

## **Status of Selenium in seminal plasma of Male infertility and their correlation with Various Sperm Parameters.**

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### **Abstract:**

#### **Background;**

Human semen contains low concentration of selenium (Se). The presence of abnormal level of this trace element may affect spermatogenesis with regard to production, maturation, motility and fertilizing capacity of the spermatozoa. The aim of this study is to evaluate the level of Se in seminal plasma in different groups of male infertility and to correlate their concentration with various semen parameters.

#### **Subjects and Methods:**

Forty primary infertile male individuals, who had regular unprotected intercourse for at least one year without conception with their partners, aged 25-40 years were involved in the present study. After seminal plasma fluid analysis they were grouped as, azoospermic, oligoasthenozoospermic, and teratozoospermic.

Twenty males selected from general population and after seminal fluid investigation they were taken as normospermic control group. Selenium concentration in separated seminal plasma of each infertile male and fertile control subject were determined by HPLC.

#### **Results:**

This study showed significant decrease of seminal plasma Se mean ( $\pm$ SEM) value in azoospermic and in oligoasthenozoospermic infertile males than in infertile male controls ( $p < 0.05$ ), and highly significant decrease in teratozoospermic patients ( $p < 0.005$ ) when compared with that of fertile males.

The results also showed that there was no significant correlation between Selenium concentration and sperm count, morphology and motility.

#### **Conclusion:**

On the basis of the findings of this study, it seems that the estimation of seminal plasma levels of selenium may aid in investigation and treatment of infertile males.

#### **Key Words:**

Infertility, Azoospermic, Oligoasthenozoospermic, Teratozoospermic, Seminal Selenium.

#### **الخلاصة:**

يحتوي السائل المنوي للإنسان على كمية قليلة من عنصر السيلينيوم. ووجود هذا المعدن بمعدلات غير طبيعيه قد تؤثر على تكوين النطف مع الأخذ بنظر الاعتبار تكوين ونسج والحركة والقابليه على الإخصاب للنطف.

#### **هدف البحث:**

يهدف هذا البحث لقياس تركيز معدن السيلينيوم في السائل المنوي لمجاميع مختلفه من مرضى عقم الرجال وربطها مع مختلف معايير العقم النطف

#### **خطة البحث:**

تمت الدراسة على اربعين مريضاً يعانون من العقم الأولي عمرهم يتراوح بين ٢٥-٤٠ سنة. وبعد فحص السائل المنوي للمرضى تم تقسيمهم الى ثلاثة مجاميع الأولى: اللانطفية والمجموعه الثانيه انخفاض عدد ووهن حركة النطف والمجموعه الثالثه الشكليات غير الطبيعيه. وقد تم جمع السائل المنوي من عشرين رجلاً اصحاء ولا يعانون من العقم للمقارنه وقد تم فحص السيلينيوم بجهاز الكروماتوجرافي

#### **النتائج:**

لوحظ في هذه الدراسة نقص معنوي في كمية السيلينيوم في السائل المنوي لمرضى اللانطفية والمرضى الذين يعانون من انخفاض في العدد ووهن الحركة للنطف عند المقارنه مع تركيز السيلينيوم في السائل المنوي للاصحاء، ونقص عالي المعنويه عند المرضى الذين يعانون من الشكليات غير الطبيعيه.

#### **الاستنتاج:**

ان قياس تركيز عنصر السيلينيوم في السائل المنوي قد تقود الى التحري عن اسباب عقم الرجال وعلاجه.

**Table.1 Se Concentration in Seminal Plasma in Three Groups of Infertile Males and Fertile Control Group . The values are Expressed as Mean ( $\pm$ SEM).**

Parameter	Control N= 12	Azoospermic N = 12	Oligoasthenoz Ospermic N=16	Teratozospemic N=12
Seminal Plasma Se Concentration (ng/ml)	98.12 $\pm$ 5.57	* 77.19 $\pm$ 5.57	* 80.01 $\pm$ 5.05	** 82.19 $\pm$ 5.41

\* P < 0.005 when azoospermic and oligoasthenozospermic groups are compared with control group.

\*\* P < 0.05 when teratozospemic group is compared with control group.

**Table .2. Correlation Coefficient (r) of Seminal Plasma Se Concentration with Semen Parameters.**

Parameters	Azoospermic (n=12) Se (r: p-value)	Oligoasthenozospermic (n=16) Se (r :p-value)	Teratoazospermic (n=12) Se ( r: p-value)
Sperm Count (10 / ml)	(0:0)	( 0.47:0.11)NS (0.008:0.98) NS	(-0.41:0.24)NS
Sperm Morphology (%)	(0:0)	(-0.12:0.72)NS	(0.34:0.34)NS
Motility (%)	(0:0)		(0.10:0.78)NS

**NS: Not Significant**

**Introduction:**

Infertility is complex and has many causes and consequences depending on the gender, sexual history ,life style of society and cultural background of people it affect(1). Infertility affects approximately( 8%to12%) of the world’s population and in about half of cases male are either the single cause of or contribute the couples infertility(2).More than (90% )of male infertility cases are due to low sperm count, poor sperm quality, or booth of them. In (30-40% )of cases of sperm abnormalities , the cause is unknown. It may be the end result of one or more factors that include chronic illness, malnutrition, genetic defects, structural abnormalities, and environmental factors (3). Selenium is one of essential trace elements that present in the body in very low amounts. Essential trace elements are part of the micronutrients of the body, which have been shown to be essential for normal growth, development, and maintenance, and specific biological role has been identified. Selenium in animal and human is present predominantly as selenocysteine (4). There is growing evidence to indicate that reactive oxygen species are involved in the peroxidative damage of human spermatozoa seen in many cases of male infertility(5).These free radicals may arise from defective spermatozoa and from leukocytes(6). To counteract the effect of reactive oxygen species ,semen is believed to posses a number of antioxidant systems(7).Glutathione peroxedase has been assumed to play a role in protecting cells from the harmful effects of toxic metabolites and free radicals by preventing lipid peroxidation of membranes(8).

Four selenium atoms are covalently bound to cysteine residues in the enzyme glutathione peroxidase, which has strong antioxidant properties and acts synergistically with vitamin E(9). Both low and high concentrations of seminal plasma selenium may be harmful to male fertility (10). A reduction in selenium concentration could render spermatozoa more vulnerable to oxygen radicals(11). The present study was designed to evaluate seminal plasma level of selenium and correlate its concentration with various semen parameters among fertile and infertile male subjects.

### **Subjects and Method:**

This study was carried out at the Institute of Embryo Research and Infertility Treatment, Univ. of AL-Nahrain, Baghdad, during the period from Feb. 2006 to August 2006. Forty primary infertile male subjects, who had regular unprotected intercourse for at least one year without conception with their partners, aged (25-40) years were included in this study. Patients had traumatic abnormalities which could be implicated in the development of infertility. At first clinic attendance, a detailed background history and physical examination were done on both husband and wife. Semen specimens from all infertile patients were collected into sterile polystyrene jars after an abstinence period of 3 to 5 days. A portion of each semen sample was examined for sperm count, motility and morphologic features. Infertile male patients were then divided into the following three groups [according to their sperm count /motility and/or morphology, WHO criteria, 1992(12)].

Group I: Azoospermic (sperm count=zero, n=12),

Group II: Oligoasthenozoospermic (sperm count  $<20 \times 10^6/ml$ , motility  $<50\%$ , n=16), and

Group III: Teratozoospermic (sperm count  $>20 \times 10^6/ml$ , motility  $>50\%$  morphology  $<50\%$ , n=12).

Twelve fertile males whose partners had conceived within one year and having sperm count more than 20 million /ml with motility and morphology more than  $>50\%$  were selected from general population and taken as normospermic control group. After liquefaction, the seminal plasma was collected after centrifugation at 3000rpm for 15-20 minutes. Supernatant, the seminal plasma, was transferred in fresh tubes and stored at  $-20^\circ C$  until assay. The concentration of selenium in separated seminal plasma of each infertile patient and fertile control were determined by HPLC (high performance liquid chromatography).

### **Results:**

The results are expressed as mean ( $\pm$ SEM) from each parameter.

Table 1 summarizes the mean ( $\pm$ SEM) value on seminal plasma level of Se element in the three groups of infertile male subjects (azoospermia, oligoasthenozoospermia and teratozoospermia) and in fertile control group. The mean ( $\pm$ SEM) value of seminal plasma Se concentration was significantly decreased in teratozoospermia infertile males than in fertile males ( $82.18 \pm 5.41 ng/ml$ ,  $98.12 \pm 5.57 ng/ml$ , respectively,  $p < 0.05$  Table 1), while there was a highly significant decrease in Se concentration in azoospermic and oligoasthenozoospermic infertile males when compared with fertile males ( $77.19 \pm 5.57 ng/ml$ ,  $80.01 \pm 5.05 ng/ml$ ,  $98.12 \pm 5.57 ng/ml$  respectively,  $p < 0.005$  Table 1).

Correlation coefficient of seminal plasma concentration of Se with various seminal parameters in azoospermic, oligoasthenozoospermic and teratozoospermic males are shown in table 2.

There was no significant correlation between seminal plasma Se concentration and sperm parameters in all patients as shown in Table 2.

### **Discussion:**

The results of the present study were shown that there was significant low concentration of Se in all infertile patients when compared with that of fertile controls. These findings are in accordance with results reported by: Zhoghua et al. 2001 (13), Xu. DX et al 2003(14), Shinohara et al, 2005(15), Behne D et al 1988(16), they observed significant decrease in seminal plasma Se concentration in infertile

patients. They found that the proportion of whole semen selenium increased with increasing sperm count, indicating that Se derive mainly from the prostate gland. In contrast Saaranen M et al 1987(17), and Akinloye et al 2005(18) observed significant increase of Se concentration in azoospermic when compared with oligospermic subjects and controls. In animals, selenium has been shown to be an essential element for normal male reproductive function. The best characterized effect of selenium deficiency on mammalian spermatozoa is a loss of motility, breakage at the midpiece level and an increased incidence of sperm shape abnormalities, mostly of the sperm head (11).

The biological functions of selenium in mammals appear to be expressed through different biologically active compounds, including glutathione peroxidase (19) and other selenoproteins in serum and tissues (20). One role of glutathione peroxidase, which is present in both animal and human semen, is to remove hydrogen peroxide and lipid peroxides and thus protect tissues including spermatozoa, from peroxidative damage (8).

Among the reproductive organs, the testis had the highest selenium concentration, this high concentration may imply a protective role of this trace element and its associated enzymes during spermatogenesis.(11).Dimitrov SG et al 2007(21) found a better semen integrity and an improved fertilizing ability of spermatozoa in Turkey after feeding with diet containing 0.1ppm Se in the form of sodium selenat. Our study also demonstrated that there was no significant correlation between Se and sperm number, motility and sperm morphology. Our results are in agreement with those of other studies; Behn D et al 1988(16) Xu D et al 2001(13), Saaranen M et al 1989(22), but it was not agreed with the studies of ; Oldereid NB et al 1998(11), Xu DX et al 2003(14) ,Shinohara A et al 2005(15) ,Akinloye et al 2005(18), Xu B et al 1993(23).They found significant positive correlations between semen level and sperm concentration ,motility and morphology .This difference in result may be emphasized that the allocation of the subjects was based on limited information about their occupations and the groups were limited in numbers of subjects.

In conclusion, the current interest in the potential role of oxidative damage in sperm function has highlighted the importance of natural substances involved in protecting tissues and cells from free radical damage. In this regard, selenium may play a role in conferring protection in the reproductive organs.

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