

Correlation of Fructose with Spermatogenesis

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ABSTRACT

This study is to ascertain association of Fructose with sperm count among infertile males. A cross sectional study was conducted from June 2012 to May 2013. Sample size was 350 males (250 infertile and 100 healthy fertile control subjects) aged 30 and 60 years, selected from the Baqai Hospital Nazimabad, Karachi They were selected by purposive sampling after a detailed medical history and physical examination. Semen analysis was done and blood samples were also collected. Data was analyzed via SPSS 17.0 by using Analysis of Variances (ANOVA) and independent t test to compare the means and to evaluate the significant association within the group.

There is significant correlation between corrected fructose concentration and sperm motility ($r^2=0.3692$).

Fructose levels should be detected in routine semen analysis and have clinical usefulness for the evaluation of infertility in local population.

Keywords: BMI, Male Infertility, Azoospermia, Oligospermia.

Introduction

Despite increasing population of the world, the desires for reproduction remain a basic human desire. Infertility is a complex phenomenon and couples suffering from this problem along with their investigation and treatment, need a lot of emotional and psychological support. Approximately 10-15% of couples are affected by infertility due to physio-pathologic problems which come into consideration when the couple fails to conceive after unprotected coitus for more than one year. A male factor can be diagnosed in approximately 50% of them. The main causes of this disorder for men are associated with various factors, among them are genetic, physiopathologic and anatomopathologic abnormalities, intense and prolonged physical exercises, aging, drugs, and even excessive time of sexual abstinence (Pasqualotto FF, 2007). In almost 20% of cases in which male infertility cannot be attributed to any other cause, the role of genetic alterations is being increasingly scrutinized (Simoni M et al, 2004). This form of infertility can be classified as a genetic disorder, where structural chromosomal alterations, acquired or congenital, have been one

of the main etiologic factors (Stankiewicz P and Lupski JR, 2002). About 25% couples experience infertility at some point in their reproductive lives; the incidence of infertility increases with the male partner contributing about 40% of cases of infertility and a combination of factor is common. (Dieterich K et al, 2007). Fructose is human seminal plasma derived from the seminal vesicles and is therefore a suitable marker for the secretory function of the accessory sex gland. Fructose is also an energy source for spermatozoa while staying in semen, which may have importance also in pathological conditions of semen, e.g. in asthenozoospermia. In rare cases the seminal fructose can be used for the diagnosis of congenital absence of the deferent ducts and in ejaculator duct obstruction (Ozgokmen et al, 2001). The mean concentration of fructose in human semen is about 2-3 mg/ml (11-16 μ mol/ml). In addition to fructose, minimal amounts of other sugar compound can also be found in human semen, e.g. glucose, but if concentration is only about 1/50 of the fructose concentration the lowest reference value for total fructose concentration as defined by WHO

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(1999) is 13 μmol or more per ejaculate. (World Health Organization Manual, 1999).

It may be concluded from the studies of various inflammatory diseases affecting the male genital tract that α -glucosidase is a sensitive indicator of the epididymal dysfunction, which seems to be reduced in both epididymitis and prostatourethritis. The level of citrate was also found to be decreased in prostatitis and prostate-urethritis. Biochemical analysis of seminal plasma components are helpful in establishing clinical diagnosis of male tract diseases.

Literature Review:

There are several terminologies in reproductive medicine which are deceptive and ambiguous (Habbema JDF et al, 2004). Infertility is often used interchangeably with sterility and infecundity. Furthermore, these terms may be defined differently in demographic and medical context and between languages (Rutstein SO and Shah IH, 2004). Primary infertility, sometimes referred to as primary sterility, in English demographics is described as the "inability to bear any children, either due to the inability to conceive or the inability to carry a pregnancy to a live birth". However, inability to conceive is termed as infertility in medical terminology. English demographic language defines "infecundity" as "the inability to conceive after several years of exposure to the risk of pregnancy". The epidemiological definition of infecundity recommended by the World Health Organization (Rowe PJ et al, 2000) is incapability to conceive within two years of exposure to pregnancy. It is important to note that the period of exposure used is often one-year in clinical studies whereas five years in demographic studies. Demographic languages describe "fertility" in terms of quantity of offspring rather than the physiological ability to reproduce and therefore, "infecundity" is sometimes used in preference to "infertility".

Infertility affects about 10-20% of the couples and is becoming a major health risk (Rowe PJ et al, 2000, Mittal RD et al, 2004). In approximately 40% of the infertile couples, the primary etiology lies in the female and another 30-40% case are due to the male factor (Dieterich K et al, 2007). This implies that a male factor is causative in more than half of the cases seeking infertility evaluation (Niederberger CS and Meacham RB, 2003, Shefi S and Turek PJ, 2006). The fertile partner usually compensates for the lesser fertile one in cases where only one partner is contributing towards the infertility. However, infertility becomes manifested when both the partners are subfertile explaining the coexistence of male and female factors in infertile couples (Dohle GR et al, 2005). Fructose is produced by the seminal vesicles and is essential for spermatozoa motility; fructose is a main source of energy metabolism (Soenfeld C Y et al, 1979). Tarry in 1999 studied that zinc is essential beside fructose for spermatozoa degradation and crucial for their membrane stability. In another prospective study by (Lewis-Jones D L et al, 1996), observed that fructose level and seminal zinc essential for the motility of sperm and these parameters should be referred to routine semen analysis (Mawhinney, MG and Tarry, W.F 1991).

Materials and Methodology:

According to the following criteria, infertile males attending the infertility clinic at Baqai hospital Nazimabad, Karachi for infertility screening were included in the study.

Inclusion criteria:

Infertile males whether oligospermic or normospermic were included in the study.

Exclusion criteria:

Since the current investigation focused on sperm motility, patients with absolute azoospermia were not included in the study. Infertile couples coming to Baqai Hospital Nazimabad, Karachi for treatment or screening of infertility were studied. 298 infertile males were studied, 48 were excluded and 250 were the target cases. This was a cross sectional study, 100 fertile males were also included in the study as controls.

The collection and analysis of semen were done by standardized procedures as mentioned in WHO laboratory manual (2003). For the examination of human semen and sperm cervical mucus interaction. Analysis of sperm morphology assessed by light microscope and sperm counts were performed using a Neubauer counting chamber (WHO manual, 1999) It is a cross sectional study during the period of one year at Baqai University Hospital.

Ethical consideration

This research was conducted by proper ethical consideration. It was approved by an ethical review committee that went through the proposal before the research was conducted. Informed Consent was taken from infertile males attending the infertility clinic at Baqai hospital, Nazimabad, Karachi for infertility screening. The study was approved by IRB (Institutional Review Board) of Dow University Health Science, in their meeting dated 6, Feb 2010.

Result:

The study included 250 infertile males and 100 males (controls). Out of 250 infertile males, 83 were oligospermic and 167 were normospermic. The details of the results for individuals cases are given in appendix table 1.

Table 2 also shows a significant ($P < 0.001$) in column for normal sperm morphology, it shows that normal serum morphology is higher in controls and normospermic males than oligospermic males. Table also shows a significant ($P < 0.001$) for sperm concentration, it shows that sperm concentration was significantly higher in normospermic and control males than oligospermic males. Table 6 shows a correlation between fructose concentration and sperm motility ($r^2 = 0.3725$). There is also a significant correlation between corrected fructose concentration and sperm motility ($r^2 = 0.3692$).

Conclusion:

Therefore it is concluded from this study that quantitative measurement of seminal fructose should be introduced routinely in all infertile male as WHO guideline, so that we would be able to screen infertile male with seminal vesicle pathology effectively.

Discussion:

In seminal plasma the fructose levels is confusing and contradictory. In 2001 Gonzales study shows that True Corrected Seminal Fructose correlates strongly with motile density in oligospermia, and with serum testosterone. It also demonstrates lower values of seminal fructose concentration in azoospermia than in oligospermia or normospermia. But seminal fructose concentrations are known to be higher in azoospermic men than in men with oligospermia or normospermia. This lower value in our study may be an indication of a high proportion of obstructions in our azoospermic population. Mild correlation between fructose and seminal activity was observed by Moon and Bunge in 1986 and in 1989 by Matschalut and Schirren (Matschalut, A N and Schirren, C, 1989). Some studies, however shows that sperm motility has increased by decreasing the fructose concentration. In our study significant correlation was found between fructose concentration and sperm motility. Study by D.L Lewis-Jones observed negative correlation between spermatozoa and fructose concentration (D.L Lewis-Jones et al, 1996). These finding from various studies exemplify the complexity of relationship between fructose levels and sperm motility and correlation between sperm function and seminal fructose level. In 1990 lower levels of zinc were noticed in infertile patient by Kvist et al (Kvist, U et al, 1990). In another study sperm density, motility, vitality and morphology, all shows insignificant correlation with fructose concentration by Andrade-Rocha FT in 2001 (Andrade-Rocha FT, 2001).

Recommendations

Fructose levels should be referred as a routine semen analysis to all infertile patients.

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APPENDIX

Table 1: Comparison of seminal parameters in infertile males and controls

No of subjects	count	Semen fructose concentration (m mol/ L)	Sperm motility (%)	Sperm normal morphology (%)	Sperm concentration (mil/ml)
Oligospermic	83	176.9±21.2	24.9±2.23	3.25±0.43	8.4±0.66
Normospermic	167	300.8±18.1	47.95±1.88	4.89±0.28	94.9±8.48
Controls	100	812.7±52.3	50.12±1.69	5.49±0.44	56.1±4.2
P value		<0.001**	<0.001**	<0.001**	<0.001**

The values are expressed as mean ± standard error of mean, The numbers of cases or units are given in parenthesis

Table 2: Correlation of semen fructose concentration (mmol/l) and sperm motility (%) of infertile males

Variables	Correlation coefficient	
	R	r ²
Fructose concentration / sperm motility	0.61	0.3725*
Corrected fructose concentration / sperm motility	0.6	0.3692*

Figure 1: Sperm Count in case and control Groups

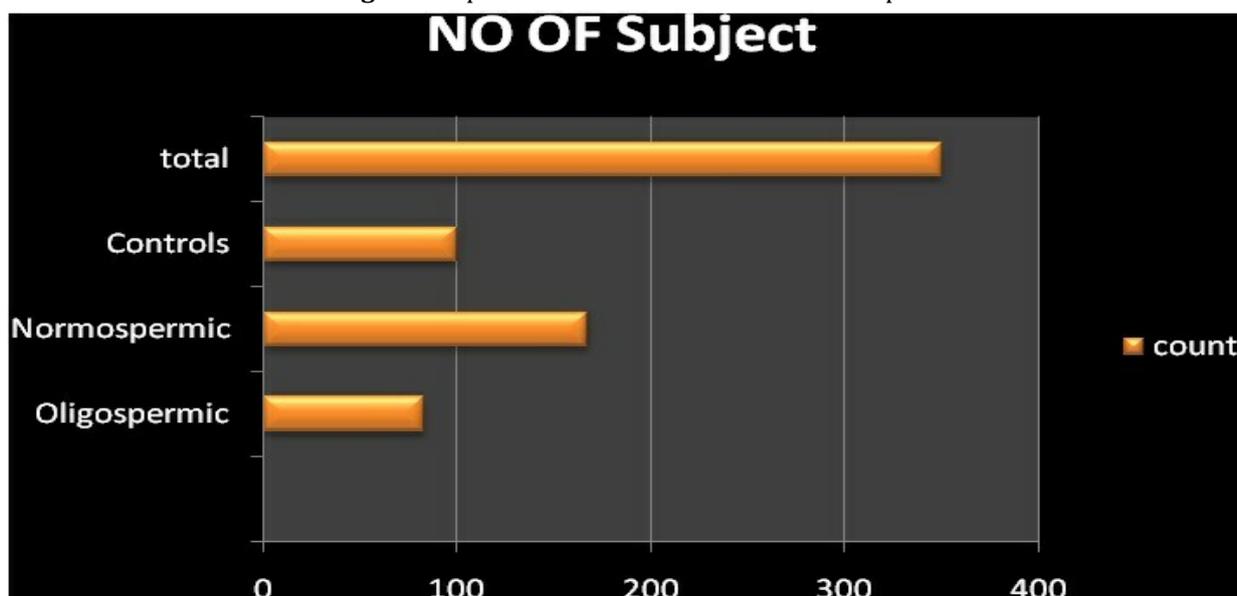


Figure 2: Shows Sperm motility in Control group and in Normospermic and Oligospermic Males.

