

Original article:

Environmental and occupational factors leading to oligospermia : A pilot study

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Abstract:

Background: The various lifestyle factors affect the fertility in men. The aim of our study was to study the risk factors associated with infertility in men and compare these factors between primary and secondary infertility

Material and Methods: A detailed questionnaire was prepared and a detailed history was taken from patients. Semen count and number of motile sperms were counted. A total of 50 cases with low sperm count were recruited for the study.

Results: We observed high odd's ratio of alcohol intake, tobacco chewing, smoking, occupational heat exposure, medication in chronic illness and long hours of driving for secondary infertility than primary infertility.

Conclusion: Lifestyle factors as well as occupational hazards contribute significantly in predisposition of secondary fertility in men when compared to primary infertility.

Keywords: Infertility, Lifestyle factors, Occupational hazards

Introduction

It has been estimated that 15-20% of couples attempting to achieve pregnancy are unable to conceive. A male factor is the main single diagnostic category in more than half of them (1). Gradual decline in sperm production in men has become a growing concern and subject of widespread debates in the last decades (2). Several factors have been implicated as possible causes of the deterioration of the male reproductive function, including changes in lifestyle and exposure to heat (3). Testicular function is temperature dependent and requires a temperature 2-4°C below body temperature (4). Elevated testicular

temperature is a well-documented mechanism of abnormal spermatogenesis in common diseases associated with male infertility eg. varicocele, undescended testis (5).

The effect of ageing on male fertility is not clear. Fertilization rates are usually over 60% for men under 39 years but for those over that age, the rates fell to slightly over half. Other factors include emotional stress, environmental pollutants like benzene, DDT, PCP, Toluene, Xylene as well as many pesticides in our food and drinking water, drugs like cocaine, heroin, LSD and medications like

cimetidine, antihistamine, sulphasalazine and long term dialysis can lead to low counts.

Smoking impairs sperm count, sperm motility, reduces sperm lifespan and may cause genetic changes in the offspring. Chronic alcoholism also leads to low sperm count. Relaxation activities including hot sauna baths, hot tubs, laptop usage on lap, driving for long periods, heated waterbeds and electrical blankets are big culprits due to increased scrotal temperature. Other contributory factors are tight nylon underwear, bicycling for long hours, obesity all lead to low sperm counts. Genetic factors also contribute to male infertility. Inherited conditions like cystic fibrosis, Klinefelter's syndrome, Kartagener's syndrome may lead to oligospermia. Exposure to heavy metals like lead, arsenic, cadmium may effect sperm production. Radiation treatment and X rays in significant levels and for considerable period of time can impair sperm production. Surgical conditions like varicocele, blockage of epididymis or ejaculatory ducts, production of antisperm antibodies after vasectomy may lead to low sperm counts. Sexually transmitted infections, mumps are associated with male infertility.

Various conditions like diabetes, bladder, prostate or urethral surgery leading to retrograde ejaculation can lead to low sperm counts. Sexual issues like premature ejaculation, erectile dysfunction can also lead to infertility. The aim of the present study to see the effects of various factors that contributed to low sperm counts in males particularly the effects of lifestyle, environmental and occupational factors on primary and secondary male infertility.

Material and Methods

The prospective study was conducted in the Department of Lab Medicine, AIIMS, from a period of February 2008 to July 2008 . A detailed ques-

tionnaire was prepared and a detailed history was taken.

Semen was collected after a three day abstinence period in a clean wide mouthed 5 ml container. Liquefaction time was noted for each sample and thereafter sperm counts were done in a Neubauer's chamber. Low counts were defined as counts below 20million/ml. Sperm motility was seen in a wet mount. Low motility was defined as less than 40% actively motile or greater than 60% non-motile. Haematoxylin eosin stained smears were prepared of those samples that showed abnormal morphology on wet mount. These included pin heads, monster heads, double tailed sperms etc. Their percentage was calculated.

A questionnaire included the following important points Age of the patient, duration of infertility, whether primary or secondary infertility, h/o of emotional stress, rural or urban background, occupation, alcoholism or any drug dependence, h/o tobacco chewing, long hours of driving or cycling for long hours, h/o of any chronic illness or intake of any medications for a prolonged period, h/o of any neurological problem like premature ejaculation or erectile dysfunction disorder ,h/o of sexually transmitted disease, mumps or fever at the time of giving sample, wearing tight nylon underclothing, hormonal status, h/o of administration of radiation for a prolonged period.

Statistical Analysis : The data were entered into the computer database and responses were calculated and analyzed by using statistical software SPSS version 11.0. Prevalence of an outcome variable along with 95% confidence limits was calculated. Both, descriptive and inferential statistics were used to depict the features and characteristics of the data. Continuous variables were expressed as mean±

standard deviation. Non-continuous variables were expressed as number of occurrences and percentage.

A value of $p < 0.05$ was considered significant.

Table 1: Subject characteristics

Characteristics (n = 50)		Mean or number of occurrences (percentage)
Age (years)		30.68±6.14
Duration of infertility (years) post marriage		6.91±4.13
No. of count (million/ml)		8.46±5.35
Non motility (%)		63.30±28.28
Type of Infertility (Primary)		42 (84.0%)
Addiction	Alcohol	4 (8.0%)
	Smoking	4 (8.0%)
	Tobacco/Gutka	13 (26.0%)
Medication for chronic illness		7 (14.0%)
Neurological disorder		6 (12.0%)
Cycling		7 (14.0%)
Driving		4 (8.0%)
Surgery		2 (4.0%)
Varicocele		3 (6.0%)
Atrophic testis		5 (10.0%)
Trauma		1 (2.0%)
Wearing of tight nylon undergarment		2 (4.0%)
Occupation	Heat exposure	8 (16.0.0%)
	Chemical exposure	10 (20.0%)
Emotional stress		6 (12.0%)
Infection past /present		5 (10.0%)
Idiopathic (No known cause)		3 (6.0%)

Table 2: Comparison of risk factors in Primary and Secondary Infertility in men

Variable	Primary infertility (n=42)	Secondary infertility (n=8)	P value(OR Ratio)
<i>Age (years)</i>	30.12 ±5.89	33.63±6.97	0.1398
<i>No. of count (million/ml)</i>	8.43±5.52	8.63±4.66	0.9240
<i>Non motility (%)</i>	62.74± 28.67	66.25±27.74	0.7512
<i>Alcohol</i>	3 (7.1%)	1 (12.5%)	0.514(1.857)
<i>Smoking</i>	3 (7.1%)	1 (12.5%)	0.514(1.857)
<i>Tobacco/Gutka</i>	10 (23.8%)	3 (37.5%)	0.413(1.920)
<i>Medication for chronic illness</i>	5 (11.9%)	2 (25.0%)	0.3098(2.467)
<i>Neurological disorder</i>	5 (11.9%)	1 (12.5%)	0.9621(1.057)
<i>Cycling</i>	6 (14.3%)	1 (12.5%)	0.8939(0.8571)
<i>Driving</i>	2 (4.8%)	2 (25.0%)	0.1152(6.667)
<i>Surgery</i>	2 (4.8%)	0 (0.0%)	0.5287(0.9529)
<i>Varicocele</i>	3 (7.1%)	0 (0.0%)	0.4356(0.6639)
<i>Atrophic testis</i>	4 (9.5%)	1 (12.5%)	0.7970(1.357)
<i>Trauma</i>	1 (2.4%)	7 (87.5%)	<0.001(287.0)
<i>Wearing of tight nylon undergarment</i>	2 (4.8%)	0 (0.0%)	0.5287(0.9529)
<i>Heat exposure</i>	5 (11.9%)	3 (37.5%)	0.1992(4.440)
<i>Chemical exposure</i>	9 (21.4%)	1 (12.5%)	0.9232(0.5232)
<i>Emotional stress</i>	5 (11.9%)	1 (12.5%)	0.9621(1.057)
<i>Infection past /present</i>	5 (11.9%)	0 (0.0%)	0.6996(0.4011)

RESULTS

The study included 50 males aged from 22 to 46 years with 2 to 20 years of infertility duration post marriage. Subject's characteristics are listed in Table 1. Subjects with primary infertility were compared with those with secondary infertility after one live issue. Age, duration, counts, motility, addiction, medication, cycling, driving, wearing of tight nylon undergarment, occupation stress and infection past/present were selected to predict secondary infertility. Although the incidence of heat exposure, medication in chronic illness and long hours driving was not significantly different from in secondary infertility as compared to primary infertility, but high Odd's ratio in smoking (1.857), alcohol intake(1.857), tobacco(1.920), occupational heat exposure(4.440), medication in chronic illness (2.467) , trauma (287.0) and long hours driving (6.667) suggest the risk associated with secondary infertility [Table 2].

DISCUSSION

Spermatogenesis is sensitive to a variety of chemical and physical stressors. Testicular hyperthermia is one such cause which has a significant deleterious effect on male fertility since the time of Hippocrates and is a well-recognized cause of impaired sperm production (6). In our study occupation played a significant role in causing oligospermia. Those males working in factories (electrical part, plastic, cloth making) and those males exposed to high temperature as in cooking were reported to have sperm counts <10million/ml. It is a well-established hypothesis that in andrologically healthy men (eg. No varicocele, no hypogonadism, normal testicular size) scrotal temperature depends on the insulating effect of perigenital clothing, on the rapidity of the perigenital

air exchange, on the core body temperature and on the sufficient countercurrent heat exchange between plexus pampiniformis and testicular artery (7,8) . However, the role of physical activity (eg. walking versus sitting) or the type of underwear for scrotal temperature and consequently semen quality is under continuing debate. In our study, the association of tight nylon underclothing and low sperm counts was not established. Although, long hours of driving i.e. sitting for prolonged period of time was again a risk factor due to scrotal hyperthermia.

Occupational chemical exposure has also led to oligospermia and non-motility. Occupational exposure to heavy metals, solvents, fumes(notably welding fumes) or PAH impaired semen quality. More refined analyses of each semen parameter confirmed the higher risk of asthenospermia in subjects exposed to heavy metals (9). The effects of solvents and welding fumes on sperm impairment were consistent with previous results (10-14). In our study, workers exposed to chemical exposure in the form of pesticides in farmers, battery making, oxygen pipelines, mattress making factories, aluminium waste product supplier, plastic making factories were significantly exposed to chemicals but a significant correlation could not be attributed for development of secondary infertility whereas for heat exposure(OR=4.440), significant correlation was found. This could be attributed to the small sample size of this study.

Of the myriad of factors that have been blamed for influencing the semen quality of an individual, lifestyle factors like smoking and alcohol consumption have attracted much attention in recent times all over the world (15-17). Alcohol has been shown to have a deleterious effect on all levels of

male reproductive system. It interferes with the feedback mechanisms of hypothalamus pituitary gonadal axis resulting in impaired production and secretion of adequate quantity or potency of LH,FSH leading to destruction of Sertoli cells(18).

Alcohol induced reduction in levels of testosterone, LH and FSH not only hampers their normal morphological development and maturation of spermatozoa (producing significant teratozoospermia), it also slows down the sperm production by testicular germ cells, especially in heavy alcoholics(18). Other studies have reported partial to complete spermatogenic test amongst moderate to heavy alcohol consumers, even leading to “Sertoli

cell only” syndrome in advanced cases, indicating severe testicular damage (19,20). In our study, alcohol abuse was found as significant risk factor for secondary male infertility.

Previous studies conducted on fertile male smokers showed reduction in semen volume in comparison to nonsmokers and this reduction in semen volume was in proportion to the number of cigarettes smoked (21,22). In present study also we observe cigarette smoking as a risk factor for secondary infertility. In conclusion lifestyle factors as well as occupational hazards contribute in predisposition of secondary infertility when compared to primary infertility.

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