Suitable Diet with Anti-oxidant Food have a Good Effect to Embryo Quality resulting from Assisted Reproductive Technology and The increase of Sperm Quality of Infertile Male Especially with Asthenozoospermia

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ABSTRACT

The purpose of this research was to assess the correlation between antioxidant and male infertility. The study also sought to investigate the role antioxidants play in ensuring that male people can produce the right amount of sperms, perfect sperm mobility and quality embryo. Literature views were done using PubMed, Cochrane electronic database, Medline, Oxford academic, NCBI, PopLine, EMBASE, and Trip Pro. Keywords used included antioxidants, sperm function, pregnancy rate, semen, and male infertility. The cases had a lower BMI of 19.9 against 26.1 and total energy intake of 1705.3 against 1935.8. Importantly, as it was expected because of the study design the sperm mobility in the cases was lower than in the controls. The highest tertile of the whole vegetables and fruits was associated with a low risk of asthenozoospermia. The subgroups of vegetables mainly increase of tomatoes, and dark green vegetables were associated with a low risk of asthenozoospermia. Fruits and vegetables were considered as the primary sources of fibre intake in the population for the study. In the high research intake of processed meat mainly those that have high saturated fat it was evident there was reduced sperm mobility. It is concluded in the study that the consumption of healthy foods such as vegetables, fruits and minerals is the best way men can use to improve their fertility. Too much protein in the body found by eating dairy products, sweets and processed meat only makes people develop lifestyle illnesses such as obesity which increases infertility in men.

INTRODUCTION

Infertility is a severe problem affecting very many families across the globe. Its effect is severely experienced by people who have psychosocial and medical issues. It is reported by WHO that between 60 million and 80 million people across the globe have the problem of infertility. It is therefore regarded as one of the social challenges damaging families. Infertility a social problem that inhibits someone from getting a child within twelve months when engaging in unprotected sex. It is reported that 15%...
of couples in the World face infertility challenges with or without their knowledge. The reported cases result from male factors which contribute 50% of the incidences of infertility. These cases happen after someone has had a severe disorder relating to testicular functions of reproductive truck. (Eslamian et al., 2012) 40% of reported cases of infertility, the male contributes to about 40% while their counterpart female provides 60%.

Asthenozoospermia is one of the factors that contribute to male infertility. It is a condition where which impair or paralyses the movement of sperms in the male reproductive organ. 19% of infertility cases are attributed by it. (Lombardo et al., 2011) It is a rare case to find that 24% of infertility is caused by asthenozoospermia although it may happen in isolated instances. If it happens, it is as a result of dysfunction of sperms such as blockage of seminal tube, genetical influence, total abstinence and infection. (Eslamian et al., 2012) Infertility is also caused by rapid change eating habits such as eating unhealthy foods and consumption of antioxidant foods in small quantities like greens. Low intake of these kinds of food is likely to cause dysfunction of sperms in male reproductive organs. It is, therefore, necessary to eat food rich in antioxidant which is capable of prolonging the breeding age of a person.

Antioxidant foods lead to high sperm production and also enhance their mobility. Such food is also essential in aneuploidy of sperms for people who do not smoke. For that matter, there is a closer relationship between antioxidant foods with male infertility. This is because the consumption of less food rich in antioxidant such as vegetables is likely to cause less sperm production and low sperm mobility. In consideration of its nutritional content, it is, therefore, necessary to conclude that antioxidant is an essential factor that affects the reproductive health of a male person although there are incomplete data that support the same issue. (Lombardo et al., 2011)

The paper, therefore, seeks to assess the relationship between fertility, asthenozoospermia and quality of semen concerning the result of various empirical studies.

The body of human beings has the mechanism to keep the structure and chemical reaction of antioxidant. All the chemical reactions of these substances must be maintained in a level that supports life which is usually called metabolism. For the result to take place large molecules must be broken into smaller units, and some form bigger particles. There must be the right quantity of electrons for a particle to become stable and the loss of electrons makes it free radical. Since free radicals are not permanent, therefore they are electrically charged thus can quickly react with other molecules or atoms in the human cells such as DNA and destroy them. Under different circumstances, they are likely to turn into free radicals. Under this condition, it is where the antioxidant is required when all the molecules have lost electrons and accidentally become free radicals. Antioxidant, therefore, is needed to provide particles to damaged molecules which have become free radicals and this effective support neutralization. This takes place as shown in the diagram below (Figure 1).

Through the above application, the antioxidant is capable of donating electrons to neutralize free radicals which can easily damage molecules such as DNA.

Antioxidant compounds are made up of various elements. It is converted through neutralisation of free radicals. To improve fertility, it is essential for the body to produce more antioxidant or consume food rich in it. There are some enzymes in the body responsible for regrating antioxidant. They include SOD, GPx, CAT and some of the beta enzymes available in the body. These enzymes are essential in protecting the body against ROS while SOD is responsible for reducing the level of oxygen, catalase and peroxidase which offers the same function of H2O2.

The free radical reactions with peroxidase and catalase are shown in Figure 2.

**MATERIALS AND METHODS**

**Research Strategy**

The article adopted PRISMA guidelines as its research strategy especially the literature review. The researcher wrote the literature review through the application of PubMed alongside with Cochrane electronic catalogue and Medline and other essential approaches.

The main aim in the databases was to identify the research journals, peer reviews articles, and material containing relevant information on the topic. The research in the databases was executed by the use of the following keywords which includes antioxidants, semen, sperm function, pregnancy rate, and male infertility.

**Study Selection**

Titles and abstracts screened the articles that were generated for the databases, and the relevant full papers were reviewed. Additionally, the review articles were also explored to find the related sections. Likewise, the exclusion process was mainly based on species (other animals), study method (case
Table 1: Characteristic of the study analysis is based on sperm movement

| Characteristic       | Asthenozoospermic | Normospermic | p-value |
|----------------------|-------------------|--------------|---------|
| Number               | 72                | 169          |         |
| BMI                  | 19.9(3.4)         | 26.1(3.9)    | <0.001  |
| Total energy intake  | 1710(210)         | 1920(216)    | 0.031   |
| Never smoker %       | 19 (26)           | 25 (15)      |         |
| Ex-smoker <10%       | 5 (7)             | 25 (15)      |         |
| Ex-smoker <10%       | 10 (14)           | 37 (22)      |         |

Table 2: Summary of sperm parameter and outcome of the study

| Author(s) and Year | Animal/Human | Sperm Quality Parameter | Outcome                           |
|--------------------|--------------|-------------------------|-----------------------------------|
| (Eslamian et al., 2012) | Human       | Sperm concentration, morphology, and motility | Lower risk of asthenozoospermia |
| (Giahi et al., 2016)    | Human (Patient) | Sperm concentration and morphology | Pregnancy rate                   |
| (Ross et al., 2010)    | Human       | Sperm DNA fragmentation, concentration, motility, morphology, volume | No improvement                   |
| (Kefer et al., 2009)   | Human       | Sperm DNA damage and varicocele | Detailed motility                 |
| (Lombardo et al., 2011)| Human      | Sperm Dysfunction and sperm DNA damage | Improved viability               |

Figure 1: Electron donation from antioxidant to neutralize free radicals

Figure 2: Free radical reaction

Outcome Measures

The outcomes that were of impressive the student were as follows antioxidant dosage and type, balanced diet with vegetables and fruits, their impact and mechanism of action, the impact of antioxidants of these men parameters, and the outcome on ART and live-birth rate. The results of the research were tabulated to come out with a meaningful result that could be understood.

RESULTS

The research was mainly divided in tow section 72 asthenozoospermia cases and 169 controls and association of food rich in antioxidant and its impact of asthenozoospermia (Table 1).

Study 1

The cases and controls in the study had a similar age distribution. However, the cases had a lower BMI of 19.9 against 26.1 and total energy intake of 1705.3 against 1935.8. Additionally, the number of smokers was more significant among the cases than in the
controls. Environment exposure and lifestyle had similar statistics. (Ménézo et al., 2007) Similarly, the hormone levels were similar in both cases and controls. Importantly, as it was expected because of the study design, the sperm mobility in the trials was lower than in the controls. (Keskes-Ammar et al., 2003) The command had higher seminal plasma levels compared to the cases. Other study report one of antioxidant source, the cigarettes smoking can effect the embryo development through its effect on sperm DNA fragmentation (Margiana, 2018).

**Study 2**

The study was mainly concerned with the intake of several functional groups that were rich in antioxidant to determine if it is influenced by fertility. Primarily, the highest tertile of the total vegetables and fruits was associated with a low risk of asthenozoospermia. Additionally, to further look at the protective role of vegetables and fruits, the relationship between plants and fruits subgroups and asthenozoospermia was analysed. In fruits subgroups independently, there was a significant inverse association between asthenozoospermia and the orange intake risk.

On the other hand, the subsets of vegetables mainly increase of tomatoes, and dark green vegetables were associated with a low risk of asthenozoospermia. (Lombardo et al., 2011) Primarily, there was a high protective, independent association in the highest tertile of poultry. Additionally, people who consumed processed meat had a higher risk of asthenozoospermia followed by the intakes of sweets. The summary of sperm parameter and outcome of the study is shown in Table 2.

**DISCUSSION**

How sperm oxidative stress can damage the DNA and resulting the potential consequences to fertility can happen in some mechanisms. Some sources of oxidative stress and DNA damage are causing pathological that lead to generation of endogenous ROS. Some pathological stressors are infection, abnormal sperm, bad nutrition, varicocele, cancer and advancing age. Some stressors can come from environment and causing exogenous ROS and toxicants such as genotoxins. The environmental stressors are pharmaceuticals, biocides, industrial chemical including household, cosmetics, smoking, alcohol and recreational drugs, food additives and storage containers, heat and radiation (Lombardo et al., 2011).

The stressors can damage some cell components such as lipid membrane, nuclear and mitochondrial DNA and some proteins. The stressors can increase the risk DNA damage and cause the low fertilization potential, increasing the risk of miscarriage, birth defect, childhood morbidity and de novo mutations (Ménézo et al., 2007; Keskes-Ammar et al., 2003).

The results in the above two studies indicate that high intakes of vegetables and fruits (mainly dark green vegetables, tomato, and oranges), and poultry was associated with reduced risk of asthenozoospermia (Eslamian et al., 2012). As opposed to what has been discussed above, high consumption of dairy products, sweets and another kind of food rich in proteins such as processed meat expose an individual to a higher risk of developing asthenozoospermia. Also, other studies that focus more on assessing the relationship between the likelihood of developing asthenozoospermia and eating behavior showed that there is a stronger correlation between dietary habit and the risk of contracting asthenozoospermia. This is because poor eating habits such as overeating of dairy products, processed meat, sweets in expense to vegetables, fruits and grains lead to the development of lifestyle diseases which lower men infertility.

On the contrary, eating healthy foods such as fruits, vegetables and grains without including too much of dairy products and sweets prevent one from developing asthenozoospermia. (Ross et al., 2010) For that matter, the rate of pregnancy can be improved by using oral antioxidant because it can stimulate a man to produce high quality sperms, increase the sperm count and also enhance their mobility. As a result, there is also an essential need to carry out other studies focusing on fertility disturbance.

**The Effect of Antioxidant Food to Embryo Quality**

The intake of oral antioxidants in infertility can improve pregnancy test and the quality of the sperm. Moreover, there are higher spermatozoa, and blood levels of the omega-3 fatty acids that are in comparison to the infertile patients are mainly in agreement with the level of usefulness of the antioxidants in infertility because of the omega-3 fatty acid that is vital antioxidants. (Showell et al., 2014) The elements are in the cell membrane and are necessary for the flexibility if the successful fertilization and spermatozoa. The result of the study showed that the rate of pregnancy increases for people consuming antioxidative drugs. (Huang et al., 2016) At the same time, the same survey reveals that the consumption of food rich in clomiphene also enhances the quality of the embryo. For that matter, there is a stronger correlation between men infertility and diet rich in antioxidants such as vitamins, minerals and vegetables because they support sperm produc-
tion by overcoming lifestyle diseases such as obesity and depression. The presence of enough antioxidant in the human body is essential in improving reproduction stimulatory effects in male thus support effective management of infertility and quality embryo development.

Primarily, fruits and vegetables are mainly rich in antioxidants such as vitamin C, folate, beta carotene, vitamin E, and vitamin B6 which are crucial in improving the semen quality. (Keskes-Ammar et al., 2003) Primarily, Folate prevents the damage of the DNA mainly by reducing the concentration of homocysteine by the induction of remethylation into methionine and consequently the trans-sulfuration into cysteine and cystathionine. It is the responsibility of men to lead a healthy life and the obligation to ensure they eat a balanced diet. This is because unhealthy eating habit is likely to make them develop the problem of obesity which lowers the hormonal level. The issue of obesity paralyses the mobility of sperms and also leads to low sperm count a common problem for people with obesity. To overcome the problem of obesity which has a significant effect on men fertility, it is necessary for men to eat more vegetables, fruits, minerals and vitamins. These kinds of foods are essential in enhancing the quality of sperm and also increase the production of sperms in men.

Fruits and vegetables were considered to be the primary source of fibre intake in the population that was considered for the study. (Lombardo et al., 2011) Therefore, this reduced the estrogen level of plasma mainly through binding the unconjugated estrogens directly while on the other hand reducing the deconjugating bacterial count resulting in decreased reabsorption if estrogen. (Zullo, 2015) Primarily, in the studies, it was evident that a high level of estrogen was visible in patients with asthenozoospermia. So, the association between asthenozoospermia and low intake of vegetables and fruit could be explained by this mechanism (Majzoub and Agarwal, 2018).

In the high research intake of processed meat mainly those that have high saturated fat it was evident there was reduced sperm mobility. (Gharagozloo and Aitken, 2011) These results were consistent with results from other similar studies done before which demonstrated a high intake of processed foods and dairy produced reduced sperm quality. (Giannubilo et al., 2018) Although it was not essential to determine the correlation between asthenozoospermia, and BMI interestingly is evident that BMI in normal-spermic men was high that asthenososperic men. (Zullo, 2015) Importantly, BMI was inversely associated with sperm mobility. There is a close functional relationship between exogenous antioxidant ensure that mothers should not over-rely on the total quantity of antioxidant found in eggs but check on their concentration to get the required amount of antioxidant. This is because the change in the level in the amount of antioxidant in the body of a person changes the functional association between various antioxidants which react with each other in the body. The variation is not the same in the shape of any person but varies by the sex of the embryo. This is possible because the material composition of the mother reduces the ability to transmit antioxidant into the eggs which are produced one after the other and because mothers usually apply adaptive approaches to allocate resources to eggs. For that matter, the concentration variation of a given antioxidant in the body also reduces the supply and distribution of other antioxidant and the covariation with the quality of the embryo.

**Strengths**

The strengths of the study were that the articles were readily available and they were based on case studies. Therefore, they had valid information. Additionally, the review was cheap as it was based on research studies-based results of other researchers they articles were not expensive to purchase.

**Limitations**

The limitations of the study included few prior research studies on the topic, some article used too large sample size, some reports did not indicate the imitations they encountered, and some of the measures used to collect the data were inadequate.

**CONCLUSIONS**

Several studies and researches have been conducted on the effect of antioxidant in improving male fertility. It is crucial noting that fruits and vegetables are essential in enhancing vigorous productivity. This is because they are rich in antioxidant. On the other hand, processed meat and dairy products were associated with low sperm quality. Therefore, to improve the fertility of men, it is necessary they consume high intakes of fruits and vegetables. Moreover, additional studies need to be conducted to determine the appropriate level of antioxidant that case is consumed to manage male fertility.

**Ethical clearance**

No ethical clearance needed because this paper is a review article.

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**Conflict of Interest**

There is no conflict of interest.

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