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Suhas A Chaudhary
Lecturer, Department of
Kaumarbhritya, Shri
Gulabkunverba Ayurveda
Mahavidyalaya, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Yogesh Manani
Lecturer, Department of Stree
Roga & Prasuti Tantra, Shri
Gulabkunverba Ayurveda
Mahavidyalaya, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Archana Pithadiya
Lecturer, Department of
Kriyasharira, Shri
Gulabkunverba Ayurveda
Mahavidyalaya, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Pravin Masram
Ph.D. Scholar, Department of
Kaumarbhritya, Institute of Post-
Graduate Teaching and
Research in Ayurveda, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Krutika Joshi
Ph.D. Scholar, Department of
Dravyaguna, Institute of Post-
Graduate Teaching and Research
in Ayurveda, Gujarat Ayurved
University, Jamnagar, Gujarat,
India.

Satyavati Rathia
Ph.D. Scholar, Department of
Kaumarbhritya, Institute of Post-
Graduate Teaching and
Research in Ayurveda, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Correspondence:

Suhas A Chaudhary
Lecturer, Department of
Kaumarbhritya, Shri
Gulabkunverba Ayurveda
Mahavidyalaya, Gujarat
Ayurved University, Jamnagar,
Gujarat, India.

Modern life-style: A threat for the fertility

Suhas A Chaudhary, Yogesh Manani, Archana Pithadiya, Pravin Masram, Krutika Joshi, Satyavati Rathia

Abstract

Infertility means a man or woman is unable to reproduce. In total cases of infertility, male is directly responsible in about 30-40%, the female in 40-50% and both are responsible in 10% cases. Today, Zygote Intra Fallopian Transfer like infertility treatments is more than \$ 3 billion industry, a year. The study was planned to find out the relation between infertility and modern life-style. In results - Atrazine as Pesticides, Phthalates in plastic items, Perfluorooctanoic acid in coated non-stick vessels, nonylphenol in detergent etc are found as causes lead to infertility. Stress, smoking, tobacco, coffee, alcohol causes erectile dysfunction in male while loss of libido in females. Occupational hazard with Cadmium, Lead, Aluminium, Nickel and welding-fume industry found as sperm killer. Medicines like – Spironolactone, Nitrofurantoin, Cimetidine etc. found as cause of infertility. In conclusion, definitely there is a major role of modern life-style as causative factor in infertility.

Keywords: Infertility, Life-style, Pre-mature ejaculation, Erectile dysfunction, Endometritis.

1. Introduction

Now-a-days more couples delay childbearing in order to establish their careers and those couples seek evaluation and treatment for infertility. Approximately 6.1 million people in The United States, or roughly 10% of the reproductive-age population are facing the problem of infertility [1]. For these couples, a lack of success with conception is not just an inconvenience but also rather a disease of their reproductive system. \$ 3-5 billion a year industry per a year for Gamete Intra Fallopian Tube Transfer (GIFT), Zygote Intra Fallopian Transfer (ZIFT) etc as infertility treatments found in some research [2]. Infertility defined as the inability of a couple to achieve conception after one year of regular unprotected coitus. Sterility is an absolute state of failure to conceive. Secondary infertility or sterility is the same state developing after an initial phase of fertility. The 10-15% of marriages are proved to be childless [3]. Infertility is termed primary if conception has never occurred, and secondary if patient fails to conceive after previous conception [4]. Conception depends on fertility potential of both male and female partner. The male is directly responsible in about 30-40%, the female in 40-50% and both are responsible in 10% cases [5]. The remaining 10% is unexplained in spite of thorough investigations with modern technical knowhow. Commonest causes of female infertility [6] are as follows – Tubal blockage, Ovarian factor, PCOD, Anovulation, Uterine factor, Pelvic causes, Cervical factor while Pre-mature ejaculation, erectile dysfunction, Varicocele etc found as causes in male infertility. Some common cause of infertility related to health and lifestyle such like, excessive smoking, alcohol intake, degrading environment, high pollution levels, changes in food habits, and deskbound work, stress etc. that affect fertility negatively both in male and female. Present study was planned with aim to find out the pivotal role of lifestyle factors play in the development of infertility and the relation between infertility & modern life-style.

2. Material & Methods

Various published articles online and offline, website data, newspapers articles etc. on infertility affecting factors were studied, analysed and used as material to highlight the facts according to aim of the study.

3. Result & Discussion

3.1 Chemicals used in routine life

3.1.1 Plastic container

Bisphenol-A (BPA) is a chemical often found in hard plastics, microwave-safe food containers, water bottles & aluminium cans. Studies have found that the higher the levels of

BPA in men's urine, the lower their sperm count. A study also found that women with twice as much BPA in their bloodstreams had half as many viable eggs ^[7].

Phthalates ^[8] are plasticizing chemicals found in vinyl products and products containing artificial fragrances like cologne, perfume, candles, air fresheners, laundry detergent, shampoo, soap, hairspray, body spray, lotion, deodorant, and other personal care items.

Phthalates act as a man-made estrogen in the body, which could be messing with a guy's manhood. Men with higher levels of Phthalates ^[9] pay for it in the sperm quality department: In studies, their sperm tested as abnormal or showed signs of suffering DNA damage.

3.1.2 Detergent

Commercial laundry detergents use a synthetic chemical called "nonylphenol" to emulsifying. Men with urine levels of this laundry detergent chemical had a 21 times greater risk of having low sperm counts ^[10].

3.1.3 Chemicals in water

Fluoride in the U.S. water supply has been linked to lower fertility rates, hormone disruption and low sperm counts ^[11].

Water chlorine decreases sperm quality. Men exposed to chlorinated water (drinking, bathing, showering, swimming) were found to have reduced sperm motility and lower sperm count. The effect was correlated to the chemical Trichloroacetic Acid, which forms as a by-product after chlorine disinfection of water. The study was conducted among 2,009 men with a median age of 31. For assessing sperm count effects, men were divided into four groups (quartiles) from highest to lowest sperm count. Men with sperm counts in the lowest quartile had the highest levels of chlorine disinfection chemicals in their urine/blood. The same effects were observed for sperm motility ^[12].

3.1.4 Non-stick cookware

Perfluoroalkyl acids known as PFAAs; common types include PFOA or PFOS. They used in candy wrappers, fast-food wrappers, and pizza boxes. PFOA has also been linked with between high PFOA exposure and irregular menstrual periods, among other troubling effects ^[13]. Men with higher levels of a common nonstick chemicals, perfluoroalkyl acids, had half the amount of healthy sperm of men with the lowest levels.

3.1.5 Caffeine

Men who drink at least a quart of cola daily have sperm counts almost 30 percent lower than men who drink no cola. One study that yielded this stat suggests that the caffeine in cola hinders sperm ^[14].

Caffeine reduces muscle activity in the fallopian tubes that carry eggs from a woman's ovaries to her womb, which can reduce a woman's chance of becoming pregnant. A study of 1,909 women in Connecticut found the risk of not conceiving for 12 months as per the usual definition of infertility. In that study, 55% higher for women drinking 1 cup of coffee per day, 100% higher for women drinking 1 and one-half to 3 cups and 176% higher for women drinking more than 3 cups of coffee per day was found ^[15].

3.1.6 Food Additives

MSG (Monosodium glutamate) is found in flavoured potato chips and many packaged soups. Male rats fed MSG before mating had less than a 50% success rate (5 of 13 animals), whereas male rats not fed MSG had over a 92% success rate (12 of 13 animals) ^[16].

3.1.7 Trans fatty acid (TFA)

Trans-fatty acids are commonly found in fast food and junk food; their presence in a man's semen proves that he eat foods containing them. Trans fatty acids can affect spermatogenesis profoundly. Men with high concentrations of trans-fatty acids, in their semen have 96% fewer sperm than men with low concentrations of trans-fatty acids in their semen ^[17].

3.1.8 Meat & Beef

Replacing chicken and red meat with vegetable sources of protein might reduce the risk of ovulatory infertility, write the authors of the Harvard-based study that yielded this stat. Red meat contains arachidonic acid that can cause or worsen internal inflammatory reactions ^[18].

Sperm concentration was inversely related to mothers' beef meals per week. These findings suggest that maternal beef consumption, and possibly xenobiotics in beef, may alter a man's testicular development in utero and adversely affect his reproductive capacity ^[19].

3.1.9 Diet coke & Sugar – free

Aspartame ^[20] is likely to be found in any sweetener you put in your drink. Anything labelled 'diet' or 'sugar free', any gum or breath freshener, all will have aspartame as a sweetener. When the temperature of aspartame exceeds 30 degrees centigrade (86° F.), which the body accomplishes quite quickly once it is ingested, the wood alcohol in it converts to formaldehyde - a poison used to preserve body parts and then to formic acid which is even more toxic.

3.1.10 Obesity & Excessive sweet consumption

In women, the most specific reason is hormonal imbalance which is caused due to excess fat in the body. It leads to more sex hormone binding globulins (SHBG) in the system, which binds to testosterone (which is responsible for sexual arousal), thus inhibiting normal sexual desire or libido.

Other than sex-related issues, there's also evidence to suggest that obese women are likelier to have abnormalities in their eggs, which makes it harder for them to give birth ^[21]. They are also likely to suffer from failed pregnancies and miscarriages than regular people and in young girls it can lead to thyroid problems and PCOD ^[22].

Sweet spike in insulin, once the sugar high feel us drained and exhausted ^[23]. To counter that, our adrenal glands release adrenaline and cortisol which if stimulated too often can lead to a miscommunication with endocrine system which definitely not good for fertility. In Obesity – fat cells secrete estrogen. The consequence is a diminished testosterone level which needed for sperm production.

3.1.11 Phyto-estrogen

If a man's sperm count is low, or even low-to-normal, soy foods could tip the estrogen/testosterone balance in the wrong direction and reduce sperm count further. Men who eat large quantities of soy-based foods produce 32 percent less sperm per milliliter than men who consume no soy-based (Phyto-estrogen) foods ^[24].

3.1.12 Low fat products

Concept of Low fat food for Zero figure in women who eat lots of low-fat dairy products face an 85 percent higher risk of ovulatory infertility than women who consume little or no low-fat dairy products ^[25]. Women who eat large quantities of omega-3 fatty acids are 22 percent less likely to be diagnosed with endometriosis—a common cause of infertility—than women who eat little or no omega-3s ^[26].

3.1.13 Pesticides & chemical fertilizers

Atrazine found as a common chemical weed killer used heavily in sugar cane farms. From that soil & has been detected in tap water. This pesticide suspected of causing infertility as Men experiencing infertility were found to be employed in agricultural/pesticide related jobs 10 times more often than a study group of men not experiencing infertility [27].

In another study of Danish greenhouse workers, an unexpectedly high sperm count was found among organic farmers, who grew their products without the use pesticides or chemical fertilizers. The sperm count was more than twice as high in these men as in a control group of blue-collar workers [28]. Common pesticide reduces sperm count lower sperm counts and obvious damage to the quality of the sperm producing part of the testicles (called the seminiferous tubules), were found in test posed to the pesticide chlordane [29].

The pesticide Chlorpyrifos was found to cause increases in auto-immune antibodies in people exposed to it. Auto-immune antibodies mistakenly attack the persons own self, which link some cases of male and female infertility to autoimmune disorders in which the immune cells attack either the sperm or egg [30].

3.1.14 Smoking, Nicotine, and Erectile dysfunction

Smoking and use of recreational drugs (e.g., marijuana, cocaine, hashish) may reduce sperm count or cause abnormal sperm morphology [31]. Marijuana use at "moderate" levels was found to stop ovulation in monkeys for 103 to 135 days. Researchers also stated that the THC in marijuana may be directly toxic to the developing egg. There are nervous pathways into the hypothalamus (a gland that regulates the reproductive cycle) that are being suppressed [32].

Smokers are twice as likely to get erectile dysfunction as non-smokers. Nicotine also clogs the arteries with fatty acids, further restricting blood flow to the genitals. Testosterone is a hormone present in both men and women which along with promoting muscle growth is responsible for libido in both the sexes. When a person light up, it actually rises own testosterone levels temporarily, but the long term effect is negative. Smoking is increasing the carbon monoxide content in blood, which in the long run inhibits production of the hormone. The cadmium in smoke also interferes with zinc metabolism in your body and lower testosterone levels. Smoking adversely affects the semen quality of infertile men [33].

Smokers have lower sperm on average 13%-17% lower than non-smokers [34]. 38% of female non-smokers conceived in their 1st cycle of attempting pregnancy compared to 28% of smokers. Smokers were also 3-4 times more likely than non-smokers to have taken greater time than a year to conceive [35].

3.1.15 Alcohol

Alcohol is also responsible for a decrease in male libido. In a study of men with poor sperm quality, excessive alcohol consumption was associated with a decrease in the percentage of normal sperm [36].

Most ovulatory infertility includes hormonal imbalances that are worsened by hepatic congestion. Hormonal excesses in the blood require a clean and healthy liver to metabolize and excrete. The body cannot rid itself of excess hormones when it is busy metabolizing alcoholic beverages [37].

That is why, the ancient cities of Carthage and Sparta had laws prohibiting the use of alcohol by newlyweds [38] because a child conceived by intoxicated parents was thought to be unhealthy.

3.1.16 Metals & Occupational hazard

Cadmium has been linked to poor human semen quality and DNA damage in a report males who expose to textile dyes, dry cleaning chemicals like lead and cadmium [39].

Molybdenum-Male Reproductive Toxicant used in the manufacture of electronic parts, glass, ceramics, in the production of catalysts and pigments; in steel alloys; and in chemical reagents found in hospital laboratories [40].

Aluminium - Exposure Ups Men's Infertility Risk, Lowers Overall Sperm Count. There has been a significant decline in male fertility, including sperm count and research has linked this as endocrine disruptors [41].

Nickel is a metal, commonly used to make coins, jewellery, stainless steel, and components of industrial machines. This "imposter estrogen" contributes to the risk [42].

Chemical solvents used in cleaning the electronic components including xylene, acetone, petroleum distillates and others in soldering vapors found as sperm killer [43].

3.1.17 Pollution

The common car exhaust compound benzo-a-pyrene [44] (BaP) causes a significant reduction in fertility in test animals. The fertility was further lowered when animals were exposed to both BaP and lead (Pb). Results showed approximately a 33% reduction in ovarian weight and a marked reduction in ovarian follicles. Higher lead levels in the men's semen was associated with low fertilisation rates which reduced ability of the sperm to bind to the egg, and also to then penetrate and fertilise the egg. Pb [45] may adversely affect sperm shape, motility, and DNA integrity.

3.1.18 Stress

Stress and infertility are a chicken and egg problem. While stress can cause infertility, infertility causes stress as well! Stress can lead to Functional hypothalamic amenorrhea (FHA) [46]. FHA relates to excessive physical or emotional stress that results in amenorrhea (absent periods). If at least one partner is stressed it is possible that the frequency of sexual intercourse is less, resulting in a lower chance of conception. Present lifestyle and work pressure has brought stress into our lives. This health problem is one of the major triggers of infertility in men. In few cases, stress can also lead to erectile dysfunction as the sperm production decreases due to stress [47].

3.1.19 Stress & adrenaline

The presence of adrenaline, the hormone that is released by our bodies during stressful times, signals to our body that conditions are not ideal for conception [48]. Adrenalin inhibits us from utilizing the hormone progesterone, which is essential for fertility. It also causes the pituitary gland to release higher levels of prolactin, which also causes infertility to occur [49].

3.1.20 Stress & GnRH

Stress boosts levels of stress hormones such as cortisol, which inhibits the body's main sex hormones GnRH (gonadotropin releasing hormone) and subsequently suppresses ovulation, sexual activity and sperm count [50]. GnRH is responsible for the release of Luteinizing hormone and follicle stimulating hormone by the pituitary, the suppression of testosterone, estrogens, and sexual behaviour [51].

3.1.21 Stress & testosterone

The men who experienced job-related strains had low levels of testosterone (sex hormone) and this could have a negative impact on reproductive health [52]. Interestingly, men who were unemployed also had lower semen quality compared to men

who were employed. Hypogonadism - low levels of testosterone and/or impaired production of sperm [53].

3.1.22 Stress & adrenal hormones

Stress – adrenal hormones can interfere with the production of our major sex hormones. Chronic stress leads to other health ailments, which can eventually interfere with the reproductive system [54].

3.1.23 Stress & Glucocorticoids

Release of Glucocorticoids- Stresses may activate glucocorticoids (steroid hormones). These affect metabolism of fats, proteins and carbohydrates which may in turn reduce sperm production and testosterone levels [55].

3.1.24 Oxidative Stress

Stress can act as a trigger for physiological (oxidative) stress, which is caused by the damage from un-neutralized free radicals- this has been linked with semen quality [56].

3.1.25 Modern Medicines

Some drugs such as Sulphasalazine [57] used to treat inflammatory bowel disease can drastically reduce semen quality. In some studies, modern medicine found as enemy of fertility mentioned in Table -1.

Table 1: Medicine and their role in male infertility [58]

Sr. No.	Medicine	Role in male infertility
1.	Spironolactone	Decreases spermatogenesis
2.	Calcium channel blockers	Decreases fertilization capacity
3.	Anti-androgens	Decreases spermatogenesis
4.	Erythromycin	Decreases sperm density/motility
5.	Nitrofurantoin (high doses)	Decreases spermatogenesis
6.	Cyclosporine	Decreases spermatogenesis
7.	Colchicine	Decreases fertilization capacity
8.	Cimetidine	Decreases spermatogenesis

4. Conclusion

In today’s world, men and women are constantly exposed to factors which are making them more and more difficult to conceive. In reality, our natural hormonal balance is under constant stress from several factors which hard to control. Unless our exposure to junk food and toxic chemical contamination begins to decrease, it is unlikely that the prevalence of infertility will decrease. Wrong lifestyle is troublemaker for this wonderful body mechanism. Wrong lifestyle invites infertility and other diseases too. Medicines alone cannot cure this problem. Unless we correct this wrong lifestyle, we are fooling ourselves.

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