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## Environmental, occupational and lifestyle factors: An impact on male fertility

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### Abstract

The crucial role of occupational, environmental and lifestyle factors are the means of life that can affect the health and welfare of human being, including fertility. Study is therefore designed to identify the roles that environmental, occupational and lifestyle factors play in determining reproductive status of middle age male partner. A cross-sectional study was carried out in 45 male cases (age 31-56) and 35 males controls age 16-30 years). Both study subjects and controls were taken from mountainous area. Detailed characteristics of both groups are noted. Levels of blood sugar, total testosterone, bioavailable testosterone (BAT) and its carrier were estimated by ELISA. Mean age of study subject was 43.6 and of control was 23.0 with normal BMI. Both groups living in mountainous area with profession of farming showed their active life style. Multi-parity is common. Both groups used bland diet and raw vegetables. Levels of fasting blood sugar, free testosterone and BAT were non-significantly low in study groups compared to these values of controls. However the values of total testosterone and its binding protein SHBG were non-significantly increased in study subjects in comparison to the values of controls. Study found good rate of fertility, because of pollution free environment, stress free profession and active life style. Increase age is not related with infertility. Impact of these factors is vital among the partners looking for conception.

**Keywords:** Fertility; Environmental; Occupational and Dietary factors; Male partner

### 1. Introduction

Males, during their period of reproduction are exposed by many factors related with environment, occupation and lifestyle habits. Lifestyle related factors are the adaptable habits and means of life that can affect the health and welfare of human, including fertility. These factors are the marital age, diet, body weight, exercise, smoking, usage of illicit remedy, consumption of coffee, stress, exposures related to profession and environment that may have considerable effects on human fertility [1].

Environmental issues that may have an influence on fertility are air pollution, global warming, and pollution due to chemicals, infections, poor health care, and poor quality of water [2,3]. Occupational factors are short periods of job, poor language expertise, unaccustomed working atmosphere, social type of stress and different behavior towards safety. These factors may be a challenge to co-operation and communication [4]. However rural agricultural societies mainly found in South Asia have high rates of fertility as compare to urban societies [5,6].

Globally lifestyle-related factors are significant contributor to male fertility/infertility. Factors related to lifestyle factors are eating healthy/unhealthy nutrition and physical activity/ inactivity in the age of adolescents and later on. The influence of body weight on fertility is proposed to be complex and affected by environment, genetic background and

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sex hormones(7). Obesity in males is related with decrease concentration of sperm, motility of sperm, increase risk of damage of DNA of sperm and fluctuations in sex hormones [8]. It is proved that loss of weight and usage of healthy nutritional diet may help to achieve good fertility [9].

Good healthy diet (Mediterranean diet), with proper exercising and loss of weight can improve male fertility. It is proposed that healthy diet enhances the quality of sperm including concentration, count and motility of sperm as well as reduced the fragmentation of sperm DNA. Diet containing selenium, zinc, antioxidant vitamins, and supplements of carnitine and omega-3-fatty acids may help to reduce the process of inflammation and oxidative stress. It is therefore suggested that a balance diet in based on fruit, vegetable, seafoods, seeds, nuts and dairy items with low fat [10].

The crucial role of occupational, environmental and lifestyle factors may help to improve of fertility has produced interest & interrogations among investors. Study is therefore design to identify the roles that environmental, occupational and lifestyle factors play in determining reproductive status of middle age male partner.

## 2. Material and methods

A cross-sectional study was carried out in 45 male subjects (study subjects) with age range 31-56 and 35 males taken as controls with age range 16-30 years. Both study subjects and controls were taken from area of Gilgit Baltistan (mountainous area) Pakistan. Detail characteristics of both groups are noted. Duration of study was Jan 2018 to Dec 2018. Letter of consent was taken from both study subjects and control. Study was ethically approved from IRB committee of Institute of Lahore University. Male with age > 56 year and less than 16 years were not included in the study.

Detailed characteristics of both groups are noted. Levels of blood sugar, total & free testosterone, bioavailable testosterone and its carrier sex hormone binding globulin were estimated by ELISA.

### 2.1. Statistical Analysis

Data was analyzed by SPSS 22. Quantitative variables were given as mean  $\pm$  SD. Qualitative variables were given in frequency and percentages. Quantitative variables of study subjects and controls were compared by student 't' test. Probability (P) less than 0.05 is significant.

**Table 1** Environmental, occupational, and modifiable lifestyle factors

Variables	Study subjects	controls
Mean Age (yrs)	43.6 $\pm$ 5.5	23.0 $\pm$ 4.0
BMI (Kg/m <sup>2</sup> )	25.2 $\pm$ 2.6	24.6 $\pm$ 1.9
Socioeconomic status	Class B	Class B
Residences	Mountainous area of Gilgit	Mountainous area of Gilgit
Life style Active with climbing mountains	100%	100%
Profession	85% Farmers	90 % Farmers
	15 %Shop keeper	10 % Shop keepers
Parity	6-8	2-3
Tobacco smoking	Moderate	moderate
Using certain illicit drugs	Powdered tobacco dip (100%)	Powdered tobacco dip (100%)
Infection (skin disease)	Eczema/fungal infection (65%)	Eczema/fungal infection (60 %)
Having experienced trauma to the testicles	2-4%	Nil
History of any disease	HT, DM, Arthritis (45%)	Nil
Bland diet	100 %	100 %
Raw veg	100 %	100%

**Table 2** Variation in biochemical parameters of study subjects in comparison with controls

No of cases in parenthesis		Variables expressed as mean±SD	
Variables	(Group A)	(Group B)	P- value
	Study subjects with age 31-56 years (n=45)	Controls with age 16-30 years (n=35)	
Blood sugar (mg/dl)	94.92±10.52 (2.02)	96.15±8.57 (2.37)	>0.05
Total testosterone (ng/ml)	5.33±2.02 (0.38)	5.08±1.45 (0.40)	>0.05
SHBG (nmol/l)	47.52±22.04 (4.24)	38.36±12.78 (3.54)	>0.05
Free testosterone (ng/dl)	9.24±2.75 (0.53)	10.05±2.75 (0.76)	>0.05
BAT (ng/dl)	215.55±64.80 (12.47)	233.0±65.11 (18.06)	>0.05

### 3. Results

Mean age of study subject was 43.6±5.5 and of control was 23.0±4.0. Slight variation in BMI of male study subjects and controls was observed (25.2±2.6 VS 24.6±1.9 respectively). Both groups belong to class b and living in mountainous area of GilgitBaltistan. Their life style was active as they climb in routine to mountain. Their main profession was farming. Parity (6-8 children) in study group was more than control groups (parity—2-3 children). Tobacco smoking was moderate in both groups. Usage of powdered tobacco dip was 100% in both groups. Skin diseases like eczema /fungal infection was high in study group compared to controls. Only 2-4% male experienced trauma to the testis. About 45% of study group have disease of hypertension, diabetes and arthritis. However arthritis was more prevalent. Both group used bland diet and raw vegetables (Table 1).

Levels of fasting blood sugar, free testosterone and bioavailable testosterone (BAT) was non-significantly low in study groups compared to these values of controls. However the values of total testosterone and its binding protein SHBG was non-significantly increase in study subjects in comparison to the values of controls (Table 2).

### 4. Discussion

It is suggested that dietary pattern of males may have an influence on the process of spermatogenesis. The constituents of the diet are the possible factors for proper function of sperm and fertility. Though, studies may prove relationship of healthy diet with fertility however not causality [11].

Our study includes middle age men as study subjects and compared with young age men as controls. Study tried to find out the relationship of fertility with aging, dietary pattern, profession, body weight. Both of the groups were the residents of mountainous area of GilgitBaltistan. Their life style was active, profession was farming. Parity (6-8 children) in study group was more than control groups (parity—2-3 children). In both groups smoking, usage of powdered tobacco dip, skin diseases like eczema /fungal infection was common. The most prevalent disease in this area was arthritis. The diet of both groups was bland diet, raw vegetable. It is suggested that healthy nutrition and active life-style may have a good effect on fertility rate in both sexes [1]. It is thought that both healthy nutrition and active life style are important for the process of implantation, angiogenesis and growth of placenta [12]. Another study found that diet may have both positive and negative affect on quality/quantity of semen. Diet containing vegetables /fruit, seafood, nuts, whole-grain, dairy items with low fat, poultry and fiber containing items exhibit positive effects. On the other hand, low intake of vegetable/fruit, low amount of antioxidant, diet containing trans / saturated fatty acids etc have a negative effect on the quality/quantity of semen, resulting in decreased fertility in both sexes [13,10].

Number of studies were carried out to find the relationship of nutritional diet, environment and occupation /life styles. A study was carried out in 155 (mean age 36.55 year) male visited to fertility center of Boston. Their dietary pattern and life style was noted. Study found that cooked meat was negatively associated with morphology of sperm. However, fish consumption was directly related to increase no of sperm and normal morphologically sperm [14].

A survey based on 1945 researches showed that nutritional diets containing antioxidants,  $\omega$ -three fatty acids, and low amount of trans and saturated fatty acids were negatively related with quality of sperms and reproductive hormones. It is found that diet containing cooked meat, potatoes, beverages, dairy products, coffee, and sweets may have a negative impact on rates of fertilization in partners [11,15].

We also studied the levels of fasting blood sugar and both free and total forms of testosterone in association with bioavailable testosterone (BAT). It is observed that the level of blood sugar, free testosterone and BAT was non-significantly reduced in study group (middle age group) compared to these values of controls. However the values of total testosterone and its binding protein SHBG was non-significantly increase in study subjects in comparison to the values of controls. A study carried out in 2,260 male and found that exercise may have positive / neutral influence on semen related parameters 16). It is controversial that hormones, quality of sperm and reproductive ability may be affective by extensive exercise [17]. However, it is suggested that by maintaining the level of testosterone and reduce body weight male may improve their health and fertility [10].

The relationship between ability of reproduction and exercise may be due to the impairment in the axis of hypothalamic-pituitary 18). A study carried out in 50 male with mean age 36 year. Study found Unhealthy or inactive lifestyle and polluted environment may affect the parameters of semen via hypogonadism, oxidative stress and xenobiotics. It is observed active life style is related with consumption of vegetables, antioxidativevitamins and anti-oestrogenicactivity and may be proper treatment in infertile male [19].

It is suggested that environmental EDCs or endocrine impairing chemicals and xenobiotics are inversely linked with the concentration of testosterone and may affect antiandrogenic and oestrogenic activity [20]. The presence of chemicals like plastics, detergents, pesticides present in food, cosmetics, and metallo-estrogens, are also the cause environmental pollution It is thought that exposure of these chemicals may increase the frequency of reproductive problems, that is complaints of sexual development, and reduction of count of sperm [21,22].

A study recommended that high fertility diet is based on less use of trans-fat, high intake of mono-unsaturated fat, low cooked meet, high vegetable and fiber, low sugar and high intake of plant food (non-heme iron) [23].

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## 5. Conclusion

Study found that high rate of fertility is directly proportional to pollution free environment, tension free profession and active life style. Increase age is not related with infertility. Impact of these factors are vital among the partners looking for conception.

However, more research is required to confirm that environmental, occupational, and lifestyle factors may help partners to achieve conception.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest.

### *Author's contribution*

HA: Manuscript planning & data collection

MS: Literature Review

RK: Proof reading

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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