

Reproductive Effects of some trace elements On Male Infertility In Thi-Qar  
Governorate/Iraq

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**Abstract**

The present study was carried out on 50 infertile males whose age range between (19-49) year and 16 male, who were apparently healthy, as a control group whose age range between (18-49) year.

The studied males were classified into two groups according to their case health to infertile male and fertile male.

The parameters measured were seminal fluid levels lead, cadmium, zinc, copper, chromium, magnesium, iron and cobalt. These parameters were estimated in seminal fluid of patients and control group.

The results shown a highly significant different in levels of lead element( $7.541^a$ ,  $0.056^b$ ), cadmium element( $0.023^a$ ,  $0.007^b$ ), zinc element( $1.275^a$ ,  $0.054^b$ ), chromium element( $0.408^a$ ,  $0.090^b$ ), iron element( $2.172^a$ ,  $0.148^b$ ), cobalt element( $0.022^a$ ,  $0.008^b$ ), in primary infertile males when compared with in secondary infertile males(a: primary, b:secondry).The results shown a highly significant different in levels of lead element, cadmium element, zinc element, chromium element, iron element, cobalt element, in infertile men when compared with fertile men.

The results illustrated highest level of concentrations elements in measurements was lead element levels and cadmium levels in infertile males when compared with control group.

As well as lower levels of concentration metals was cobalt element levels in infertile males when compared with control group.

**Keywords: Seminal fluid , Trace Element , Azoospermia.**

## 1. Introduction

Infertility is typically defined as failure to conceive within a certain period of time. For the male, this definition is particularly problematic, as it relies on an outcome for his female partner, who may have reproductive issues of her own. Fecundity is the term used for the probability of a woman in a sexually active couple becoming pregnant per menstrual cycle without contraception. It is customary to define infertility clinically as the inability of a couple trying to conceive to do so within one year. Infertility can be classified as primary infertility when no pregnancy has ever occurred or secondary if it occurred after one or more pregnancies. Approximately 15% of couples attempting their first conception meet with a failure, and another 10% face infertility (1).

Data available over the past 20 years reveal that in approximately 30% - 50% of the cases of infertility, the cause is found in the man alone, and another 20%, the causes are found in both (2). And in another 50% - 70%, the causes are found in the female alone (3). Human fertility is complex; it depends upon the synergy of male and female reproductive competence in which physiological, genetic, behavioral, and environmental factors have limited our understanding of the mechanisms of conception and fertility, and the problem is compounded by the diversity of reproductive physiology among mammals, which limited extrapolation from animal models. Historical interest

and research in human fertility have been motivated by several goals, including diagnosis and treatment of infertility (5).

Improvements in contraceptive technology and, more recently, concerns of environmental and occupational exposure. In the majority of cases of male infertility, the cause of impaired semen parameters is unknown (4).

Azoospermia (absence of sperm) or significant oligozoospermia (sperm concentration  $< 15$  million per ml) may be associated with small soft testes and raised (FSH) levels. Histological changes within the tubules, such as the absence or reduced number of germ cells, may be patchy and non-specific (4).

Asthenozoospermia implies impaired motility (less than 50%). Absent or very poor motility in sperm may be caused by structural abnormalities such as the absence of dynein arms, radial spokes, and dysplasia of the fibrous sheath (5).

Teratozoospermia is the term used to describe abnormal sperm morphology on microscopy. Although the assessment is inevitably subjective, observance of the strict criteria can lead to a degree of consistency of reporting, at least within each laboratory. Morphology is believed to reflect immaturity and functional integrity of sperm and has been related to acrosome defects and sperm motility (6).

A varicocele is a group of dilated veins in the pampiniform plexus of the spermatic cord. On examination, it is visible as a tangle of distended blood vessels in the scrotum. Usually left sided, varicoceles develop at puberty and affect 15% of otherwise healthy men (3).

A number of heavy metals, chemicals and pesticides have been associated with deranged spermatogenesis. Tobacco, cannabis, alcohol and lifestyle factors such as wearing tight underwear have also been linked with male infertility. Evidence regarding some these associations is conflicting (7).

These heavy metals could adversely affect the male reproductive system; either by causing hypothalamic-pituitary axis disruption or by directly affecting spermatogenesis, resulting in impair semen quality. A number of commonly used drugs can impair semen quality. Cancer chemotherapy its action alkylating agents cause irreversible damage (8).

Hormone treatment its action high dose corticosteroids, androgens ,anti-androgens ,estrogens and (LHRH) agonist. Cimetidine may competitively

inhibit androgen effect on the receptor. Sulphasalazine can cause impairment of sperm quality by direct toxicity. Colchicine cause depression of fertility by direct toxicity to spermatogenesis (9).

The male reproductive system is very sensitive to many factors which are contributed to decrease of sperm quality. These factors are environmental pollution, nutrition, diseases and others (10).

The heavy metals exposure is associated with impaired semen quality due to their direct effect on testicular function as well as hormonal alteration (11).

Lead appears in homes in many forms as lead piping, lead -containing solders, paints, ceramic glazes, base metal utensils and fixtures (12).

Also, cream powder, lipstick and hair color have lead. Agricultural soil contamination may be responsible for lead found in many herbal medicines and cigarettes. On the contrary, their detrimental effects on physiological, biochemical, and behavioral dysfunctions have been documented in animals and humans by several investigators (13).

## 2. Materials and Methods

**Table (1): chemicals with their suppliers company and purity and molecular weight.**

Number	Chemicals	Purity	Molecular weight	Supplies company
1	Nitric acid	70%	63.01	Scharlau
2	Perchloric acid	71%	100.45	Scharlau

**Table (2): classified two group**

$n > 15 \times 10^6$	Fertile men	Group (1)
$n < 15 \times 10^6$	Infertile men	Group (2)

### 2.1 Design of study

This study was conducted at Al-Hussein teaching hospital in infertility unit Thi-Qar governorate. The study was carried out in the unit of the Laboratory Department of Clinical Biochemistry during the period collect from 1 \9\ 2015 to 29 \5\ 2016. Informed consent was obtained verbally from all participant . A total of thirty four men with infertility of the ages 18 – 49 years. To compare the results, sixteen fertile men. The present study including (50) men, which were divided into general groups:

- Control group (fertile men): including (16) apparently fertile men.
- Case group (infertile men): including (34) infertile men who infertility.

### 2.2 Collection of semen samples and semen analysis

Semen samples were collected after masturbation into sterile cups following three days sexual abstinence. After 30 min of liquefaction, the standard semen parameters were immediately evaluated according to the world health organization (WHO). Specimens were analyzed for spermatozoa morphology using a modified papanicolaou stain. Sperm samples were stored at -20 c and subsequently mineralized in the laboratory.

**Table (2-1) Shows the device running AAS conditions and conditions hollow cathode lamps.**

<b>Element</b>	<b><math>\lambda_{\max}</math></b>	<b>Background</b>	<b>Flame type</b>	<b>Sensitivity (ppm)</b>	<b>Detection limit (ppm)</b>	<b>Working range (ppm)</b>
<b>Cr</b>	<b>357.9</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.05</b>	<b>0.005</b>	<b>0.04-8</b>
<b>Fe</b>	<b>248.3</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.05</b>	<b>0.0046</b>	<b>0.03-8</b>
<b>Mg</b>	<b>285.2</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.003</b>	<b>0.0018</b>	<b>0.007-0.4</b>
<b>Cd</b>	<b>228.8</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.012</b>	<b>0.0028</b>	<b>0.02-2.2</b>
<b>Zn</b>	<b>213.9</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.01</b>	<b>0.003</b>	<b>0.01-3</b>
<b>Cu</b>	<b>324.7</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.03</b>	<b>0.004</b>	<b>0.02-6</b>
<b>Co</b>	<b>240.7</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.05</b>	<b>0.01</b>	<b>0.04-8</b>
<b>Pb</b>	<b>217</b>	<b>D<sub>2</sub>/SR</b>	<b>Air/ Acetylene</b>	<b>0.08</b>	<b>0.012</b>	<b>0.08-14</b>

### 2.3 Measurement of the heavy metal concentration:

The digestion process using for determination the concentration levels of heavy metals in the samples of seminal fluid in two groups of patients with infertility and in normal group with fertility.

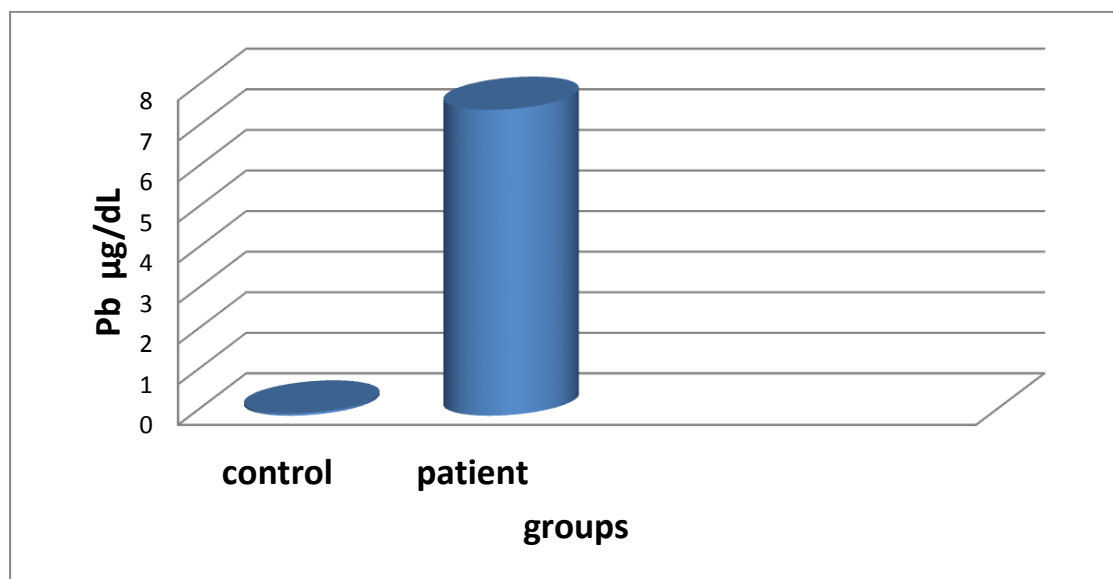
### 2.4 Atomic absorption spectroscopy AAS

Atomic absorption spectroscopy (AAS) is a technique for measuring quantities of chemical elements present in environmental samples by measuring the absorbed radiation by the chemical element of interest. This done by reading the spectra produced when the sample is excited by radiation (14 ).

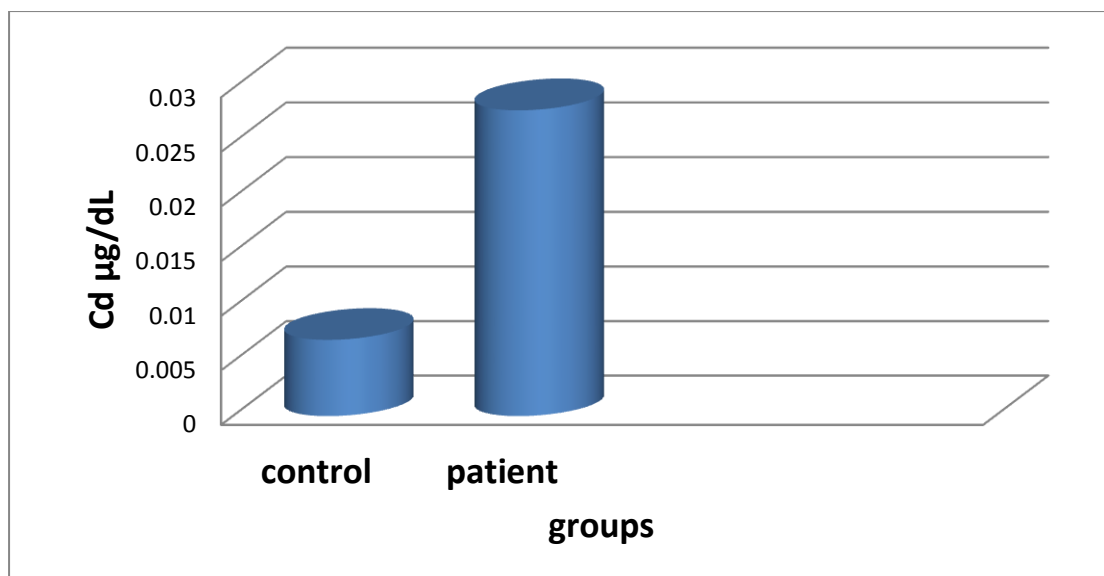
The atoms absorb ultraviolet or visible light and make transition to higher energy levels. Atomic absorption methods the amount of energy in the form of photons of light that are absorbed by sample (15 ). A detector measures the wavelengths of light transmitted by the sample. And compares them to the wavelength which originally passed through the sample(14). The technique make use of absorption spectrometry to assess the concentration of an analytic in a sample it requires standards with known analytic content to establish the relation between the measured absorbance and the analytic concentration and relies therefore on the beer-lambert low (16).

### 3. Results

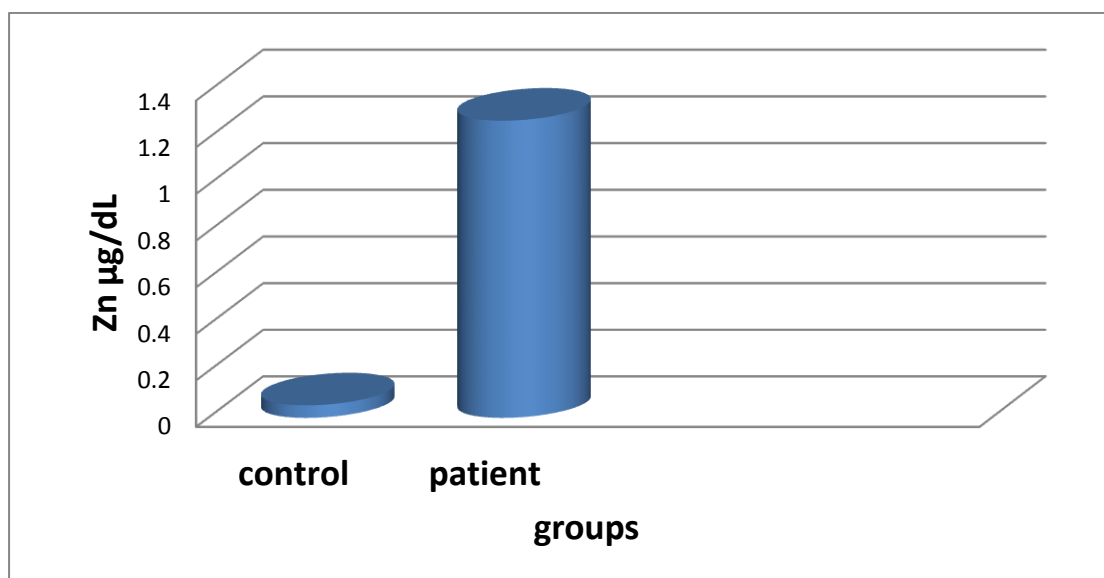
The heavy metals concentrations in azoospermia and oligospermia patients comparison with fertile men (control group).The study was showed significant different  $p < 0.005$  in all heavy metals obtained significant increase in (lead Pb, magnesium Mg, cadmium Cd, iron Fe, chromium Cr, copper Cu and cobalt Co) comparison with control group at following figures:



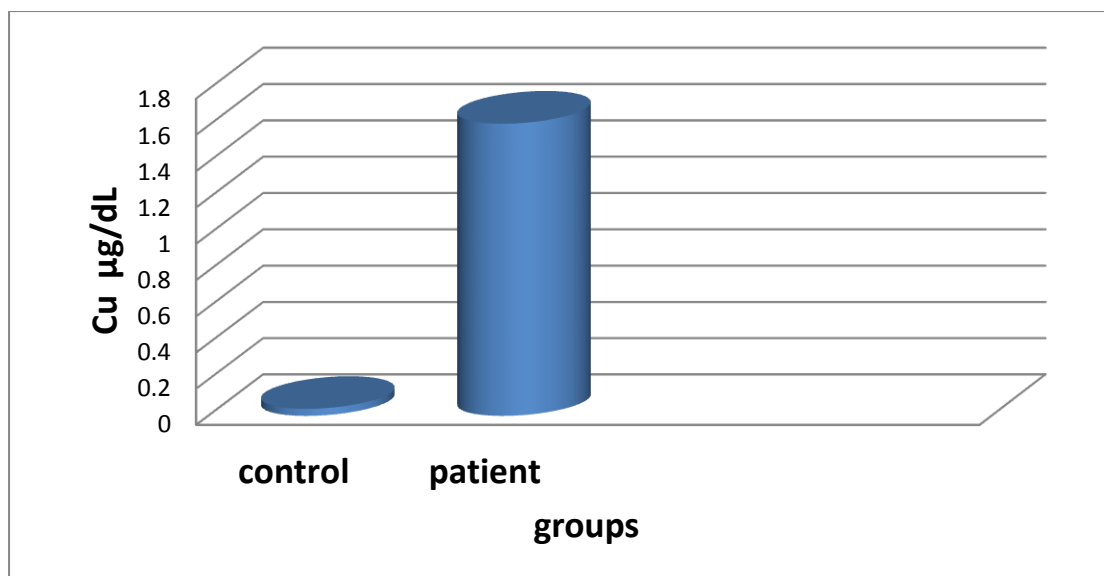
**Figure (3-1) the comparison of lead concentration in µg/dl in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



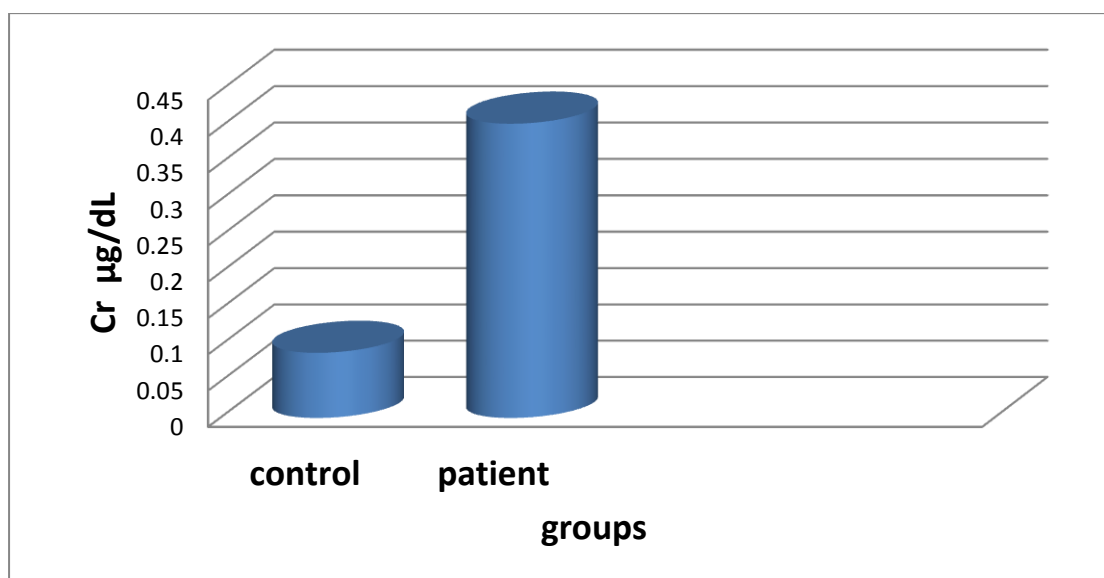
**Figure (3-2) the comparison of cadmium concentration in µg/dl in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



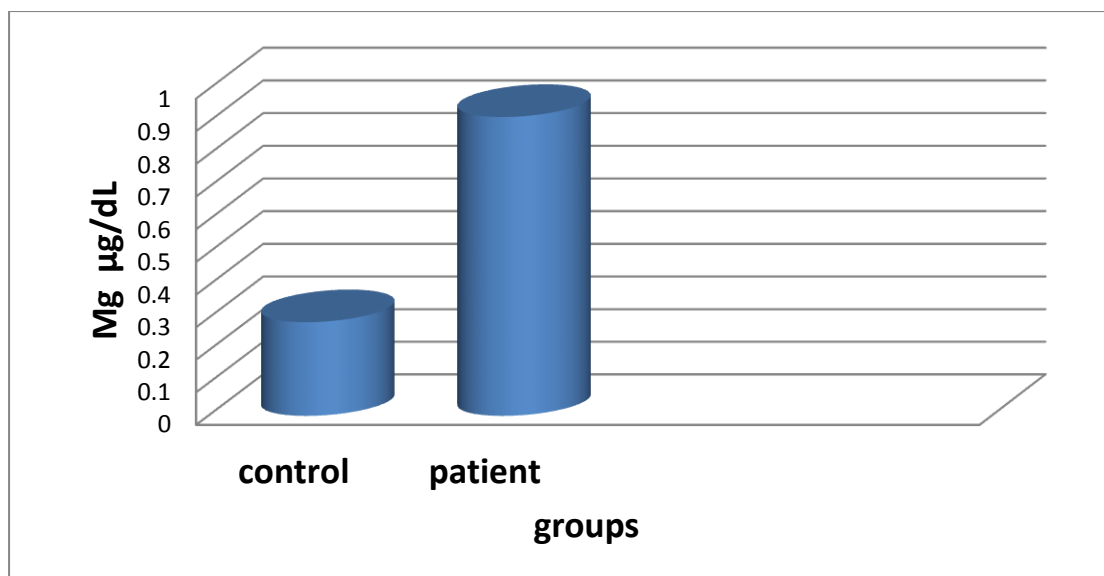
**Figure (3-3) the comparison of zinc concentration in µg/dl in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



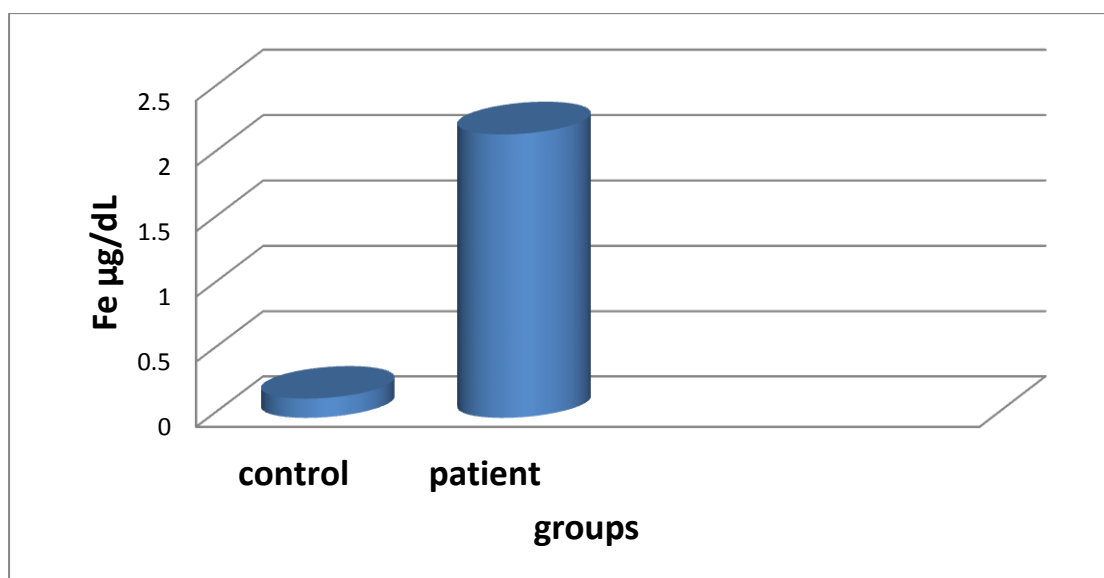
**Figure (3-4) the comparison of copper concentration in µg/dl in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



**Figure (3-5) the comparison of chromium concentration in µg/dl in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



**Figure (3-6) the comparison of magnesium concentration in  $\mu\text{g/dL}$  in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**



**Figure (3-7) the comparison of iron concentration in  $\mu\text{g/dL}$  in semen between patient group (infertile men) with control group (fertile men). Significant different  $p \leq 0.05$  between two group patient and control group.**

#### 4. Discussion

This study working on samples from tow group of men fertile and infertile to estimation level concentration of heavy metals in samples tow cases.

The seminal fluid obtained from 100 men including infertile and control group. Their ages varied 18 to 49 years, thus covering the entire span of the reproductive years. Seminal fluid samples were investigated for the possible relationship between trace metals ( Cd, Pb, Zn, Cu, Fe, Mg, Co) and infertility.

The results of study similar to the results of the research (15)and (16) who found that infertile men had higher concentration levels of lead when compared with the control group.

But results was different with the results of research (17)who found that concentration of lead in seminal plasma did not appear correlation with sperm parameters studies. Also statistical evaluation of lead concentration in seminal plasma among two groups infertile males and fertile males reflected no statistically significant variation in relation to infertility.

#### 5. Conclusion:

Infertile men showed lower sperm concentration and lower motility, lower proportions of normal sperm morphology than fertile control. With patients groups differences in these parameters are prominent also.

The concentration levels of trace elements in patients group with infertility were higher than concentration levels in control group fertile men.

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## دراسة التأثيرات الانجابية لبعض العناصر النزرة على العقم عند الرجال في محافظة ذي قار/ العراق

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ساجد حسن كزار

### الخلاصة

العقم يعرف بأنه عدم الانجاب لمدة سنة كاملة بدون استخدام موانع حمل ويقسم الى نوعين ثانوي يعرف بأنه حدوث عقم بعد حمل او انجاب واحد او اكثر اما العقم الاولي فيعرف بأنه عدم حدوث أي حمل. تختلف انواع العقم عند الرجال تبعاً لاختلاف اسبابها وتقسم الى عدة انواع وهي:

كما يمثل مرض العقم عند الرجال إحدى المشاكل الصحية كبيرة وان الزيادة المفرطة في تركيز العناصر النزرة مثل الرصاص والكاديوم والزنك والنحاس والكروم والكوبلت والمغنيسيوم والحديد يمكن أن تشكل احد عوامل المؤثرة في العقم عند الرجال.

اثبتت الدراسات حول العلاقة بين زيادة تركيز العناصر النزرة في الجسم والحالات الاصابة بالعقم ان هناك علاقة طردية حيث كلما يزداد تركيز بعض العناصر ذات التأثير الضار على جسم الانسان كلما يزداد احتمالية حدوث عقم بسبب التشوه الحيامن.

أجريت الدراسة الحالية على أربع وثلاثون رجل عقيم تتراوح أعمارهم بين (١٩-٤٩) سنة وستة عشر رجل غير عقيم كمجموعة ضابطة تتراوح أعمارهم (١٨-٤٩) سنة.

تم قياس تراكيز العناصر النزرة الرصاص والكاديوم والزنك والنحاس والكروم والكوبلت والمغنيسيوم والحديد في السائل المنوي لدى الرجال لتحديد مستويات هذه العناصر ومعرفة مدش تأثيراتها عند مرضى العقم وتم قياس تركيز العناصر الثقيلة باستخدام جهاز الامتصاص الذري.

تم استخدام طريقة الهضم لغرض تحضير العينات لغرض القياس تراكيز العناصر النزرة لكون الجهاز الامتصاص الذري غير قابل لاستخدام العينات بشكل مباشر لذلك تم استخدام الحوامض المركزة لهضم العينات قبل القياس. تقنية الامتصاص الذري هي احدى التقنيات التحليلية المستخدمة لغرض تقدير وجود تراكيز قليلة في أي نوع من العينات سواء كيميائية او عينات بايولوجية مثل المصل الدم او السائل المنوي او غيرها.

أظهرت النتائج زيادة في تراكيز عناصر النزرة وخاصة عنصر الرصاص أعلى من بقية العناصر الأخرى.

كما ان الدراسة اظهرت زيادة تركيز العناصر المشمولة بالدراسة في حالة الاشخاص الذين يعانون من العقم الاولي مقارنة بالاشخاص الذين يعانون من العقم الثانوي وكما تبين النتائج:

بالنسبة للرصاص ٦.٩١٠ لدى مصابين بالعقم الاولي و ٥.٢١١ لدى المصابين بالعقم الثانوي. عنصر الكاديوم ٠.٠٢١ لدى المصابين بالعقم الاولي و ٠.٠١١ لدى المصابين بالعقم الثانوي. عنصر النحاس ٠.٠٢٣ لدى المصابين بالعقم الاولي و ٠.٠٩٩ لدى المصابين بالعقم الثانوي. عنصر الزنك ١.١٧٥ لدى المصابين بالعقم الاولي و ٠.٦٥٣ لدى المصابين بالعقم الثانوي. عنصر الكروم ٠.٣٤٨ لدى المصابين بالعقم الاولي و ٠.٣٠٨ لدى المصابين بالعقم الثانوي. عنصر الكوبلت ٠.٠١٩ لدى المصابين بالعقم الاولي و ٠.٠١٥ لدى المصابين بالعقم الثانوي. عنصر الحديد ١.٩٨٣ لدى المصابين بالعقم الاولي و ١.٦٧٥ لدى المصابين بالعقم الثانوي.