The Relationship Between Serum Zinc Concentration , Serum Testosterone Concentration and Semen Parameters In Infertile Men

Sajeda S . Al – Chalabi¹, Yasir T.Al-Wattar²

¹Dept. of physiology, College of medicine, University of Mosul, Mosul, Iraq.
²Al-Jumhory Teaching Hospital, Mosul, Iraq.

(Received 19 / 1 / 2009, Accepted 23 / 5 / 2010)

Abstract

Objective: to find out the relationship of zinc concentrations in blood and serum testosterone concentrations with various semen parameters between fertile and infertile men.

Design: prospective study

Setting: this study was carried out in infertility clinic of Al – Batool teaching Hospital in Mosul.

Subjects and Methods: one hundred infertile male subjects without any treatment aged 25 – 50 years, were selected from infertility clinic at Al – Batool Teaching Hospital. After semen analysis they were grouped as oligospermic. Fifty known fertile male selected from general population and after semen analysis they were taken as normospermic control group. Blood samples were taken from each subject in the morning for serum zinc and testosterone estimation. Serum zinc was estimated using atomic absorption, serum testosterone was estimated using minividus technique.

Result: Anon – significant negative correlation between serum zinc and semen volume in infertile subjects was found, while a significant positive correlation was found between serum zinc and sperm count, motility, morphology and serum testosterone. Also we found that serum zinc level and serum testosterone level were significantly lower in infertile men as compared to control men.

Conclusion: on the basis of the findings of this study and those of other reports, zinc may contribute to fertility through its significant effects on various semen parameters and testosterone concentrations. It seems that the estimation of serum zinc may help in investigation and treatment of infertile male.

Key words: serum zinc , oligospermic , infertility ,testosterone.

Introduction

Zinc is a micronutrient abundantly present in meat and sea food. It is the second most abundant trace element in the body totaling nearly 2 g, essential for normal functioning of the male reproductive system. Numerous biochemical mechanisms are zinc dependant, including more than 200 enzymes in the body[1]. Zinc is a natural aromatase enzyme inhibitor. Aromatase enzymes cause the body to block the pituitary gland from releasing lutein and follicle stimulation of hormones which stimulate the production of testosterone, aromatase enzyme converts testosterone into estrogen and result in lower amounts of available testosterone[11]. Zinc is not only vital in the production of testosterone, it also works to maintain healthy semen volume and has been implicated in testicular development and sperm maturation[1].

Zinc in seminal plasma stabilizes the cell membrane and nuclear chromatin of spermatozoa[2] and protects the tests against the degenerative changes[3]. It may play a regulatory role in the process of capacitation and acrosome reaction[4]. It contributes to the stable attachment of sperm head to tail and its removal induces head–tail detachment[5].

Zinc have antioxidant property that counteract reactive oxygen species (ROS), it affects apoptosis and has antiapoptotic properties[6,7] therefore it may have substantial effect on reproduction. It serves as a cofactor for more than 80 metalloenzymes involved in DNA transcription and protein synthesis, because DNA transcription is a major part of germ cell development[8]. Furthermore, zinc finger proteins are implicated in the genetic expression of steroid hormone receptors[9].

Kvist et al 1990 found that zinc concentration in seminal plasma were lower in men with idopathic subfertility compared with fertile controls[10].

Zinc deficiency is associated with decreased testosterone level and sperm count[11].

Aim of the study: Since zinc concentration in blood affects spermatogenesis, we conducted this study to find the relationship between serum zinc concentration, serum testosterone concentration and semen analysis in infertile men.

Subjects and methods: This study was carried out in the infertility clinic at Al-Batool Teaching Hospital for the period from April 2009 – July 2009. One hundred infertile male subjects, without any treatment who had regular intercourse for at least 12 months without conception with their partners, aged 25 – 50 years, were selected from infertility clinic. A detailed background history and physical examination were done.

The subjects were considered oligospermic according to the sperm count less than 20 million / ml. Fifty males, who had sperm counts more than 20 million/ml and whose partners conceived within a year, with motility more than 50% were selected from general population and taken as normospermic control group.

Subjects who had undergo surgery of hernia repair, medical disease as D.M, U.T.I. thyroid disease, patients who were on antipsychotic or anti hypertensive drugs or taking alcohol, vitamin and mineral supplementation were excluded from the study.

Semen samples were obtained by masturbation after an abstinence period of 3 days. After liquefaction, samples were processed by conventional analysis to determine the volume, PH, sperm count sperm motility and sperm morphology according to WHO criteria.

10 ml of blood samples were taken from each subject in the morning. After centrifugation, serum was kept frozen at -20 c until analyzed for testosterone and zinc, serum testosterone was estimated using using atomic absorption, serum testosterone was estimated using minividus technique.

Result:
Results are expressed as mean ± S.D for each parameter. Statistically significant differences among oligospermic & normospermic control group s are indicated along with their significant values.

Table (1) : serum zinc concentration and serum testosterone concentration in infertile and control groups. The values are expressed as mean ± S.D.

<table>
<thead>
<tr>
<th>parameters</th>
<th>Infertile (n=100)</th>
<th>Control (n=50)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum zinc concentration(μg/dl)</td>
<td>69.57 ± 1.48</td>
<td>81.73 ± 2.29</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Serum testosterone concentration (ng/ml)</td>
<td>2.59 ± 0.64</td>
<td>4.79 ± 1.46</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Correlation coefficient of serum zinc with various semen parameters in control, oligospermic males are depicted in table -2. This study observed a non significant negative correlation of serum zinc concentration with semen volume in oligospermic men & a significant positive correlation of serum zinc concentration with sperm count, motility & morphology in oligospermic men.

Table (2) : correlation coefficient (r) of serum zinc concentration with semen parameters and serum testosterone

<table>
<thead>
<tr>
<th>parameters</th>
<th>Infertile(n=100)</th>
<th>Control(n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume(ml)</td>
<td>-0.114</td>
<td>0.490</td>
</tr>
<tr>
<td>Count(million/ml)</td>
<td>0.469</td>
<td>0.673</td>
</tr>
<tr>
<td>Motility%</td>
<td>0.444</td>
<td>0.495</td>
</tr>
<tr>
<td>Morphology%</td>
<td>0.454</td>
<td>0.418</td>
</tr>
<tr>
<td>Testosterone(ng/ml)</td>
<td>0.298</td>
<td>0.778</td>
</tr>
</tbody>
</table>

Data analyzed by using pearson correlation, negative correlation with semen volume while positive correlation with sperm count, motility morphology & serum testosterone was noticed, (p < 0.05).

Discussion
The most important male hormone produced by the testis is testosterone (a steroid that stimulates the development of sex characteristics). The essential mineral zinc, is important in prostate gland function and growth of the reproductive organs. Moderate to severe zinc deficiency produces regression of the testes, mild deficiency leads to low sperm count. Male infertility is influenced by zinc in several different ways, low zinc levels have a negative effect on serum testosterone concentration and semen volume. Our finding of low serum testosterone in zinc deficient subjects was in agreement with other searchers who found that zinc deficient animals develop impairment of testicular growth, low serum testosterone and elevated FSH & LH. A clinical study demonstrated that adult males experimentally deprived of zinc showed that the Leydig cell synthesis of testosterone was disturbed. The role of zinc in testicular testosterone production is not clear. However, zinc is essential for nucleic acid synthesis and activities of many enzymes. Zinc deficiency may produce abnormalities in nucleic acid synthesis. The predominant role of zinc in testicular function probably has an effect on cellular proliferation. Zinc & testosterone are known to be closely interrelated, though the nature of the relationship remains unclear: the prostate gland is one of the organs richest in zinc. It is thought that testosterone is the main factor governing the zinc level of the prostate. One of the functions of zinc may be to control testosterone metabolism at the cellular level & zinc is thought to regulate the metabolism of testosterone in the prostate.

The finding of low sperm count, decreased motility, and increased percentage of abnormal forms agreed with Valle et al 1984 who found that zinc deficiency causes atrophy of the seminal tubules, failure of spermatogenesis and decreased testosterone secretion in rats. Zinc deficiency impairs the responsiveness of Leydig cell to gonadotropins and may cause primary hypogonadism in humans as well as in experimental animals.

References
العلاقة بين مستوى الزنك في مصل الدم ومستوى هرمون التستوستيرون وخصائص المني لدى الرجال العقيمين

سامجة سعيد الجلبي1، ياسر طليع الوتار2

1فرع الطب الباطني، كلية الطب، جامعة الموصل، الموصل، العراق
2مستشفى الزهراوي التعليمي في الموصل، العراق

(تاريخ الاستلام: 21/2/1222، تاريخ القبول: 12/5/1222)

الملخص

اهداف البحث: لمعاينة العلاقة بين مستوى الزنك في الدم ومستوى هرمون التستوستيرون في الدم وكذلك مستوى الزنك في الدم مع خصائص المني المختلفة للرجال العقيمين والرجال الخصبين.

التصميم: دراسة مستقبليه.

مكان اجراء البحث والاطار الزمني له: أجري البحث في عيادة العقم في مستشفى النجاح التعليمي في الموصل للسادة من ديموز 1221-تموز 1222.

الطريق المتبوع: أجريت فحوصات السائل المنوي وقياس مستوى الزنك في الدم وقياس مستوى هرمون التستوستيرون في الدم لكل من الرجال العقيمين الذين تتراوح اعمارهم بين 25-50 سنة تم اختيارهم من عينة الرجال العقيقين الذين تم اختيارهم من عامة الناس كعينة سيطرة.

النتائج: أظهرت هذه الدراسة انخفاض في مستوى الزنك في الدم وانخفاض في مستوى هرمون التستوستيرون في الدم لدى الرجال العقيمين عندما تم مقارنتهما مع الرجال الخصبين.

الاستنتاج: بالاعتماد على ما أظهرته هذه الدراسة من الاختلافات بين الرجال العقيمين ورجال الخصبين، كما لوحظاب التأثر السلبي بين مستوى الزنك في الدم وحجم السائل المنوي لدى الرجال العقيمين، يمكن اعتبار عبارة عن علاقة جيدة بين مستوى الزنك في الدم وخصائص المني عن طريق تمييز الجهاز المناعي عند الرجال العقيمين ورجال الخصبين.

12