TREND OF FERTILITY POTENTIALS WITH INCREASING AGE IN PAKISTANI MALES

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ABSTRACT

Objective: *The objective being to examine the magnitude and the shape of the relationships between age and semen volume, sperm concentration and sperm motility by keeping the other factors affecting fertility directly constant among patients undergoing infertility evaluation at National Institute of Health, Islamabad, Pakistan.*

Methodology: *This experimental study with non-probability sampling was conducted in Reproductive Physiology/Health, Public Health Laboratories Division, National Institute of Health, Islamabad during 2006-2009.*

Results: *A total 350 patients (21-50 years) were divided age wise into three groups (21-30, 31-40 and 41-50 years) to compare alteration in sperm count and motility. Semen profile was evaluated according to WHO reference value for normal semen characteristics. The result of Sperm concentration showed a non significant ($p>0.05$) decreasing trend with increasing age that was 0.047million/ml for every year where as sperm motility declined significantly with increasing age at $p>0.05$.*

Conclusion: *Age-related decreases in semen qualities particularly decline in sperm motility revealed that men may become progressively less fertile as they age. However, unlike women, there appears to be no evidence of an age threshold for men.*

Key words: *Age, Sperm count, Sperm motility.*

INTRODUCTION

Aging affects the efficiency of nearly all physiological processes. On the other hand human spermatogenesis continues well into advanced ages, allowing men to reproduce even during senescence. It is well known that maternal age is a significant contributor to human infertility[1], primarily due to the precipitous loss of functional oocytes in women by their late thirties[2]. Along with this fact understanding, the effect of male age on fertility has become increasingly important in public health because of growing number of men choosing to father the children at older ages[3]. Approximately 15% couples of reproductive age of most of the populations are infertile and half of them are due to the male factor[4, 5]. In the United States, for example, there has been a 24% increase in the birth rate for fathers aged 35 to 54 years since 1980. However, advanced male age has been associated with significant reductions in pregnancy rates, increased time-to-pregnancy and increased subfecundity[6].

According to study, men older than 35 years had half the chance of fathering a child within 12 months compared with men aged less than 25 years, after controlling for women's age and other factors[7]. Increase in age and exposure to toxic agents affect the semen quality that is generally considered to be a proxy measure of male fertility[6-8]. Another review from clinical studies by Kidd *et al*, 2001 suggests that age is associated with diminished semen volume, sperm motility and/ or sperm morphology, but that sperm concentration is affected little by age[9].

Although an improvement in the socioeconomic status has increased the life

expectancy of human beings during recent decades in developed countries. But higher maternal and paternal age due to campaigns of controlling birth rate in underdeveloped countries has raised the question of fertility maintenance. However, it is unclear that whether these observations are applicable to the general population of healthy men or not because the potential confounders including smoking history or duration of abstinence that might explain changes with age were seldom controlled. The objective of the present study was to examine the magnitude and the shape of the relationships between age and semen volume, sperm concentration and sperm motility by keeping the other factors affecting fertility directly constant among patients undergoing infertility evaluation at National Institute of Health, Islamabad, Pakistan.

METHODOLOGY

In this study 350 semen samples were collected from the patients referred by the different medical centers located at the twin cities of Pakistan i.e., Islamabad and Rawalpindi at Reproductive Physiology Department of Public Health Laboratories Division, National Institute of Health, Islamabad. The age of the patients were varied from 21 years to 50 years. All the patients were divided in to three groups. The 1st group (n=167), 2nd group (n=157) and 3rd group (n=26) were included within the age ranges of 21-30, 31-40 and 41-50 years, respectively.

According to the nomenclature of semen recommended[10], semen sample were categorized as: without spermatozoa (Azoospermia), motility less than 50% (Asthenozoospermia), volume less than 2 ml and more than 6 ml (Hypospermia and Hyperspermia, respectively) sperm concentration less than 20 million/ml and more than 250 million/ml (Oligozoospermia and polyzoospermia, respectively) while the semen sample having progressive activity more than 25 percent (overall motility>50%) with sperm concentration within the range of 20 to 250 million/ml were classified as normozoospermia. Our data consisted of samples whose concentration was within the range of 20 to 250 millions per ml and motility was more than 20 percent.

The patients were examined, consent form was obtained and interviewed for detail history including their nutrition, living status in order to maintain all other factors constant that might affect the fertility of the patients. Semen analysis was performed according to the procedure described in the[10] at Reproductive Physiology Department of Public Health Laboratories Division, National Institute of Health, Islamabad.

The samples were collected in plastic bottles and subjected for the analysis of physical parameters i.e., color, consistency, volume, liquefaction time, Agglutination clumps and pH. After liquefaction each specimen was thoroughly mixed with the help of glass rod and then

Table 1: Showing the Mean & Confidence Intervals of Seminal Parameters In Various Age Groups

(Means sharing a common letter do not differ significantly, others differ significantly (p < 0.05)

Parameter	Groups	n (Cases) %	Mean ± S.E	Confidence interval (95%) C.I	Range (Min-Max)
Age (Years)	Group I	167 (47.74 %)	27.4±0.2 [a]	27.0-27.8	21-30
	Group II	157 (44.86 %)	35.4±0.2 [b]	35.0-35.9	31-40
	Group III	26 (7.42 %)	43.9±0.5 [c]	42.8-44.9	41-50
Sperm Mill/ml	Group I	167 (47.74 %)	113.0±4.7[a]	103.7-122.3	23-250
	Group II	157 (44.86 %)	110.4±4.6[a]	101.3-119.5	22-231
	Group III	26 (7.42 %)	92.8±10.2[a]	71.9-113.8	27-190
Motility %	Group I	167 (47.74 %)	52.8±0.9[a]	51.0-54.7	20-75
	Group II	157 (44.86 %)	51.4±0.9[a]	49.6-53.2	20-70
	Group III	26 (7.42 %)	44.9±3.0[b]	38.8-51.0	22-70

Figure 1: Trend of sperm concentrations changes in different age groups.

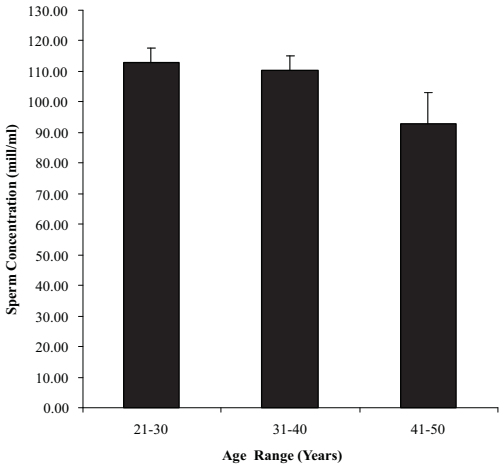
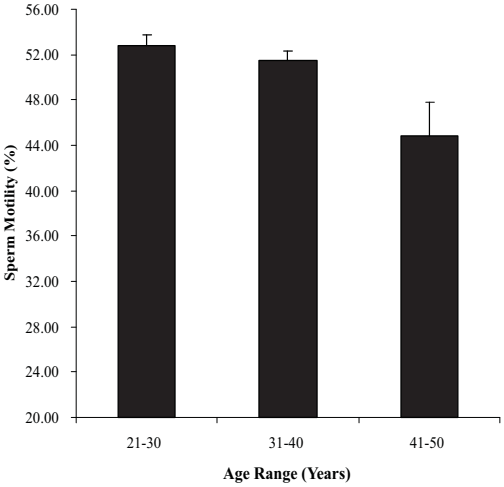


Figure 2: Trend of motility changes in different age groups



examined for microscopic parameters like concentration, motility, agglutination, pus cells and particulate debris under microscope. Total sperm count was obtained by counting the sperms in an improved Neubauer haemocytometer after diluting the semen sample with diluting fluid (1:19) ratio[10].

All statistical analysis were performed by using SPSS (Version 10.0 for windows) software and graphs were prepared and the application of regression and correlation was done with the help of Microsoft Office Excel 2003. Differences between groups were analyzed by using anova followed by the Bonferroni post-hoc test. $p < 0.05$ was considered as statistically significant.

RESULTS

The semen samples of the patients within the age range of 21-50 years were arranged in three groups i.e., 1st, 2nd and 3rd within the age range of 21-30, 31-40 and 41-50 and number of samples in each group was 47.74%, 44.86%, and 7.42 % of all the samples under consideration, respectively. The mean concentration in first, second and third group were 114.0±4.9, 110.4±4.6, and 92.8±10.2 million/ml (Fig-I) and mean motility were 52.8±0.9, 51.4±0.9, and 44.9±3.0 percentage (Fig-II) and mean volume were 3.5±0.1, 3.7±0.1 and 3.7±0.3 ml and mean pH were 8.4±0.0, 8.4±0.0 and 8.4±0.3, respectively. Slightly negative correlation was seen between age and sperm concentration (r= -.047) and data evaluated through linear regression analysis reveals that the decrease in semen concentration was 0.047 million/ml for every year of passing age but this decrease was not found significant at $p>0.05$. The motility on the other hand decreases significantly at $p>0.05$ and was negatively Correlated with age (r=-.164). Volume of ejaculate and pH both varied insignificantly among the patients in these three groups.

DISCUSSION

The process of spermatogenesis continues well in advanced ages of men but the clue about its contribution can not be ignored because 50 % of all infertility cases are due to male factor abnormalities either isolated or combined with female factor disorders[5]. Generally male fertility is assessed by considering the semen quality. Our present data indicates that the decrease in concentration was not significant at p >0.05, while the trend of decrease in motility and volume is seen significant. The analysis of data through correlation (r=-0.047) also indicates the decreasing trend in sperm concentration with age of patients but not significant (p >0.05). Similar findings were seen in a study in which the number of sperm formation arising from spermatogonium reduced[11]. Furthermore, the present findings are generally consistent with some previous studies which demonstrated a decreased pregnancy rate and longer time to pregnancy in partners of older men[9, 12-14]. The trend of decrease in motility of spermatozoa, although gradual but becomes prominent after the age of 40 years due to alterations of semen parameters that may have several causes such as urogenital infections, vascular diseases, infection of accessory glands or an accumulation of toxic substances[15].

Some studies performed on clinical trails reported similar findings of a significant decrease in semen motility [13, 16, 17]. The finding of decreased sperm motility with age was consistent with the findings of others[18], whose study also included a large number of men aged over 60 years. The age-dependent changes observed in semen quality may be due to cellular or physiological changes in the genitourinary tract with ageing as reported in autopsies of men who died from accidental causes, there have been age-related narrowing and sclerosis of the testicular tubular lumen, decreases in spermatogenic activity, increased degeneration of germ cells, and decreased numbers and function of Leydig cells[19]. Changes in the prostate that occur with ageing, such as smooth muscle atrophy and a decrease in protein and water content, may contribute to decrease the sperm motility[20]. In addition, there may be age-related changes in the epididymis where sperm acquire the capacity for vigorous forward motility during transit. The epididymis is a hormonally sensitive tissue, which plays an important role in sperm maturation[21]. Thus, hormonal or epididymal senescence may lead to decreased motility in older men. Also, older men may have decreased capacity to repair cellular and tissue damage from toxicant or disease exposure. The other causes are the increased opportunities to suffer reproductive damage from exogenous exposures or diseases[8].Every person exposed to number of toxic agents during aging process[8], pathogenic microbes[15], that gradually damage the quality of semen parameters and ultimately reduce the fertility particularly in under developed countries because of poor standard of living. Older men have had illnesses including genitourinary infections. Male age may also be a proxy for a 'cohort effect'; that is, a common specific exposure experienced by men in the same birth cohort. For example, men who were born prior to 1972 were more likely to have been exposed to DDT, an endocrine disruptor, which was later banned[6, 22]. In the present study, the decline in semen quality could be due to some unknown occupational exposure that was related to age. Furthermore, the age-dependent alterations of testicular histology and semen parameters are accompanied by a significant increase in FSH[18] and a slight but significant decrease in inhibin B[23, 24], which are also found in men with apparently normal semen parameters.

In summary, significant age-related decreases in semen qualities were observed, most notably for sperm motility. Because semen quality is a proxy for fertility, this data suggests that men may become progressively less fertile as they age. However, unlike women, there appears to be no evidence of an age threshold for men. The present findings have important implications for men who choose to delay fatherhood, since they may reduce their chance of success the longer they delay. We further suggest that there is need to evaluate the effect of all other factors like different pollution element, nutrition status and standard of living on semen quality reduction in healthy population by keeping the age factor constant as this factor have a definite role in reproductive physiology directly or indirectly.

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