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The impact of genome information on mate selection: From the African perspective

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Mate selection in humans is an important social activity which is central to every individual's life. The debate on the ethics of generating and using genetic information has been of concern to several researchers from the time of the completion of the human genome project till now. Some of the important questions to consider include whether it is ethical to generate and use genetic information in mate selection. This piece of literature is focused on critically evaluating the possible impacts of the knowledge of the genomic information on the choice of a life partner from the African perspective.

Key words: Mate selection, ethical, legal and social issues, genome information.

INTRODUCTION

The completion of the human genome project has instigated the development of a genome-wide association study (GWAS) which enhanced the practice of genetic screening, diagnosis, and treatment (Wu et al., 2009). The GWAS approach has facilitated the unbiased association of the entire human genome to diseases. Through the human genome project, the techniques for sequencing has been improved hence decreased the cost of sequencing portions of an individual's genome and gave easy access to genetic information. The project has directly improved our understanding of diseases and their treatment as well as risk calculation for life threating conditions (Wu et al., 2009).

The easy access to generating genetic information has led to the commercialization of genomic medicine and counseling. The global development of commercial genomics in research, diagnosis, and treatment has the potential of increasing a wealth of opportunities which may translate into billions of dollars (Agarwal et al., 2013; Cho et al., 1999; Pirmohamed, 2014; So and Joly, 2013). In sub-Saharan Africa however, there is a need to conduct comprehensive research to identify novel pathogenic genes using the "multi-OMICS" approaches aimed towards personalized medicine and gene therapy (Adadey et al., 2017).

Apart from the above-anticipated benefits, there are other potential negative paybacks of the unconstrained access to human genome information.

The extent to which the genetic information generation and use affects prospective African marriages remains unknown. It is important therefore to discuss the possible implications of the generation and use of genetic information (Hallowell et al., 2003) and how it affects mate selection.

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METHODS

A literature search was conducted on PubMed and google scholar to identify publications on the generation and use of genetic information in Africa with regards to marriage/mate selection. The search term below was used for the literature search "gneration+and+use+of+genetic+information+in+Africa+AND+Mate +selection". Publications from other search engines such as google search were also used to augment the results from literature search. The titles of the publications obtained from the search were screen to determine their relevance to the subject of this paper. The abstracts of the selected articles were further evaluated to select the most appropriate publications for the study.

RESULTS AND DISCUSSION

Sociocultural implication of knowing your partner's genome information

Genome information is a powerful tool that can be used to explain and predict the behavioral response and genetic conditions of an individual (Rogers et al., 2008). Its power is also displayed by having the potential to peek at an individual's future, family history and discover secrets through the person's DNA information. Knowing the problems associated with genome information, it is difficult for couples preparing for marriage to disclose their genetic information to their partners. For instance, if your partner has the mutation associated with Huntington's disease, then you know that there is a possibility for his/her brain to deteriorate once he/she reaches 40 to 50 years of age (mid of his career), and may even lose control over his/her movements and die within another 10 to 20 years (Stoyanova, 2014).

In another case, if your wife has the mutated versions of *BRCA* genes (breast cancer genes), her chances of developing breast cancer in the future is about four to seven times higher than the average (Saha et al., 2015; Surbone, 2011). It is not an easy task for people to accept to live with a man who will lose his memory at age 50 and die at 60 or live with a woman who will develop breast cancer and may die at any time alongside the cost and pain of cancer therapy. Even though the predictions are not certainties, but mere probabilities, they are statistical statement pointing out predispositions that are not comfortable to live with.

A study using comparative phylogenetic analyses suggested that the first modern human who Africa practiced arranged marriages (Walker et al., 2011). Even though modernization has altered the marriage process in Africa (Takyi, 2001), some tribes still practice arranged marriages. In the African culture, marriage is between two families (Meekers, 1992) and knowing the genome of your life partner does not only influence your life as a small nuclear family but an extended family. Africans will protect their negative family history more especially when they are not well accepted by the society.

In the Ghanaian culture, for example, diseases such as epilepsy, congenital deafness/blindness, and madness are critical factors families look out for during marriage (Dugbartey and Barimah, 2013; Kinariwalla and Sen, 2016). Each family wants to protect its members from getting involved with families known for these conditions. It is believed that once a member unites with such a family, the disease is brought to their family and will spread from generation to generation. Most families are likely to terminate the marriage process if there is a possible genetic disease in the prospective family. Majority of these family diseases/conditions can be predicted from the DNA information of a member of the family. If there are mutations in any of the in *GJB2* and *GJB6* gene in an individual's DNA information, then, there is a likelihood of his family having some members living with a permanent hearing loss (Bosch et al., 2014). In addition, genes that point to these deleterious human conditions within families can be detected in the genome of any family member. Sensitive family secrets/truths may be considered as family threatening issues and be treated as such.

Genetic discrimination exists because genetic information is available from the medical records of patients. Patients are vulnerable and face the risk of being stigmatized in society and may lose their jobs if management knows about the full implication of their medical condition. A customer care or front desk personnel with mild epilepsy or genetic predisposition to situations that make him/her not to be competent will surely encounter a lot of confrontations from his or her boss (Rothenberg et al., 1997). The full knowledge of the genetic condition and that it must be managed for a lifetime can cost such a person his or her job. In the cooperate world, time on the job is equated to productivity. In a typical case, an individual who takes 5 to 8 days off his or her job monthly to seek medical attention due to sickle cell anemia crises is likely to lose the job after 6 months. A genetic condition such as Edward's syndrome, Down syndrome, cystic fibrosis, among others may get many people not hired in some industries (Rothenberg et al., 1997). Knowing that your genetic information can cause you your job and social respect, how much can you trust your spouse and share this information with him/her?

Ethical, Legal, and Social Issues (ELSI) on genomic information

Ethical, Legal and Social Issues (ELSI) on genomic information need to be clearly defined as a nation to guide all aspects of human rights. Over the past decade, the general public has shown a lot of concerns over the ELSI involved with the generation and use of genomic information (Lin et al., 2010; Wolf et al., 2015). Improvement in sequencing techniques has made profound impacts on genetic screening of individuals, with medical practitioners having the potential of making

several prediction from patients' genomic data. The technology of generating human genetic information has brought a number of issues such as ownership and fairness in the use of genetic information (Geller et al., 2014). With regards to ownership, should the family own the genetic information or the individual? Whether or not an individual's genetic information should be used as the basis for screening and treating other family members is another big question to answer.

The improper use of genetic information can lead to discrimination against people with potential traits of genetic defects. The agencies likely to misuse genetic information are insurers, employers, courts, schools, and the military (Healy, 1992). There will be possible discriminations based on genetic disorders when some of these agencies are allowed to use the information. The discrimination can be family based since most of the genetic disorders are family linked. Potential problems are likely to arise from privacy and confidentiality of genetic information. Many people will like to protect their genetic information from getting into the public domain because there are some associated psychological issues with knowing one's own genetic makeup and the risk of developing future genetic conditions. Most people will drastically change their thinking on life after knowing that they stand the chance of dying or having a terminal disease (Healy, 1992) which can lead to reduced productivity, the reproductive and mental stress of the individual.

Among prospective couples, the important ELSI question to answer is "who owns and have access to the genomic data generated?" There must be laws to control the access, ownership and extent of interpretation of genomic data of spouse. In the light of the drawbacks to the generation of human genomic data, most African marriages will be terminated if the ethical and legal issues of genomic data generation are not carefully handled.

Benefits of knowing your partner's genome information

Even though it will take a long time to fully obtain and understand the information encoded in the 3 billion nucleotides of the human genome, there is already an advanced application of the little information generated so far. Based on about 2% of the genome information that can be interpreted (Kelavkar, 2006), it is possible to determine the differences between individuals and calculate their risks for conditions such as cystic fibrosis, cancer, Alzheimer's disease and other terminal illness (Antoniou et al., 2001; Khoury et al., 2004). Many married couples, as well as people preparing to get married, will normally not make their genome information available to their spouse based on some of the above-mentioned reasons. It is worth mentioning that, making available one's genetic information has equally important benefits in spite of the numerous ethical and social issues.

Personalized medicine is one of the potential benefits an individual can get from knowing and making known his/her genetic makeup. In personalized medicine, medical decisions, practices, interventions and/or products are custom-made to an individual patient based on his/her predicted response or risk of disease. The information encoded in the genome of the individual is used to predict their response and risk of disease. This practice was found to increase life expectancy in patients living with the terminal genetic disease (Hidalgo et al., 2011; Nichols et al., 2015; Paquot, 2015; Stopeck et al., 2012). It is therefore evident that a couple who know their genetic information will seek personalized medical attention to increase their chances of not developing a genetic disorder or seek curative or treatment advice for an existing genetic disease.

Gene therapy is currently used in some clinics to treat terminal genetic diseases. In the practice of gene therapy, the gene mutations responsible for the diseases are determined from analyzing the patients' genetic data. Based on the genetic information, appropriate techniques are used to replace the defective gene (Katz et al., 2017; Williams et al., 2017). Some people think that it is not in place to do gene therapy because replacing faulty gene is assumed as altering nature. Others also base their argument on religious backgrounds that there is no need to "undo" what God has done. People living with the genetic condition mostly approve of gene therapy and will even want to receive the treatment if they have the means.

Conclusion

Knowing your genome information enables you to optimize your health. It is important to note that knowledge of your spouse's genome information will help you appreciate his/her current and possible future conditions. It clears doubts and helps the couple to prepare adequately to manage any present or yet to come genetic condition. The understanding and the full explanation of the cause of a genetic condition will also help the couple to know how to support each other to improve the health and quality of life of the affected partner.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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