transl Med; 3: 65ra4

Clark CJ, Hill A, Jabbar K, Silverman JG (2009). ViolenceduringpregnancyinJordan**:** itsprevalenceandassociatedriskandprotectivefactors**.** Violenceagainstwomen, 15**:**720 735

Clark, L, Emerole, O (1995). Coronary heart disease in African Americans: Primary and secondary prevention. *Cleveland Clinic Journal of Medicine* 62, 285–292.

Christianson A, Howson C, Modell B (2006). Global Report on Birth Defects: The Hidden Toll of Dying and Disabled Children. March of Dimes Birth Defects FoundationWhite Plains, New York.

Donbak L (1991). Consanguinity in Kahramanmaras city, Turkey, and its medical impact. Saudi Med J, 25(12):1991-94.

Ericso A (1979). Cigarette smoking as an etiologic factor in cleft lip and palate. AmericanJournalofObstetricsandGynecology 135, 348–351.

Elaine J, Arthur P (1993). Basic human genetics. Sinauer associate pub, 83-100.

Gowri V, Udayakumar M, Bsiso W, Al Farsi, Y. & Rao, K (2010). Recurrent early pregnancy loss and consanguinity in Omani couples. *Acta Obstetricia et Gynecological Scandinavica,* 90**,** 1167-1169.

Güz K, Dedeoğlu N & Lüleci G (1989). The frequency and medical effects of consanguineous marriages in Antalya, Turkey. *Hereditas,* 111**,** 79-84.

Hamamy H, Jamhawi L, and Al-Darawsheh J, Ajlouni K (2005). Consanguineous marriagesinJordan**:** whyistheratechangingwithtime?Clin Genet,67**:**511-516.

Hamamy H (2012). Consanguineous marriages: preconception consultation in primary health care settings. J Community Genet; 3: 185–192

Hamamy H, Antonarakis SE (2011). Consanguineous marriages, pearls and perils: Geneva International Consanguinity Workshop Report. Genet Med; 13: 841–847.

Hamamy HA, Masri AT, Al-Hadidy AM, Ajlouni KM (2007). Consanguinityand geneticdisorders**.** ProfilefromJordan**.** SaudiMedJ*;* 28**:**1015-1017

Hasanzadeh-nazarabadi M, Rezaeetalab GH, Dastfan F (2006). A study on the youths' knowledge, behavior and attitude towards consanguineous marriages. Iranian *J* PublicHealth; 35(3):47-53.

Husain R, Bittles AH (1998). The prevalence and the demographic characteristics of the consanguineous marriages in Pakistan. *J BiosocSci*; 30: 261-75.

Jaber L, Romano O, Halpern GJ, Livne I, Green M, Shohat T (2005). Awareness about problems associated with consanguineous marriages: survey among Israeli Arab adolescents. J Adolescent Health; 36: 530.

Khlat M (1988). Consanguineous marriage and reproduction in Beirut, Lebanon. Am J Hum Genet*;*43:188-196?

Khalid Y, Tamim H., Khogali M, Beydoun H. and Melki I (2010). Consanguineous marriage and congenital defects: A case control study in the neonatal period. Am. J. Med.Genet; 15.

Khoury SA, Massad D (2000). Consanguinity, fertility, reproductive wastage, infant mortality and congenital malformations in Jordan. *Saudi Med J;*21:150-154

Khoury MJ, Cohen BH, Chase GA, Diamond E (1987). An epidemiologic approach to the evaluation of the effect of inbreeding on the pre-reproductive mortality. Am J Epidemiol; 125(2):251-62.

Kanaan ZM, Mahfouz R, Tamim H (2009). The prevalence of consanguineous marriages in an underserved area in Lebanon and its association with congenital anomalies. Genettest; 4.

Modell B, Darr A (2002). Science and society: genetic counseling and customary consanguineous marriage. NatRevGenet, 3:225-229

Movahedian AH, Mosayebi Z, Yousefian S (2002). Congenital anomalies and consanguineous marriages. KumsJournal *(*FEYZ*)*; 6(3): 84-88.

Mukherjee D, Das S, Banik S (2007). The trends of consanguineous marriages in a Sunni Muslim population of West Bengal, India. AnthropolAnz; 65(3):253-62.

Mubasshir A (2013). Examining the social cultural impacts of consanguinity and implications for healthcare. University of Bedfordshire, 4: 34-89

Ottenheimer M(1996). *Forbidden relatives: the American myth of cousin marriage*, Champaign: University of Illinois Press.

Sedehi M, Keshtkar AA, Golalipour M (2012). Knowledge and the attitude of youth couples on/towards consanguineous marriages in the North of Iran. JCDR 2012; 6: 1233–1236.

Saify K, Saadat M. Consanguineous marriages in Afghanistan (2012). JBiosocSci; 44(1):73-81.

Simek S, Türe M, Tugrul B, Mercan N, Türe H, Akda B (1999). Consanguineous marriages in Denizli, Turkey. AnnHumBiol; 26(5):489-91.

Sandler I, Sandler L (1988). On the origin of Mendelian genetics. *Am Zool* 1986 26 753-768.

Speicher M, Antonarakis S and Motulsky G (2009). *Vogel and Motulsky's Human Genetics: Problems and Approaches*, Heidelberg: Springer.

SPSS Inc. Released 2(009). PASW Statistics for Windows, Version 18.0. Chicago: SPSS, Inc. Chicago.

Tanner S (1958). Fertility and child mortality in cousin marriages: a study in a Moslem community in east Africa. *Eugenics Review,* 49, 197-199.

Ten Kate L (2012). Genetic risk. *Journal of Community Genetics,* 3**,** 159-166.

Winsor E (1988). Mendelian genetics. Can Fam Physician .1988; 34 859-862

Young R & Collin A (2004). Introduction: Constructivism and social constructionism in the career field. *Journal of Vocational Behavior,* 64**,** 373-388.

Zaman M (2008). Socio-cultural security, emotions and exchange marriages in an agrarian community. *South Asia Research*, 28, 285-298.

Zinn, M. B. 1979. Field Research in Minority Communities: Ethical, Methodological and Political Observations by an Insider. *Social Problems,* 27**,** 209-219.

Zlotogora J, Hujerat, Y, Barges S, Shalev S. A. & Chakravarti A(2007). The Fate of 12 Recessive Mutations in A Single Village. *Annals of Human Genetics*, 71**,** 202-208.

Zlotogora, J. & Shalev, S. A. 2010. The consequences of consanguinity on the rates of malformations and major medical conditions at birth and in early childhood in inbred populations. *American Journal of Medical Genetics Part A,* 152A**,** 2023-2028.

Zakzouk S (2002). Consanguinity and hearing impairment in the developing countries: a custom to be discouraged. *J* LaryngolOtol. 2002; 116(10): 811-16.

APPENDIX 1

QUESTIONNAIRE

Dear participant, I am a master student from Department of Medical Biology and Genetics, Near East University (TRCN) with Registration Number: 20157728 undergoing a research to study the understanding and attitudes toward the consanguineous marriage (marriage within biologically related people) this kind of marriage increases the risk of having children with birth defects. Kindly fill this questionnaire appropriately.

Email; zurkiibrahim@yahoo.com please tick the provided box [ ]

A. Socio-demographic characteristics of study participant

1. Please indicate your age range – 20 – 29 [ ] 30 – 39 [ ] 40 – 49 [ ] ≥ 50 [ ]

2. Educational Level – Secondary School [ ] Undergraduate [ ] Postgraduate [ ] Non-Formal Education [ ]

3. Marital Status – Single [ ] Married [ ] Divorce [ ] Widowed [ ]

4. Nationality- Libya [ ] Egypt [ ] Nigeria [ ] Jordan [ ]

5. Gender - Male [ ] Female [ ]

6. Religion- Islam [ ] Christianity [ ] others [ ] please specify …….

B.Knowledge or Understanding of the Participants on Consanguineous Marriage

1. Do you know what consanguinity is before? Yes [ ] No [ ]

2. Does your tradition allow marriage between close relatives? Yes [ ] No [ ]

3. Do you know someone who marries his cousin brother/sister? Yes [ ] No [ ]

4. Have you ever heard that marrying a first cousin or second cousin has genetic consequences? Yes [ ] No [ ]

5. Have you notice any birth defects from any child of consanguineous couples? Yes [ ] No [ ]

6. Do you agree that consanguineous marriage can increase the risk of Intellectual disability? Yes [ ] No [ ]

7. How can you rate the level of consanguineous marriages in your country? Low [ ] Moderate [ ] High [ ]

8. Do you agree that consanguineous marriage can increase the rate of children with genetic disabilities in your community? Yes [ ] NO [ ]

Attitudes of the Participants toward Consanguineous Marriage

1. Consanguineous couples has the right to seek information about the risk of hereditary or congenital defects in their children, is it wise to do so? Agree [ ] Uncertain [ ] Disagree [ ]

2. Do think parents should be informed about the genetic effects of marriage within a family, so as not to force their children into it? Agree [ ] Uncertain [ ] Disagree [ ]

3. How do you see marriage within a family? Good [ ] Old fashion [ ] Not good [ ]

4. In your opinion why do you think people get married within their family in your country? Religion [ ]Poverty [ ] Sustaining the good relationship within the family [ ]

5. In your opinion do you agree that marriage within relatives can reduce the rate of divorce? Agree [ ] Uncertain [ ] Disagree [ ]