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Effect of Bacterial Genitourinary Tract Infection on Seminal Copper in Men

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ABSTRACT

Usually, the level of copper in seminal plasma of men is very low in the normal subjects, but in certain conditions such as bacterial infection, level of this element may be affected. The purpose of this study is assess the effects of bacterial infection on seminal copper level in genitourinary tract infection. Atomic absorption spectrometer were used to estimate level of seminal copper among 100 patients with bacterial infection, whose diagnosed after cultured their semen on ordinary and selective cultural media in addition to 20 comparable semen samples .The results revealed that the copper level among patients infected with both Gram's positive and Gram's negative bacteria suffered a significant increased ($p<0.05$) compared with health persons. So, we can conclude that the increasing in copper level is mainly followed the bacterial infection in genitourinary tract, and recommended to study the influences of this increasing on men fertility.

Key words: Bacterial infection, Copper, men fertility, seminal plasma

INTRODUCTION

Copper(Cu) is one of an essential trace elements, its vital to the health of all living things (humans, plants, animals, and microorganisms). In humans, copper is essential to the proper functioning of organs and metabolic processes. The human body has complex homeostatic mechanisms which attempt to ensure a constant supply of available copper, while eliminating excess copper whenever this occurs[1].

However, like all essential elements and nutrients, too much or too little nutritional ingestion of copper can result in a corresponding condition of copper excess or deficiency in the body, each of which has its own unique set of adverse health effects. The tissues of the body contain it in traces but the highest amount is found in the brain and liver. About 95% of the copper present in blood plasma is found firmly bound in a protein complex, ceruloplasmin, and the remaining 5% loosely bound to another protein, albumin [2]

Molybdenum and zinc are opposed to copper so that an increased intake of these elements results in the increased intake of copper[3].

Although copper compounds are used as bacteriostatic and fungicides [4], Elevated copper levels are frequently associated with urinary tract infection due to their effects on neutrophils[5].

Copper may predispose to infections by displacing zinc[3].

Also devices such as copper intrauterine device IUD increase the risk of genitourinary tract infections[6]. Therefore, copper may has adversely effects on fertility status in both female and male [7][8][9].

Moreover, high concentration of copper in seminal plasma is correlated with reduced sperm motility, as well as excess levels of monovalent and divalent copper ions in solution should result in lipid peroxidation in sperm plasma membrane, an effect that may render sperm immotile[10].

MATERIALS AND METHODS

2.1. patient

Seminal fluid samples were collected from 100 patients who attended and examined by urologist in the Fertility Center at Al saddr Teaching Hospital (Al sadr Medical City) in Al-Najaf city, throughout a period from January 2015 to march 2015.

The ages of patients were ranged from 18-55 years old. In addition to patients, all semen samples were collected from healthy fertile men are considered as a control group; also, their ages range is resembled to ages of patients.

2.2. Sample collection

Semen samples were collected from patients and control group who have same abstinence period (3-5) days by masturbation in quit room under a aseptically conditions, they were asked to pass urine first and then wash and rinse their hands and penis before specimen were collected[11].

The patients and control individuals were informed how to obtain the sample by sterile way into sterile container in order to avoid external contaminants. The specimen were collected into clean wide mouth, aseptic plastic cups, and then incubated at 37c° for 30 minutes.

2.3. Sample culture

All samples were cultured on blood agar and Manckonky agar to detect present of any bacterial infections.

2.4. Copper estimated assay

The aliquoted seminal plasma samples were thawed at room temperature. Seminal plasma was diluted 1:10 in deionized water. Standards were also prepared in deionized water. They were run in the range of 0.1 ppm to 0.5 ppm and 0.05 ppm for copper element, then assayed with an atomic absorption spectrophotometry (AAS).

All the trace element stock standards (of concentration 1000 ppm) were obtained from FlukaChemika [11].

2.5. Static analysis

Statistical analysis using SPSS 18.0 for Windows was conducted. Inc. Data expressed as mean \pm SE., Comparison between groups infected and control samples were performed with independent t-test and Mann-Whitney test as well as paired samples test. In all tests, $P < 0.05$ was considered statistically significant.

RESULTS

Table 1: Distribution of studied groups based on seminal culture results in addition to control group.

G r o u p s	N u m b e r s	D e s c r i p t i o n
G r o u p 1	17	Gram's Negative infected patients
G r o u p 2	35	Gram's Positive infected patients
G r o u p 3	28	Patients with No bacterial growth
C o n t r o l	10	H e a l t h p e r s o n s

3.1 Subjects

According to the outcomes of seminal culture the patients were categorized in to three groups. Twenty healthy person were also involved to comparison as shown in table1. This table also showed that out of 100 cultured samples , there are only 52 revealed bacterial growth included 17 samples (group 1) with Gram's negative bacterial growth and 35 (group 2) with Gram's positive bacterial growth, while the third group revealed no bacterial growth

3.2 Seminal Copper level.
The measurement of seminal copper level among patients and control group revealed that the level of copper in group 1(Mean=3.54 ppm) while group 2 (mean=2.6 ppm). Also patients have not bacterial growth(group 3) revealed (mean=1.08 ppm) Figure 1.

Therefore, when applied paired differences samples test. Our results revealed that there are a statically differences($P < 0.05$) between both group 1&2 compared with control group, while there is no significance($P > 0.05$)

between group 3 and control. A significant increased ($P < 0.05$) of copper concentration in group 1 when compared with group 2 table 2.

When investigation about is there any correlation between existence of bacterial infection and level of seminal copper, table 3 illustrated that there is a significant positive correlation ($P < 0.05$) between group 2 and control, while other group have no significant correlation compared with control group.

Table 2: Paired Samples Test between studied groups against control group

Paired groups	Paired Differences \pm SE	Significance
Group 1 & control	2 . 7 6 \pm 0 . 3 0	P < 0 . 0 5
Group 2 & control	1 . 7 5 \pm 0 . 3 6	P < 0 . 0 5
Group 3 & control	2 . 3 \pm 0 . 1 8	P > 0 . 0 5
Group 1 & group 2	0 . 9 \pm 0 . 3 5	P < 0 . 0 5

Significance when $P < 0.05$, SD: standard error

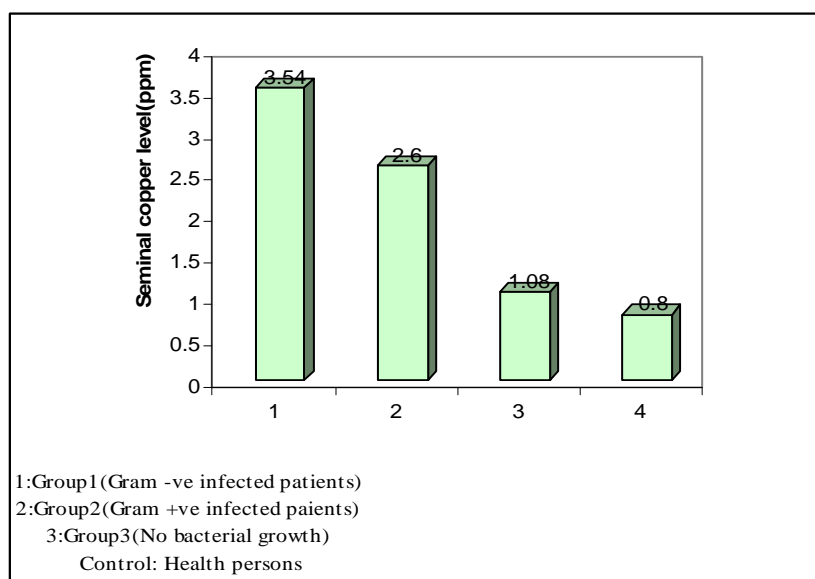


Figure 1: Concentration of Seminal Copper (PPM) among studied groups and control

Table 3 Correlation between studied groups against control

Paired groups	correlation	P value
Group 1 & control	0 . 0 6 8	0 . 7 9 7
Group 2 & control	0 . 5 9 4	0 . 0 0 6
Group 3 & control	0 . 0 7 4	0 . 7 5 3

Significant when $P < 0.05$

Moreover, consultation by urologist to evaluate fertility status for patients were involved in current study, they characterized group 1, 2, and 3 as a subfertile cases based on their semen analysis outcomes.

DISCUSSION

There are many trace elements have a vital roles in the fertility status in men via their elevation or dropping in seminal fluid, the investigations about the relationship between certain trace elements such as copper and bacterial genitourinary tract infection still controversial [1].

Albeit copper is existed primarily in brain, liver and bones (95% of this element was bound firmly with certain protein called ceruloplasmin and the other 5% bound loosely with another proteins like albumin), the level of this element could influenced by different causative agents such as infections mainly bacterial infection [2], also most copper excreted throughout the bile in fecal matter [12]

Therefore, our study focused on the relationships between level of seminal copper and bacterial genitourinary tract infection in side and the main parameters of sperm quality in other side rather than study of these parameters lonely as other previous investigators [13]. The current study revealed that out of 100 semen samples, there are 52 samples have positive bacterial growth Table.1.

However, the concentration of copper in seminal plasma of patients suffered from bacterial genitourinary tract infection (both G+ve and G-ve) were significantly increased ($P < 0.05$) compared with control Figure.1 Table.2, this agreement with [5], this elevation usually combining with lowering of seminal zinc concentration which is posses a very important roles in sperm efficiency [3].

Moreover, current study results that there is a significant difference of copper level between G+ve and G-ve bacterial infection, as well as there are significant positive correlation between G+ve rather than G-ve and level of seminal copper Table.3, this could be due to the number of group 1 less than group 2 in which statically affected .

Unlike many investigations that regarded to level of copper in blood stream [8], our study focused on seminal copper level in which proof rise of this element during bacterial infection.

In addition, the current study agreement with Slivkova *et al.*, (2009) were stated that increased seminal copper involved in deterioration of sperm quality [7], this may be due to the excess of copper could lead to enhance certain enzymes involved in elevation of reactive oxygen species (ROS) synthesis [14] which posse adverse effects on sperm motility.

However our study outcomes that there is a high percentage patients may encountered to bacterial genitourinary tract infection eventually the copper level significantly increase in that cases leading to increase probability of reducing sperm quality due to direct effect of excessive copper or indirectly by their influence on lowering zinc.

As well as it is contributed to decrease immune system efficiency allowing bacteria to increase their pathogenicity such as toxins production [15].

Regarding to group 3 which have not bacterial growth but still have abnormal sperm parameters, this may be because other reasons such as hormonal disorders or viral infection that usually reduced sperm quality.

CONCLUSION

The level of copper in seminal fluid of healthy person is very low, but in bacterial infection increased, leading to deteriorate in sperm quality.

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