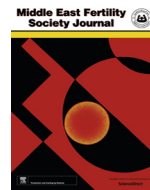


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Original Article

Semen quality among different professional groups: A retrospective study in a teaching hospital

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1. Introduction

Infertility refers to the inability to contribute conception after 12 months of unprotected intercourse. It may be due to either female or male or some unexplained reasons. Retrospective studies revealed that around 10–15% couples are infertile worldwide, and around 35–40% infertility cases are due to the male partner [1]. Rise in male infertility has been alarmed all over the world affecting around 60–80 millions of couples in most developed and developing countries. World Health Organization (WHO) has estimated that around 3.9–16.8% Indian couples are infertile [2]. On the other hand, similar analysis of the third national health survey of India covering 29 states recorded differential percent values of infertile couples including metropolitan cities [3,4] that corroborate WHO findings, in general. Moreover, male infertility of the country is in the increasing trend from 40% in 1980 to 60% in 2014 [5].

Changed lifestyles and environment at occupation are the ascribed factors for deterioration of male reproductive health, apart from systemic and clinical causes [6]. In addition, addiction to alcohol, smoking and caffeine, intake of junk foods, the use of electronic items such as, cell phone in present day lifestyle interfere with hormone actions controlling spermatogenesis and the development of secondary sexual characters with the disruption of sperm chromatin integrity [7]. Further, reduced physical activity in work environment leads to obesity in many males that eventually alters androgen to oestrogen (AR/ER) ratio, essential for

spermatogenesis [6]. Erectile dysfunction (ED) is another problem behind obesity in males, often correlated to diabetes mellitus type II [8]. In addition, carrier oriented individuals prefer delayed parenthood with the use of contraceptives that often landed at infertility. Other lifestyle factors include overtime work and inadequate sleep, often violate circadian rhythm affecting the reproductive axis too [9].

Additionally, subjects in daily life often get exposed to several thermogenic factors arising from occupation, clothing, incorrect sitting postures and other physical activities [10]. In normal conditions, testicular temperature is maintained 3 °C lower than the core body temperature and is an important prerequisite for an efficient spermatogenesis [11]. Any alteration to the thermoregulation of testes could be detrimental to the spermatogenesis process. Reduced testicular weight, mitochondrial degeneration, epididymal membrane damage, loss of zona binding capacity and penetration to oocytes were seen in animal studies; in human germ cell apoptosis, DNA damage, production of reactive oxygen species and impairment of embryonic development are the reported consequences to heat stress in hyperthermic testes [12–14]. Some reports suggested the association of impaired spermiogenesis and increased rate of pathospermia in professional drivers [15,16]. Continuous sedentary position at work was reported to cause increase in scrotal temperature [17]. However, a previous report on sedentary workers suggested that continuous sitting for more than 30 h per week had no adverse effect on any of the cited semen parameters [18].

In the present retrospective study, semen quality of different professional groups was presented and further sub-grouped to find the intensity of several factors, especially the heat exposure. Eventually, this could help to overcome the issue of male infertility management during assisted reproduction techniques.

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2. Materials and methods

2.1. Patient selection

Male partners of 20–40 years of age from the infertile couples attending the infertility unit of this hospital from May 2012 to July 2015 were included in the study after getting the ethical approval from institutional ethical committee. Consent of each patient was taken and a common questionnaire was given to each patient for the clinical history during counseling. Their profession and duration of exposure at work place were ascertained. To analyze the impact of prolonged sitting/driving on semen quality, sedentary workers and professional drivers within 40 years of age were included. Exclusion criteria were patients under any antibiotic treatment, infections, other medical (diabetes/hypertension/mumps/STD) and surgical history (hernia/hydrocele/reversal vasectomy/varicocele/ectomy/testicular biopsy/undescended testis), addicted to any narcotic/alcohol, and known azoospermia, etc.

2.2. Semen analysis

Collected semen samples were analyzed in the andrology laboratory within 30–60 min, after liquefaction at 37 °C. Parameters such as, semen volume, total sperm count, percentages of spermatozoa with progressive motility, vitality and normal spermatozoa were analyzed, according to the WHO standard criteria [19].

2.3. Assessment of nuclear condensation defects

To evaluate the nuclear condensation defects (%), slides were prepared by smearing 5 µL of either raw or washed semen samples and fixed in 3% glutaraldehyde for 30 min. The smear was dried and kept in 5% aqueous aniline blue solution at pH, 3.5 for 5 min.

Immature spermatozoa with defective nuclear condensation takes up blue stain due to higher lysine content in histone-rich nuclei. On the other hand, protamine rich nuclei of mature spermatozoa rich in arginine and cysteine with relatively low levels of lysine do not take up the stain. The percentage of spermatozoa stained with aniline blue is determined by counting 200 spermatozoa per slide under a bright field microscopy at 1000×, as specified [20].

2.4. Data analysis

Using statistical programme for social sciences (SPSS), Inc version 20.0, association of semen parameters with duration of sitting and driving was analyzed by the application of Pearson's correlation coefficient, *r*. Student's *t* test was applied to compare the mean values of semen parameters between group of subjects at sedentary work and professional drivers.

3. Results

Semen samples of 1132 male partners were analyzed. From the questionnaire, subjects were balkanized according to their professions, drug addiction, disease/their surgical history (Table 1). Among them, 0.8% were addicted to alcohol, smoking 3.5% and 21.1% were addicted to chewing tobacco. Among professional groups, percentage of males with business (30.7%) and job (53.5%) were higher than other professionals. Semen parameters had different ranges of volume, total count in millions, progressive motility, vitality and percentage of normal sperm morphology. With respect to semen quality, 55.2% subjects were normozoospermia, 22.6% oligoasthenozoospermia, 10% asthenozoospermia, 5.6% oligozoospermia, 0.6% asthenoteratozoospermia, 2.9% oligoasthenoteratozoospermia and 0.45% azoospermia. Sperm count and motility parameters were affected in farmers, drivers, labourers,

Table 1
Values of semen parameters among different groups of subjects (mean ± SE).

Subjects	Subjects n (%)	Semen volume (mL)	Total sperm count (millions)	Progressive motility (%)	Vitality (%)	Normal morphology (%)
<i>Professional groups</i>						
Business	348(30.7)	3.5 ± 0.1	73.8 ± 3.1	33.2 ± 0.9	66.1 ± 0.9	15.1 ± 0.3
Job	606(53.5)	3.4 ± 0.06	79.2 ± 2.5	33.9 ± 0.7	63.5 ± 0.8	14.5 ± 0.25
Farmer	47(4.2)	3.3 ± 0.2	72.23 ± 8.7	31.9 ± 3.0	61.4 ± 3.8	12.2 ± 0.8
Driver	55(4.9)	3.06 ± 0.1	44.7 ± 3.6	32.9 ± 1.9	66.3 ± 2.7	12.7 ± 0.8
Labourer	50(4.4)	3.3 ± 0.1	74.33 ± 9.1	32.6 ± 2.6	62.3 ± 3.0	13.8 ± 0.8
Others	26(2.3)	3.6 ± 0.25	70.5 ± 11.2	30.8 ± 3.7	64.7 ± 3.6	12.9 ± 1.2
<i>Disease/surgical history</i>						
Diabetes	21(1.9)	3.06 ± 0.1	87.57 ± 14.1	35.5 ± 2.8	69.0 ± 3.1	13.7 ± 1.1
Mumps	4(0.35)	2.9 ± 0.1	88.1 ± 31.4	49.2 ± 7.9	90.5 ± 1.9	12.2 ± 0.9
Hydrocele/hernia	64(5.7)	3.6 ± 0.1	51.9 ± 6.7	28.3 ± 2.3	61.2 ± 2.9	12.7 ± 0.8
Varicocele	15(1.32)	3.6 ± 0.2	45.32 ± 10.8	32.2 ± 5.2	67.7 ± 4.0	14.2 ± 1.7
<i>Addiction</i>						
Alcohol	9(0.8)	3.3 ± 0.07	54.3 ± 23.1	28.3 ± 5.7	59.7 ± 4.5	10.4 ± 2.3
Tobacco smoker	39(3.5)	3.5 ± 0.2	33.4 ± 4.3	25.5 ± 3.1	61.6 ± 3.7	10.8 ± 0.7
Chewer	239(21.1)	3.37 ± 0.06	48.31 ± 1.7	32.7 ± 1.1	67.66 ± 1.0	11.91 ± 0.24

Note: In parenthesis percent value of each profession is given; total number, n = 1132. Others were, welder (n = 6), carpenter (n = 3), thermal plant worker (n = 6), painter (n = 4), plumber (n = 3), social worker (n = 4).

Table 2
Semen quality of sub-fertile males among different professional groups.

Professional groups	Normozoo-spermia	Oligostheno-zoospermia	Astheno-zoo-spermia	Oligozoo-spermia	Oligoastheno-teratozoospermia	Azoo-spermia
Business	52.2	25.0	10.3	7.2	2.6	1.1
Job	58.4	21.3	9.6	4.6	2.6	3.0
Farmer	51.1	19.1	10.6	8.5	0	10.6
Driver	52.7	20.0	10.9	3.6	7.3	5.5
Labour	52.0	24.0	8.0	8.0	4	2.0
Others	42.3	30.8	15.4	0	7.7	0

Note: Values were presented in percentage.

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