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Effect of Male Hyperinsulinaemia on IVF Outcome: A Tertiary Center Report

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Abstract:

Objectives: different factors such as maternal age, number of oocytes and embryo quality could affect IVF outcome. The little is known about effects of hyperinsulinemia on IVF outcome. we designed this study to evaluate effect of hyperinsulinemia on IVF outcome in infertile couples.

Material and methods: Ninety two couples completed the study. According to insulin level at the start of the study, they divided into two groups: 1. men with normal insulin level (≤9.2 µIU ml^{-1}). Women underwent GNRH agonist protocol. All couples followed up to two weeks after embryo transfer.

Results: Thirty one had hyperinsulinemia (33.6%). Mean sperm count, motility and morphology were not significantly different between two groups. Chemical and clinical pregnancies were significantly higher in normal insulin group.

Conclusion: along with other factors, male hyperinsulinemia should be considered in couples referred to infertility clinic.

Key words: insulin, pregnancy, IVF

INTRODUCTION:

Infertility which is defined as inability to conceive after one year of unprotected sex increases is increasing world wide and affecting 20% of couples (1, 2).Increase of the rate of infertility results in increasing the rate of couples seeking assisted reproductive treatments (ARTs). Early pregnancy loss occurs in 12-48% of all pregnancies after ART which leads to range of problems(3).Maternal age. duration of infertility, cause of infertility, basal concentrations of FSH, grade of embryo and number of oocytes are among factors affecting IVF outcome(4).Recently, paternal hyperinsulinemia has been considered as one of the factors affecting ART outcome (5).Insulin is an anabolic hormone which has effects on metabolism of carbohydrate, fat and protein metabolism(5). Insulin and insulin growth factor II (IGF-II), and IGF-I stimulate spermatocytes formation(6).Hyperinsulinemia has consequences such as hypertension, obesity, ischaemic heart disease, and dyslipidaemia(7-9). There are few studies regarding effect of paternal hyperinsulinemia on infertility outcome. In a previous study, Bosman et al, reported lower sperm count, sperm morphology, and fertilization rate in men group with hyperinsulinemia(5). Timely diagnosis of paternal hyperinsulinemia and proper treatment may influence IVF outcome but lack of evidences is obvious. So, we designed this study to evaluate effect of hyperinsulinemia on IVF outcome in infertile couples.

MATERIAL AND METHODS:

This cohort study conducted in Women's hospital (affiliated hospital of Tehran university of medical sciences) between August 2015 and August 2016.Inclusion criteria for men were : men who referred to infertility clinic, age between 30-45 years, BMI (Body mass index) between 18 and 25, sperm count more than 20 million, sperm motility more than 50%, morphology between 5 and 13% normal forms(10, 11). Inclusion criteria for women were: normal insulin level, infertility due to tubal problems.All participants asked to fill written informed consent forms and the study had been approved by TUMS ethics committee.Men were asked to be fast on the day of oocyte retrieval for insulin analysis (from 22pm till 8AM the day after). Insulin assays were performed on an Immulite_ Automated Analyser (Siemens Healthcare Diagnostics Inc., Flanders, NJ, USA)

We divided couples into two groups:

1. Men with normal insulin level (≤9.2 µIU ml^{-1})
2. Men with hyperinsulinemia (insulin level more than 9.2 µIU ml^{-1})

Women were undertreatment with GNRH agonist using follicle-stimulating hormone (FSH) (Gonal F_, Merck Serono, Gauteng, South Africa) and Luveris_ (Merck Serono, Gauteng, South Africa).All patients were followed up by vaginal sonography.The ovulation target was two or more follicles greater than 18 mm.Thirty-six hours after human chorionic gonadotropin (hCG) administration (10000 units), oocytes were picked up under sonographic guidance.All oocytes were fertilized using the ICSI method. Embryo transfer was performed under ultrasound guidance usually on Day 3 after insemination. Minimum one and maximum two high-grade blastocysts were transferred trans vaginally.All cases followed up to at least two weeks after embryo transfer..Chemical pregnancy was determined by detecting serum b-hCG. A detectable gestational sac was considered as a characteristic of clinical pregnancy.SPSS version 18 was used for data analysis. Student's t test, ANOVA and Fisher's exact tests were used for comparison of continuous and categorical variables P value less than0.05 was considered statistically significant.

RESULTS:

Ninety two couples completed the study. Demographic characteristics are summarized in table 1.Thirty one had hyperinsulinemia (33.6%).Mean sperm count, motility and morphology were not significantly different between two groups (table2).Chemical and clinical pregnancies were significantly higher in normal insulin group (table3).

Table 1: demographic characteristics.

Variable	Mean ± SD
Paternal age (year)	35.3±5.2
Maternal age (year)	32.4±5
Duration of infertility (year)	7.2±1.9
No of oocytes	5±2.1
Mean sperm count (million per ml)	52.6±11.6
Sperm motility (%)	45.1±9.5
Sperm morphology (%)	6.8±1.1

Table 2: A comparison of the different fertility factors between the two groups.

Variable	Group one	Group two	P value
Paternal age (year)	35±4.9	35.9±5.8	0.4
Duration of infertility (year)	7.1±1.9	7.4±1.9	0.5
No of oocytes	4.9±2.1	5.1±2	0.5
Mean sperm count(million per ml)	53.8±10.2	50.3±13.8	0.1
Mean sperm motility (%)	43.9±9.6	47.4±9.1	0.09
Mean sperm morphology (%)	6.9±1	6.5±1.1	0.06

Table 3: Comparison of pregnancy related factors between two groups.

	Group one	Group two	P value
Grade of embryo (day two)Good	29(47.5%)	14(45.2%)	0.8
Grade of embryo (day three)Good	34(55.7%)	16(51.6%)	0.7
Grade of embryo (day five)Good	10(16.4%)	6(19.4%)	0.7
Chemical pregnancy	26(42.6%)	6(19.4%)	0.02
Clinical pregnancy	22(36.1%)	4(12.9%)	0.02
Singleton pregnancy	23(37.7%)	4(12.9%)	0.01
Twin pregnancy	2(3.3%)	1(3.2%)	0.9
Triple pregnancy	1(1.6%)	0	1

DISCUSSION:

Fertility is one of the human reproductive health concern while one uot of six couples seek infertility treatment (12). Factors such as, sperm motility, sperm count and morphology have been considered as male factors in infertility issues. We found that chemical and clinical pregnancies were significantly lower in hyperinsulinaemic group while sperm count, sperm morphology, and sperm motility were not significantly different between two groups.Sperm count and sperm morphology were slightly lower in hyperinsulinaemic group. These findings are in agreement with Bosman et al study(5).They evaluated 82 couples, 38 men with normal insulin level and 44 with hyperinsulinemia. Lower mean sperm count, sperm morphology, and poor morphologically sperms detected in hyperinsulinaemic group. Fertilization rate was 79% in normal insulin group and 74% in hyperinsulinemic group. Singleton and twin pregnancies were significantly higher in normal insulin group(5) which is consistent with our findings.The exact effects of hyperinsulinemia on male fertilization is not clear.Fertilization of germ cells is related with glucose metabolism(13, 14).Previously, it was shown that paternal metabolic abnormalities such as diabetes would result in embryonic development alteration(15).Hyperinsulinemia along with increased body mass index (BMI) will result in steroidogenesis change and male subfertility (12).May be insulin dysfunction may cause increased oxidative stress(12).Previously, lower level of serum Insulin-like growth factor 1 (IGF-1) was associated with oligospermia(16). On the other hand, seminal IGF-1 had association with the number of motile and progressive spermatozoa(17). In another study, Colombo and Naz reported that seminal seminal IGF-1 level was associated with the total sperm count(16).This study had some limitations. First, it conducted in a tertiary hospital Second, the sample size was limited. As fertility is an important issue for couples, detecting influential factors are crucial.

CONCLUSION:

Along with other factors, male hyperinsulinemia should be considered in couples referred to infertility clinic.

REFERENCES:

1 In a study by Bonduelle et al..1 Savitz-Smith J. Couples undergoing infertility treatment: implications for counselors. The Family Journal. 2003;11(4):383-7.

2 Tanha FD, Mohseni M, Ghajarzadeh M. Sexual function in women with primary and secondary infertility in comparison with controls. International journal of impotence research. 2014;26(4):132.

3 Tehraninejad ES, Tanha FD, Ghajarzadeh M, Zandieh Z, Aziminekoo E, Zanjani HR. Stimulation of the endometrium with high-grade blastocyst culture supernatant (SEHB) can improve pregnancy outcome for couples undergoing intracytoplasmic sperm injection (ICSI): a randomized clinical trial. Archives of gynecology and obstetrics. 2012;285(4):1167-71.

4 Qublan H, Malkawi H, Tahat Y, Areidah S, Nusair B, Khreisat B, et al. In-vitro fertilisation treatment: factors affecting its results and outcome. Journal of obstetrics and gynaecology. 2005;25(7):689-93.

5 Bosman E, Esterhuizen A, Rodrigues F, Becker P, Hoffmann W. Influence of male hyperinsulinaemia on IVF outcome. Andrologia. 2015;47(1):91.6-

6 Nakayama Y, Yamamoto T, Abé SI. IGF-I, IGF-II and insulin promote differentiation of spermatogonia to primary spermatocytes in organ culture of newt testes. International Journal of Developmental Biology. 2004;43(4):343-7.

7 Zavaroni I, Mazza S, Dall'Aglio E, Gasparini P, Passeri M, Reaven G. Prevalence of hyperinsulinaemia in patients with high blood pressure. Journal of internal medicine. 1992;231(3):235-40.

8 Laws A, King AC, Haskell WL, Reaven GM. Relation of fasting plasma insulin concentration to high density lipoprotein cholesterol and triglyceride concentrations in men. Arteriosclerosis, Thrombosis, and Vascular Biology. 1991;11(6):1636-42.

9 Ducimetiere P, Eschwege E, Papoz L, Richard J, Claude J, Rosselin G. Relationship of plasma insulin levels to the incidence of myocardial infarction and coronary heart disease mortality in a middle-aged population. Diabetologia. 1980;19(3):205-10.

10 Menkveld R, Stander FS, Kotze TJv, Kruger TF, Zyl JAv. The evaluation of morphological characteristics of human spermatozoa according to stricter criteria. Human Reproduction. 1990;5(5):586-92.

11 Lieberman LS. WHO laboratory manual for the examination of human semen and sperm-cervicle mucus interaction, By WHO Special Programme of Research, Development and Research Training in Human Reproduction. viii+ 107 pp. Cambridge: Cambridge University Press, 1992. $29.95. American Journal of Human Biology. 1993;5(5):594-5.

12 Alves M, Martins A, Rato L, Moreira P, Socorro S, Oliveira P. Molecular mechanisms beyond glucose transport in diabetes-related male infertility. Biochimica et Biophysica Acta (BBA)-Molecular Basis of Disease. 2013;1832(5):626-35.

13 Urner F, Sakkas D. Glucose participates in sperm-oocyte fusion in the mouse. Biology of reproduction. 199.22-917:(4)55;6

14 Sakkas D, Urner F, Menezo Y, Leppens G. Effects of glucose and fructose on fertilization, cleavage, and viability of mouse embryos in vitro. Biology of reproduction. 1993;49(6):1288-92.

15 Kim ST, Moley KH. Paternal effect on embryo quality in diabetic mice is related to poor sperm quality and associated with decreased glucose transporter expression. Reproduction. 2008;136(3):313-22.

16 COLOMBO JB, NAZ RK. Modulation of Insulin-like Growth Factor-1 in the Seminal Plasma of Infertile Men. Journal of andrology. 1999;20(1):118-25.

17 Lee K-O, Ng S-C, Lee P-S, Bongso AT, Taylor EA, Lin T-K, et al. Effect of growth hormone therapy in men with severe idiopathic oligozoospermia. European journal of endocrinology. 1995;132(2):159-62.