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The Effect of Glutathione versus Co-Enzyme Q10 on Male Infertility Original Study

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Abstract

Background: Worldwide, numerous people are affected with the infertility problem. Especially married people find it the most stressful problem that can also cause psychological issues. Glutathione is a naturally produced oxidant that is quite useful to preserve other antioxidants. The level of glutathione varies from person to person. It plays a significant role to enhance the sperm motility pattern. Some men who are suffering from infertility problem because of andrological pathologies, the glutathione can eliminate such issues because of therapeutic effect. Men, who have a lower amount of Q 10 in the seminal fluid, experience the slow motion of the sperms. According to various studies, the increase in the quantity of Q 10 automatically enhances the motility of the sperm.

Material and Method: The presented prospective randomized placebo-controlled study was conducted in Saladin province of Samarra city (Iraq) between Jan 2016 to Dec 2018. The study deployed 51 infertile male subjects for the administration of oral glutathione (250mg sachets) for tenure of 6-months. Another group of patients 50 received oral Co-enzyme q 10 (200 mg sachets) for 6 months, a third group received a placebo (sugar sachets) for another 6 months.

Results: The results revealed oral glutathione and co-enzyme q 10 as an effective treatment for improving the sperm parameters (motility, morphology, sperm concentration) which were statistically significant except for semen volume where P value was > 0.05. Also, this study showed no statistical significance between the use of glutathione and co-enzyme q 10 as a single agent therapy (P>0.05).

Outcomes: From this study, we can conclude that both glutathione and co-enzyme q 10 are effective treatment options for improving sperm motility, morphology and concentration

Key words: *male infertility, glutathione, co-enzyme, Q10, sperm motility*

Introduction

With the passage of time, the infertility rate is being increased in males. There are various reasons for infertility problem. According to the current estimation, 15% of couples are facing infertility problem around the world. Most of the time, there is not a single reason has been identified as infertility. About 20-30% of the infertility cases are identified in males. The major cause of infertility in males is associated with sperm disorder. Some other causes include genetic defects, undescended testicles, and various health issues, i.e. HIV, gonorrhea, mumps, and chlamydia. Infertility in males can be diagnosed with different signs and symptoms (1). Different men exhibit different signs and symptoms. For instance, some show variation in the sexual desires that are directly related to the health of fertility. Some experience pain and swelling in the testicles. An erection

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problem is also common in males who are suffering from infertility (2). Presently, male infertility can be treated with the help of medication by diagnosing the core reason for infertility such as erectile dysfunction or hormonal imbalance (3).

Glutathione is present in the cells of mammals and it is a tripeptide thiol, which is a non-protein sulfhydryl compound. It consists of three amino acids named glutamine, cysteine, and glycine. During the oxidative stress, the glutathione uses the power by the cells to act as a defensive appliance against oxidative destruction. There are two types of Glutathione, i.e. GSH and GSSG. Glutathione is present not only in somatic cells but also in germ cells. The defensive mechanism is consist of enzymatic and non-enzymatic functions, characterized by the Glutathione. In males, the deficiency of Glutathione results in the dysfunction of the central part of the sperm that ultimately results in the defective sperm movement. Glutathione protects the spermatozoa plasma membrane by forming a protective layer [(4)]. As per previous researches, it is proven that Glutathione has the ability to maintain the biological importance of the germ cells [(5)]. Men, who are suffering from genital tract inflammation, unilateral varicocele, and sperm dysfunction can be cured with the help of Glutathione.

The coenzyme Q 10 is a nutrient produced in the body in a natural way. It is also present in different food items. The main function of the Coenzyme Q 10 is that it performs like an antioxidant. It defends the cells of the body from any destruction and plays a key role in metabolism [(6)].

In the initial studies, many researchers have found that coenzyme Q 10 supplementation is quite beneficial to treat the infertility problem in males. Some males are suffering from low sperm count. It not only helps to increase the sperm count but also enhances the mobility so the sperms become efficient enough to enter the egg. About 200-300 mg Coenzyme Q10 intake is beneficial to eliminate infertility problem [(7)]. With the help of Coenzyme Q 10, the sperm quality becomes better.

Aim/Objective

The aim of the present randomized placebo-controlled study is to identify the efficiency of Glutathione and Coenzyme Q10 in increasing the sperm motility rate. The quantitative research enhances the possibility of the Glutathione and Coenzyme Q10 efficacy related to motility, morphology, and concentration of the sperms.

Background Literature

According to various studies, male fertility is improved by the effect of ubiquinone. The motility, morphology, and concentration of the sperms get better with the help of Coenzyme Q10 action in an oxidized form. The reduced form of Coenzyme Q10 characterizes around 90% of the Coenzyme Q10. As per different experimental results, it has been noted that the low dose of Coenzyme Q10 that is 90mg per day for a duration of 12 weeks is quite effective to enhance the quality of sperms [(8)].

Another research revealed that the high dose of Coenzyme Q10 that is 300 mg per day for about 12 weeks is effective enough to treat the infertility issues in males because it has a powerful effect of antioxidant. According to the research conducted by Gyozdjaova, it has been revealed that the combination of carnitine and ubiquinol is very effectual to treat the male infertility problem by increasing the function of mitochondria in the sperms [(8)].

A randomized placebo-controlled study was conducted to observe the effect of Coenzyme Q10 on sperm concentration. It has been observed that the Coenzyme Q10 has a protective effect and it acts as a shield against oxidative stress to enhance the morphology as well as the concentration of the sperms. It took duration of 3 months to get significant outcomes. Another research was conducted by Nadjarzadeh, it is based on a double-blind placebo-controlled experiment. It has been observed that Coenzyme Q10 has no significant effect on sperm quality or concentration [(9)].

In human beings, the low quantity of the glutathione in the seminal fluid leads to the abnormality of the sperms because of the low level of glutathione ultimately unstable the middle portion of the sperm that effects the motility rate of sperms [(10)]. The high dosage of Glutathione 600mg per day is proved to be effectual enough to treat the infertility disorder in males (9).

In the study conducted by Yarosh and colleagues, the role of glutathione S-transferase has been observed in idiopathic male infertility. There were three gene polymorphisms have been selected that include GSTM1, GSTT1, and GSTP1 to analyze their effect on the Russian men who are suffering from idiopathic infertility. 203 samples of DNA were collected from 203 infertile males and 227 DNA samples were collected from 227 fertile males. The PCR-Restriction Fragment Length

Polymorphism technique was applied in the research. It has been noted that GSTMI, GSTT1, and GSTP1 genes are responsible to develop idiopathic infertility in men [(11)]. It has been noted that smoking is the major cause of its phenotypic effect that can be associated with the risk of infertility disorder.

Material and Method

Participants

The present randomized placebo-controlled clinical trial was conducted in Saladin province of Samarra city (Iraq) between Jan 2016 to Dec 2018. The study deployed 51 infertile male subjects for the administration of oral glutathione (250mg sachets) for 6-months. Another group of patients 50 received oral Co-enzyme q 10 (200 mg sachets) for 6 months, a third group was taken a placebo (sugar sachets) for another 6 months. All patients included in this study were of a normal female factor with idiopathic oligoasthenoteratozoospermia, patients with a chronic disease like mumps, hydrocele, neoplasm, trauma from prolonged riding, hypospadias, vas deference obstruction, varicocele, and genital tract infection were excluded from this study, also those who received treatment recently. Patients were from 30-40 years old. Before the start of the study, semen samples were taken for all three groups for baseline assessment. Another assessment was done at the end of the 6 months period. All samples were given to a lap. Within 20 minutes, the interpretation was done in accordance with the WHO 2010 criteria [(12)], semen morphology was done according to Kruger criteria [(13)]. Data analysis was undertaken through SPSS 23.0 in the windows interface. Mann Whitney U-test, Kruskal–Wallis test, and chi-square test were used when needed for assessing the data significance for P value <0.05.

Informed Consent

Informed consent was obtained from all study subjects while categorically explaining them the interventions, objectives, and concerns. After taking the informed consent of the research participants, the data were collected.

Semen samples were taken for all three groups for baseline assessment. Another assessment is done after the end of six months duration. Semen morphology was performed as per Kruger criteria. Moreover, the precipitation and centrifugation were carried out to assess the seminal plasma of Glutathione and Coenzyme Q10 with the help of Ellman technique.

Several interactive interviews were conducted to get the informed consent of the participants of the current research. Some of the essential data were collected from the participants while taking the interview that includes age, marriage time, job type, and social habits.

Results

Table (1) showing the characteristic of patients before start of therapy:

Domains	Co-enzyme q 10 group(n=50)	Glutathione group (n=51)	Placebo group (n=50)	P value
Age (years)	32.2±10.2	31.4±11.6	30.1±7.6	>0.05
% of normal Motility (grade a+b)	28	26	28	>0.05
Sperm Concentration (million per ml)	50.4±12.3	50.2±10.1	51.5±8.2	>0.05
% of normal Morphology (kruger criteria)	10	12	10	>0.05
Semen Volume (ml)	2.24±1.23	2.25±0.85	2.21±0.92	>0.05

This table shows that there is no significant statistical difference among study parameters before the start of the study.

Table (2) showing percent of improvement of semen parameters at the end of the study after 6 months of different treatment interventions.

Domains	Co-enzyme Q10 group (n=50)	Glutathione group (n=51)	Placebo group (n=50)	P value
% of motility improvement	36	38	4	P=0.01
% of morphology improvement	28	24	6	P=0.03
% of concentration improvement	24	26	2	P=0.01
% of volume improvement	6	4	4	P>0.05

This study outcome revealed oral glutathione and co-enzyme q 10 as an effective treatment for improving the sperm parameters (motility, morphology, sperm concentration) which were statistically significant except for semen volume where P value> 0.05. Also, the study showed no significant statistical difference between the use of glutathione and coenzyme q10 as a single agent therapy (P >0.05)

Discussion

The infertility problem in men is because of defective mobility, concentration, and morphology of sperms. Such types of factors are very susceptible to the free radicals that are oxygen molecules and consisted of one or more additional electrons. As per statistics, around 25% of the males are affected with the infertility issues worldwide. There are various reasons that affect the spermatogenesis process such as nutrition, environment, genetics, and physiological issues [(1)].

A study conducted to treat the Iraqi infertile men. In the study, around 60 males were selected. The semen was obtained from the participants and it was divided into three categories. The first category is in vitro sperm characterization, the second category utilized density gradient centrifugation technique and in the last category, the combination of density gradient centrifugation and TAD 600mg Glutathione is used [(14)]. It has been concluded that TAD 600mg Glutathione had a very positive effect to enhance the quality and function of sperms.

Another study was conducted by Trang and his colleagues; the idiopathic male infertility was analyzed in the Vietnam males. 300 blood samples were collected in which 150 were control samples and 150 were infertile samples. The aim of e research is to identify two common SNPs that are associated with infertility. It has been revealed that NAT2 and GSTP1 are susceptible to cause infertility in males [(15)]. Such genetic markers will be useful to investigate the cause of infertility in future researches. Research accompanied by the Kolesnikova and his colleagues. They have observed the Glutathione effectiveness on the men who are suffering from infertility issue. It has been found that a balanced amount of Glutathione is essential for proper functioning [(16)]. Without a balanced quantity of Glutathione, the detoxification of toxic substances will not be possible. To cure infertility in men, it is better to balance the glutathione level in the body. The study conducted by Sinha in 2018 to analyze the role of antioxidants in male infertility, it has been revealed that glutathione has a promising effect as a defensive mechanism [(17)]. It has the ability to cure the reproductive damage that is caused by ROS.

According to the research carried out by Ring and his colleagues, the contribution of the male infertility issue is about 50-60% in whole infertility. In most of the cases, the abnormal semen results in the infertility problem in males. The efficiency of the Coenzyme Q10 has been proved to play a major role to treat the males' infertility [(18)]. The supplementation of Coenzyme Q10 is very effective to treat sperm concentration and quality.

A small study conducted in which azoospermic males were selected for the experiment. 183 patients were selected for the study. It has been observed that coenzyme Q10 has a quite positive effect on the experimental group who were treated with coenzyme Q10 [19]. The motility and morphology of the sperms were enhanced significantly after getting the treatment. The current study indicates the significant improvement in the quality, quantity, morphology, and concentration of sperms with the treatment of glutathione and coenzyme q10.

Conclusion

From this study, we can conclude that both glutathione and co-enzyme q 10 are effective treatment options for improving sperm motility, morphology and concentration. There is no statistical difference between them as a single agent therapy; the researchers need to investigate the scope of co-administering other antioxidants like carnitine, selenium, and vitamin B complex with oral glutathione or co-enzyme q 10 to minimize the prevalence of male infertility in the selected population.

Conflict of Interest - (nil – There are "No Conflict Of Interest")**.**

Source of Funding - By all

Ethical Clearance: Committee members are approved to perform a study about**:**

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After discussion of study plan with researchers:

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