Estimation of Zinc in Seminal Fluid among Infertile Men

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Abstract

The objective of the present study is estimation of zinc (Zn) concentration in seminal fluid among infertile men. Methods: Cross section study was done to estimate different Zn concentrations in seminal fluid male patients recruited from outpatient clinic of male infertility department at El Hussein Hospital of Cairo (fertile and infertile males). Seminal fluid samples were collected by masturbation after 3 days of abstinence. Shortly after collection, semen samples were analyzed for liquefaction times, volume, leukocyte count, motility, morphology and count of spermatozoa. Seminal samples were divided into four groups according to the sperm counts; 30 normozoospermia, 30 oligozoospermia, 30 azoospermia and 30 athenozoospermia. The Zn concentrations were estimated in the four collected seminal groups using colorimetric method. The results revealed a highly significant decrease in Zn concentration in infertile male samples (oligozoospermia, athenozoospermia and azoospermia) compared to the normozoospermia samples. Furthermore a significant decrease in Zinc concentration was observed in azoospermia group compared to athenozoospermia and oligozoospermia samples.

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Conclusion: Low Zn concentrations were detected in the seminal fluids of the infertility patients compared to the seminal fluid of the fertile males.

Keywords: Seminal fluid, Zinc, male infertility, colorimetric method.

Introduction

Zinc is a very important element that is needed for many biochemical reactions. Various studies have suggested that Zn plays an essential role in the physiology and development of gonads and it is important for sperm production and/or viability in addition to prevention of spermatozoa degradation (Lewis-Jones, 1996). Zinc has anti oxidative properties and plays an important role in scavenging reactive oxygen species. Zinc is an essential trace element and is the second most abundant transition metal found in the body after iron. It is known to be essential for spermatogenesis and for the stabilization of spermatozoa during storage and ejaculation. Zinc may also have an anti-bacterial role in seminal fluid (Batra, et al 2004). Low levels of zinc in seminal fluid may contribute to male infertility due to reduced spermatogenesis and seminal fluid volume.

Aim of the work

This work aimed at estimation of zinc concentration in seminal fluid among infertile men.

Materials and Methods

A case control study was conducted. 120 male patients were recruited from outpatient clinic of endocrinology department at El Hussein Hospital of Cairo. The mean age of investigated patients was 27±7 years. Seminal fluid samples were collected by masturbation in wide sterile container after 3 days of abstinence, shortly after collection, semen samples were analyzed for liquefaction times, volume, leukocyte count, motility, morphology and count of spermatozoa according the world health organization (WHO 1993). According to the sperm count, the seminal fluid samples were divided into four groups; normal controls (30 normozoospermia samples); indicated by sperm count more than 20 millions/ml, motility more than 50% and normal morphology, 30 oligozoospermia infertility samples; indicated by sperm count less than 20 millions/ml, 30 azoospermia samples; indicated by the complete absence of spermatozoa, and 30 athenozoospermia samples; indicated by motility less than 50%. All samples were centrifuged at 4000 rpm for 15 minutes and seminal plasma was separated and kept until analyses. The seminal plasma was collected on sterile dry test tube to separate for the biochemical analysis.

Zinc concentration:-

Zinc was determined using colorimetric method. The Zn concentrations in the sample is chelated by (2-caboxy-2-hydroxy-5-Sulfoformazyl-benzene) in the reagent at alkaline pH. The formation of this complex is measured at a wave length of 610 nm (Hayakawa and Jap 1961).

Statistical analysis

The results were computerized. Statistical analysis was done through SPSS version 14. Quantitative data was expressed as mean and standard deviation (SD). Statistical comparison between the groups was done by Analysis of Variance (ANOVA) and the post-hoc test least significant difference (LSD). The results were considered significant when P-value was equal or less than 0.05 ($P \leq 0.05$).

Results

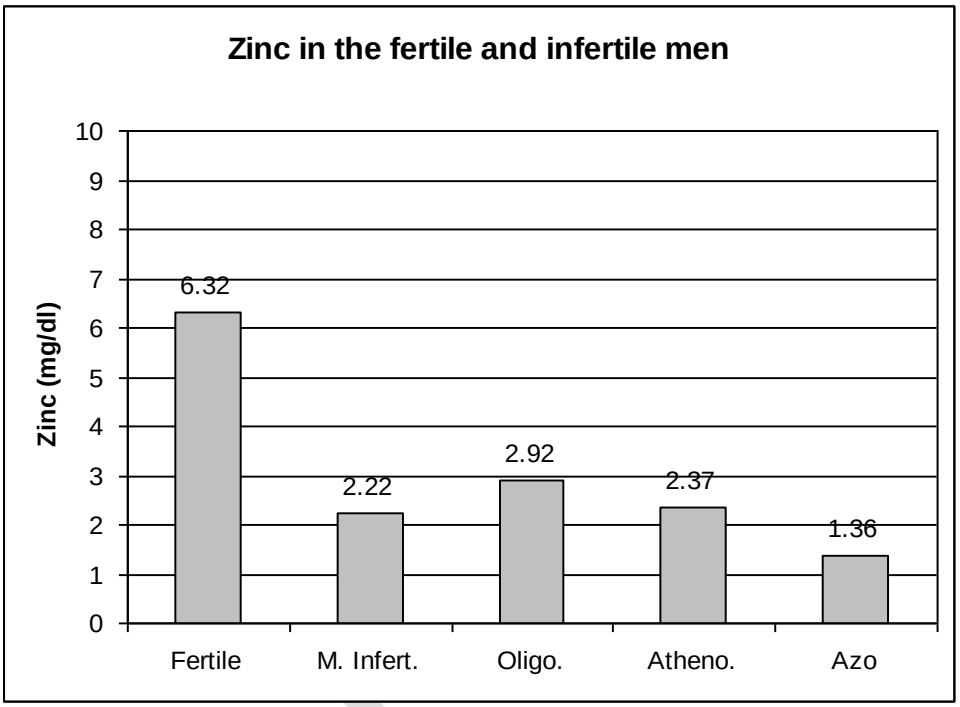
The mean age of investigated patients was 27±7 years. From the table, high statistical significant decrease in Zinc was observed in male infertility (oligozoospermia, athenozoospermia and azoospermia) groups as compared with findings of the fertile men. Furthermore, highly statistically significant decrease in Zinc was observed in azoospermia groups as compared with findings in athenozoospermia and oligozoospermia group.

Comparison between zinc concentration among male infertility groups and fertile men

	Normo-zoospermic (30)		Oligo-zoospermic (30)		Atheno-zoospermic (30)		Azoospermic (30)		ANOVA	
Zinc	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-Ratio	P-value
	6.32	2.02	2.92	0.91	2.37	0.86	1.36	0.69	90.79	P< 0.0001
	(2,3,4)		(1,4)		(1,4)		(1,2,3)			

1 = Normozoospermic, 2 = Oligozoospermic, 3 = Athenozoospermic, 4 = Azoospermic

The figure shows comparison between fertile men and male infertility regarding zinc concentration in semen



Discussion

Infertility is complex and has multiple causes and consequences depending on the gender, sexual history, life style of society and cultural background of people (Kerry, 2003). Infertility affects about 8% to 12% of the world's population and in about half of cases men are either the single cause or contribute to the couple's infertility (Barbra, 2003).

Zinc is very important element and it is needed for many biochemical reactions. Various studies have suggested that Zn plays an essential role in the physiology and development of gonads and it is important

in sperm production and/or viability in addition to prevention of spermatozoa degradation (Lewis-Jones, 1996).

In addition to its antibacterial activity in seminal fluid (Carreras, and Mendoza, 1990), previous studies revealed that sperm motility was improved after the addition of zinc citrate to fresh semen specimens. It may also have an antibacterial function and protect the testis against the degeneration change (Batra, et al 2004). It may play a regulatory role in the process of capacitation and acrosome reaction (Riffo, et al, 1992).

As regard to results of semen zinc of the present study a highly statistically significant decrease in Zinc was observed in male infertility (oligozoospermia, athenozoospermia and azoospermia) groups as compared with findings of the fertile men group ($P< 0.0001$). Also statistically significant decrease in Zinc observed in azoospermia groups as compared with findings of athenozoospermia and oligozoospermia groups ($P< 0.0001$). This study is similar to results that have been reported elsewhere (Koca, et al 2003). On the other hand these results are contrary to the finding of other studies (Eggert-Kruse, et al 2002 and Lin, et al 2000).

Conclusion

Zinc concentration was significantly decreased in male infertility patients (oligozoospermia. athenozoospermia and azoospermia) in comparison to fertile men.

Reference

- Barbara, B. Men contribute to and suffer from infertility. Family Health International 2003; 23: 17-20.

- Batra, N., Nehru, B., Bansal, M. P. Reproductive potetial of male portan rats exposed to various levels of lead with regard to zinc status. Br Nutr 2004; 91: 387-391.

- Carreras, A., and Mendoza, C. Zinc levels in seminal plasma of fertile and infertile men. Andrologia 1990; 22: 279-283.

- Eggert-Kruse, W., Zwick, E. M., Batshulat, K., Rohr, G., Armbrster, F. P., Petzoldt D. et al. Are zinc levels in seminal plasma associated with seminal leukocytes and others determinants of semen quality. Fertil steril 2002; 77: 260-269.

- Guzick, D.S., Overstreet, J.W., Factor-Litvak, P., Brazil, C.K., Nakajima, S.T., Coutifaris, C., et al. Sperm morphology, motility, and concentration in fertile men. N Engl J Med 2001; 345(19): 1388- 1393.

- Hayakawa R. and Jap J. Toxic Environ. Health 1961 ; 8:14 – 18.

- Kerry, L. W. Defining infertility Family Health International 2003; 23: 4-8.

- Koca, Y., Ozdal, O. L., Celik, M., Unal, S. Antioxidant activity of seminal plasma in fertile and infertile men. Arch Androl 2003; 49: 355-359.

- Lewis-jones, D. I., Aird, I. A., Bilijan, M. M. et al. Effects of sperm activity on zinc and fructose concentrations in seminal plasma Hun Reprod 1996; 11: 2465-2467.

- Lin, Y. C., Chang, T. C., Tseng, F. J., Kung, F. T., Chang, S. Y. Seminal plasma zinc levels and sperm motion characters in infertile samples. Changgeng Yi Xue Za Zhi 2000; 23: 260-266.

- Riffo, M., Leiva, S., Astudillo, J. Effect of zinc on human sperm motility and acrosome reaction. Int Androl 1992; 15: 229-237.

- WHO, laboratory manual for the examination of hum semen and spermcervical mucus interaction. 4th edition. Cambridge (UK): published on behalf of the world Health Organization by Cambridge University press 1993. P. x, 128