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A Comparison of Sperm Motility Between Fertile and Infertile Males

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Abstract

Background: **To determine the sperm motility of proven fertile males and compare this with that of infertile males.**

Methods: **The study design was cross-sectional comparative and was carried out at Islamic International Medical College Rawalpindi and its attached Railway hospital and Islamabad Clinic Serving Infertile Couples Islamabad, from June 2005 to July 2006. Fifty healthy fertile males were selected and their sperm motility was determined with the latest Makler's chamber, while another 50 infertile males were recruited as controls. The sampling technique used was convenience non-probability. Inclusion criterion for proven fertile males was pregnancy achieved within one year of marriage with successful coituses. In case of infertile males it was failure to achieve pregnancy without the use of assisted reproductive techniques, with no infertility factors in the female partner. The semen samples were obtained at the laboratory after 3 to 4 days of sexual abstinence with clear written and oral instructions given to the subjects before the collection of the sample.**

Results: **The infertile group was found to be statistically older than the proven fertile group i.e. (36.60 versus 31.32 years). Proven fertile group showed significantly higher motility (60.32 ± 10.80%) and progressive motility (14.32 ± 8.31%) than the infertile male group.**

Conclusion: **Sperm motility is useful in in-vivo situation to find males having a greater possibility of infertility problem. More studies with a larger sample size are required to establish a cut-off value in the local population.**

Key Words: **Sperm morphology, Strict criteria, Fertile males, Semen parameters.**

Introduction

Fertility is defined as the capacity to conceive or induce conception and infertility as the diminished ability to produce offspring. Male factor contributes about 30 to 40 % to infertility[1]. Clinicians have tried in the recent past to identify male partners in couples having significantly lower chance of fertilization in vitro[2] or in intrauterine insemination (IUI) programmes[3,4]. In-vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI) performed for male factor has been shown to have significantly higher chances of conception than when performed for female factor[5].

MacLeod in 1942, MacLeod and Gold in 1953, Eliasson in 1971 and Hellinga in 1949 and 1976 have led the scientific basis of conventional analysis of spermatozoa. Their recommendations are still considered as reference over more advanced methods[6]. Unfortunately, many aspects of sperm distribution remain unclear in both normal and abnormal semen in spite of an abundance of publications.

The estimation of sperm concentration, motility and morphology is the main-stay of the assessment of male reproductive health[7]. Sperm motility has been widely associated with the fertility[8]. Although, fertile population have rarely been studied, widely used thresholds for normal semen measurements have been published by the World Health Organization. However, the available norms for sperm concentration, motility, and morphology fail to meet rigorous clinical, technical, and statistical standards.

In recognition of these limitations, the nomenclature in the most recent WHO manual[7] for semen evaluation was changed from 'normal' to "reference" values. A recent study concluded that thresholds of less than 5% normal sperm morphology and progressive motility of less than 14% should be used to identify the infertile male[9]. A concentration of

less than 15 x 106/ml and a motility of less than 30% should be used to identify the infertile male[10, 11].

The aim of the study was to determine the sperm motility of proven fertile males and compare it with that of infertile males.

Patients and Methods

This was a cross-sectional comparative study comparing a fertile population with an infertile group. The study was conducted from June 2005 to July 2006 at Islamic International Medical College and its attached Railway hospital as well as and Islamabad Clinic Serving Infertile Couples, Islamabad. The sampling technique was convenience non probability. Inclusion criterion for proven fertile males was pregnancy achieved within one year of marriage with successful coituses. For infertile males it was failure to achieve pregnancy without the use of assisted reproductive techniques, with no infertility factors in the female partner. The exclusion criteria was secondary infertility, high grade fever, tuberculosis, mumps, orchitis, chronic debilitating illness, varicocele, sexually transmitted diseases or any drug affecting male fertility e.g. beta-blockers, anti-neoplastic agents etc.

Husbands of fifty pregnant women attending the antenatal clinic at Railway hospital Rawalpindi were asked to participate in the study and their semen collected for analysis. Another fifty infertile men were recruited into the study as a control group, as they consulted at the Islamabad Clinic Serving Infertile Couples, Islamabad. Proforma was completed and an informed consent obtained.

The semen samples were obtained after 3 to 4 days of sexual abstinence in the laboratory and the subjects were given clear written and oral instructions. The semen sample was allowed to liquefy completely and then mixed with plastic transfer pipette. A drop of 10 – 15 µl of semen in the center of Makler's chamber was placed and covered with cover glass, any bubbles were avoided. Once cover glass was placed further lifting or touching was avoided which could disturb the uniform layer of sperms. Total number and motile number of sperms in 10 squares of the grid under phase contrast microscope at x20 magnification were counted. Three observations were taken and an average number of total sperm count and motile sperm count calculated. This gave number of sperms x 106 /ml. Percentage of motility was calculated by the formula[12]:

Percentage of Motility = Average number of motile sperm x 100 divided by the average number of total sperm

The forward progression, usually graded by eye, is more subjective and depends on the person analyzing. This was standardized in the laboratory in order to avoid person to person variation. A small drop of liquefied semen sample (5 - 10µl) was placed on a labelled glass slide and covered with a 22x 22mm cover slip. Observation was taken under phase contrast at x40 magnification. Progression scoring was taken as an average of at least three fields, away from the edges, with uniform film, so that all the sperms were focused under the same plane.

The score given to progression was as follows7:

0/4 Dead Sperms
1/4 Non-motile or non-progressive, with no forward movement, sperm twitching either head or tail on the same spot
2/4 Sluggish progressive movement laterally, not directional
3/4 Sluggish to normal forward progression
4/4 Good to excellent forward progression

Results were entered into SPSS version 10.0. Descriptive statistics were used to calculate mean and standard deviations for numerical data. These were compared using t-tests at a confidence level of 95%.

Results

The results of this study are summarized in Tables 1 and 2. The infertile group was found to be statistically older than the proven fertile group i.e. (36.60 versus 31.32 years). However, the minimum age for the proven fertile males was 20 years and maximum was 49 years, as against 27 and 51 years respectively for the infertile male group. Table 1 gives Mean ± SD sperm motility percentage in proven fertile and infertile group.

Table 1. Motility Percentage of Proven Fertile and Infertile Group

Group	Motility Percentage
Proven Fertile (n=50) (Mean ± SD)	60.32 ± 10.80
Infertile (n=50) (Mean ± SD)	42.76 ± 23.38

p-Value	0.000

The motility was significantly higher in the proven fertile males (p =0.000). Table 2 illustrates Mean ± SD sperm motility grading in proven fertile and infertile group. This was found to be significantly higher in the proven fertile males as compared to the infertile males in grades 3/4, 2/4, 1/4, and significantly less in grade 0/4. However the difference was insignificant in grade 4/4 between the two groups.

Table 2. Sperm Motility Grading of Proven Fertile and Infertile Group

Group	4/4	3/4	2/4	1/4	0/4
Proven Fertile (n=50) (Mean ± SD)	0.000 ± 0.000	14.32 ± 8.31	36.62 ± 11.10	9.38 ± 6.15	39.68 ± 10.80
Infertile (n=50) (Mean ± SD)	0.000 ± 0.000	7.32 ± 6.85	28.60 ± 18.78	6.84 ± 6.08	49.24 ± 24.49
p-Value		0.000	< 0.011	< 0.040	< 0.013

Discussion

Sperm motility becomes critical at the time of fertilization because it allows or at least facilitates passage of the sperm through the zona pellucida[12]. It has also been found to be strongly associated with the probability of conception[8,13,14]. Poor sperm motility reduces the penetration of the spermatozoa in cervical mucus and sperm transport towards the site of fertilization.

Several studies have shown relationships between time to pregnancy or duration of infertility and the proportion of motile sperm cells in various populations[13,15-17]. In view of this, the analysis of sperm motility is considered a good indicator of the likelihood of conception in fertile men[18]. Sperm motility is therefore routinely monitored in the and rology laboratory because it is crucial in the assessment of the infertile male[19]. It has also been found to have a high predictive value, since asthenozoospermia is considered one of the most frequent causes of male infertility[20].

Gauci et al[21] found percentage motility a significant predictor of IUI outcome. The pregnancy rate was almost three times higher in the group with motility >50% as compared with the group with motility <50%. Menkveld et al[22] calculated a threshold value of 20% for the motility (i.e. fertile population when above this threshold). Gunalp et al[23] gave a threshold value of 30% for the sperm motility. In a similar study by Guzick et al[24] threshold value for the motility was found to be 32%. More recently Keel [25] calculated mean value for motility as 63.5% in normal men, which is almost consistent with our study where mean value for motility was found to be 60% in the proven fertile males, This is possibly because the sample size was close to ours and also the methodology used was the same in both the studies. The difference in the threshold value of motility of Menkveld et al[22] and the other studies is possibly because values of 20 × 106/ml for sperm concentration were taken as inclusion criteria in their study.

Gunalp et al[23] also calculated thresholds for progressive motility, where a lower threshold of 14% was found for progressive motility. In this study by Gunalp et al[23], progressive motility was proved to be a marginally better predictor of infertility than sperm morphology. The mean progressive motility in our study was found to be 14% in the proven fertile group which is consistent with the threshold value for progressive motility calculated by Gunalp et al[23] in their study. The results are alike possibly because of the same study design and methodology.

Conclusion

Sperm motility is useful in in-vivo situation to find males having a greater possibility of infertility problem. More studies with a larger sample size are required to establish a cut-off value in the local populaion. Husbands of women attending antenatal clinics should be motivated to give semen samples in order to get a larger sample.

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