INDIAN FERTILITY SOCIETY

SIG Newsletter

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Public Awareness

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Awareness and call to Action: The Impact of Lifestyle Factors on Fertility

Lost time is never found again. You may delay, but time will not.
-Benjamin Franklin

Reproductive capacity is known to decline with age in both males and females. Women are born with a finite number of oocytes, which peaks in utero around 20 weeks gestation. Unlike men, women do not produce new eggs throughout their lifetime. The oocyte count declines steadily until age 32, followed by an accelerated decline between ages 32-37, and an even sharper decline thereafter . This natural decline in oocyte reserve is a key factor in female reproductive aging. The quantity and quality of oocytes decrease significantly with advancing age, resulting in reduced fertility. Studies

have demonstrated that the probability of conception declines substantially after the age of 30, with a notable decrease in fertility rates observed in women over 43 years old. [1] According to a study published in the Journal of Clinical Endocrinology and Metabolism, the likelihood of live birth declines significantly after the age of 35, with a live birth rate of 12.3% in women aged 40-44 years. [2] This decline in reproductive capacity is attributed to the natural aging process, which affects the quality and quantity of oocytes.

Oocyte Freezing as a Fertility Preservation Option

Oocyte freezing, also known as egg freezing, has emerged as a viable option for women seeking to preserve their fertility. This is particularly relevant for women who are delaying childbearing due to career goals or medical treatments that may compromise their reproductive cells. Vitrification, a rapid freezing technique, has improved the success rates of oocyte freezing, making it a reliable option for women who wish to preserve their fertility.[3] A study published in the journal Fertility and Sterility found that oocyte freezing is a viable option for women with cancer who wish to preserve their fertility before undergoing chemotherapy. [4] The study reported a 75% survival rate of frozen oocytes after thawing, with a fertilization rate of 71%.

DOES LIFESTYLE IMPACTS FERTILITY?

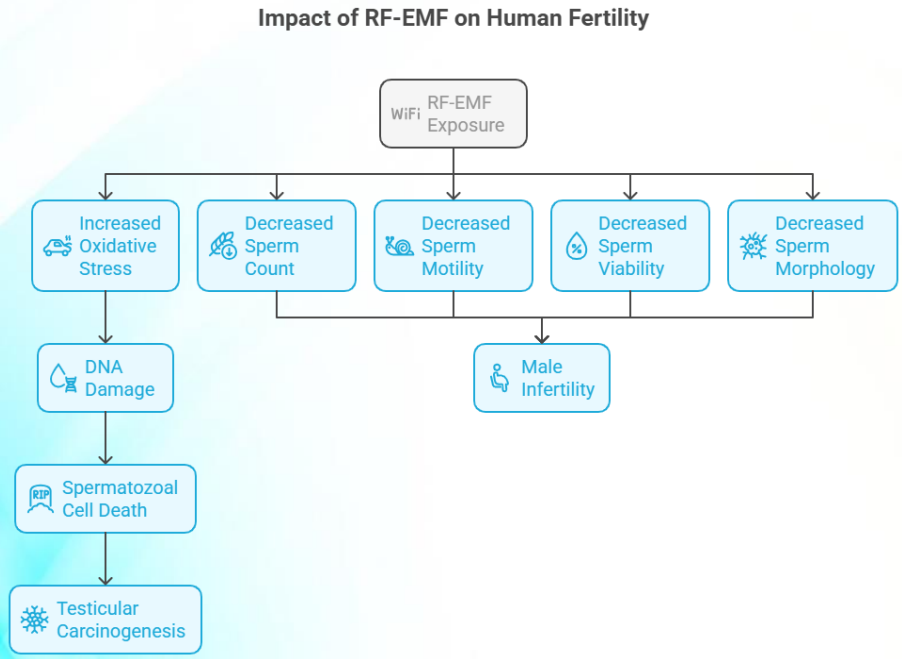
Several lifestyle factors have been identified as potential contributors to reduced fertility, including exposure to microplastics, radiation, smoking, and stress. Microplastics and nanoplastics have been shown to induce oxidative stress and inflammation in the reproductive system, potentially compromising fertility.[5] A study published in the journal Environmental Health Perspectives found that exposure to microplastics can lead to reproductive toxicity and embryotoxicity in humans.[6]

Microplastics, tiny plastic particles, are increasingly prevalent in our environment, posing a significant threat to human health. The widespread use of plastics in daily life, driven by their versatility, durability, and low production cost, has led to a culture of disposability and massive plastic pollution that resists degradation. Notably, Nanoplastics (1nm-1µm) are particularly concerning, as common polymers like polyethylene, polypropylene, and polystyrene are found in numerous household products, cosmetics, food containers, and water bottles, potentially exposing humans to these tiny particles.
Studies have detected microplastics in human semen, placenta, and female reproductive organs, highlighting the potential risks of these pollutants. In males, microplastic exposure has been linked to reduced sperm count, concentration, and motility, as well as increased oxidative stress and DNA damage. For instance, a study found that the presence of polytetrafluoroethylene (PTFE) in semen was associated with reduced total sperm count and concentration. In females, microplastic exposure has been shown to disrupt ovarian function, induce fibrosis, and affect embryo implantation. Research has also demonstrated that microplastics can accumulate in the placenta, potentially affecting fetal development and long-term health outcomes. Furthermore, studies have found that exposure to microplastics can lead to epigenetic changes, oxidative stress, and inflammation in reproductive tissues, ultimately compromising fertility.[7]

Radiation Exposure and Fertility

The impact of radiation on fertility is dose-dependent, with higher doses associated with greater damage to reproductive cells. High doses (>100 mGy) known to cause significant damage to sperm and eggs.[8] Radiofrequency electromagnetic field (RF-EMF) exposure from devices like mobile phones, laptops, and microwave ovens can impact fertility. The specific absorption rate (SAR) of RF-EMF varies with factors like frequency, intensity, and exposure duration. Studies suggest that RF-EMF exposure can decrease sperm quality, inducing DNA damage and oxidative stress, which may

contribute to male infertility. Animal and human studies have reported reduced sperm count, motility, and viability following RF-EMF exposure, highlighting potential reproductive health risks.[9] Maintaining a safe distance from radiation sources, such as laptops, can help minimize exposure and reduce the risk of heat damage to sperm. [10] A study published in the Journal of Assisted Reproduction and Genetics found that exposure to ionizing radiation can cause DNA damage in sperm, leading to reduced fertility.[11]



Addictions and Fertility

Smoking is a well-established risk factor for reduced fertility in both males and females. Smoking can damage sperm DNA and reduce sperm count and motility, while also compromising female fertility.[12] Smoking cessation can lead to improvements in fertility, although the extent of recovery may vary depending on individual factors. [13]A study published in the journal Human Reproduction found that smoking can lead to a significant decline in sperm quality and fertility potential.

Excessive alcohol consumption, defined as more than 3-4 drinks per day or 7-14 drinks per week for women and men, respectively, can have serious consequences on health, increase the risk of accidents, and disrupt social behavior, ultimately impacting personal and professional lives. Intake of Alcohol can lead to Reduced sperm concentration, Altered semen volume and increased abnormal sperm morphology, Increased sperm DNA fragmentation and defects in chromatin condensation.

Caffeine and Fertility

Caffeine consumption has been linked to reduced fertility in both males and females. High caffeine intake (>2 cups of coffee per day) has been associated with decreased fertility in women. [14] However, moderate caffeine consumption (1-2 cups of coffee per day) is unlikely to have a significant impact on fertility. A study published in the journal Fertility and Sterility found that high caffeine intake can lead to a delay in conception, particularly in women with a history of infertility.

Stress and Fertility

Stress can have a negative impact on fertility, particularly in women. High levels of stress can disrupt ovulation and reduce fertility.[15] Stress management techniques, such as meditation and yoga, can

help mitigate the negative impact of stress on fertility. A study published in the Journal of Women's Health found that stress reduction techniques can improve fertility outcomes in women undergoing IVF treatment.

Food Adulteration and Heavy Metals

Heavy metals and food adulteration can significantly impact fertility in both men and women. Exposure to toxic heavy metals like lead, cadmium, and mercury can disrupt hormonal balance, damage reproductive organs, and impair fertility. In men, heavy metal exposure can lead to reduced sperm count and motility, abnormal sperm morphology, and disrupted hormone levels. In women, it can cause disrupted hormonal balance and ovulation problems, decreased ovarian reserve and egg quality, and increased risk of miscarriage and stillbirth. Common sources of heavy metals include old paint, contaminated soil, and water pipes for lead, certain fish and dental fillings for mercury, and cigarette smoke and industrial emissions for cadmium. To reduce exposure, it's advisable to eat organic products , avoid contaminated foods, use water filters, and quit smoking. Regular health screenings and lifestyle modifications can also help mitigate the effects of heavy metal exposure.[16,17]

The sleep- fertility nexus-

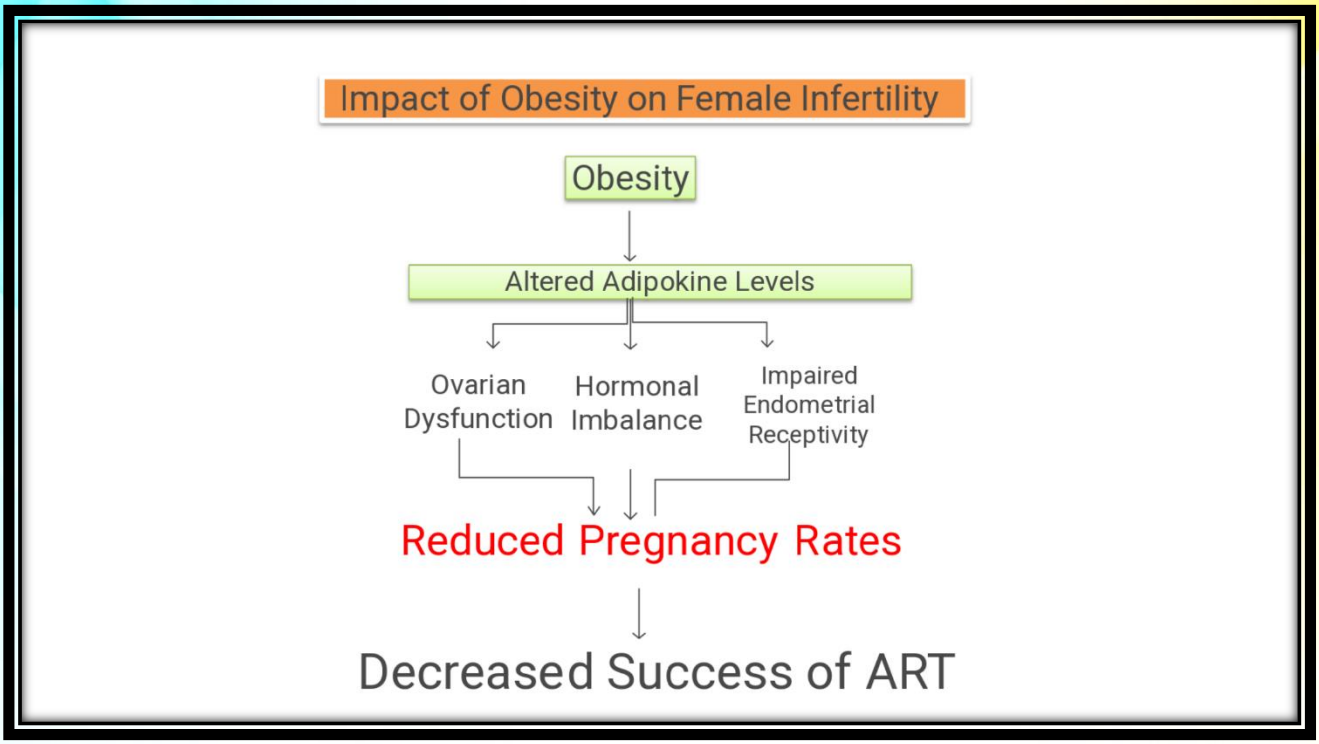
Research on sleep and ovarian function has yielded mixed results. Ten studies, including cross-sectional, case-control, and prospective cohort designs, explored this association. One study linked poor sleep quality to premature ovarian failure, but this finding wasn't replicated. Other studies examined sleep's impact on menstrual cycle regularity, with some suggesting that short sleep duration (<5 hours) and poor sleep quality may increase the risk of menstrual irregularities, longer menstrual flow, and premenstrual syndrome. However, not all studies found a significant association, particularly between chronotype and menstrual cycle regularity or anovulation. Overall, the evidence suggests that sleep disturbances may affect ovarian function, but more research is needed to clarify these relationships.

Research on sleep and sperm parameters also has shown intriguing results. Twelve studies explored this association, with some finding links between sleep quality and sperm health. One study of 953 young men discovered an inverse U-shaped relationship between sleep quality and sperm concentration, count, and morphology, indicating that both poor and excellent sleep quality may be associated with lower sperm parameters. Other studies found associations between sleep quality and sperm concentration and motility, particularly in infertile men or healthy sperm donor candidates. Sleep duration also appears to play a role, with one study finding that 7-7.5 hours of sleep per day was associated with the highest sperm counts, while shorter and longer durations correlated with decreased counts. Short sleep duration (<6 hours) has been linked to altered sperm parameters in several studies, including those involving infertile and healthy men. Additionally, late bedtimes have been associated with reduced semen quality. However, not all studies have found significant associations between sleep duration and sperm parameters, and one study found no impact of night or shift work on sperm health. Overall, the evidence suggests that sleep disturbances may affect sperm parameters, but further research is needed to fully understand these relationships.[18]

Obesity and fertility-

Obesity significantly impacts female reproductive health, affecting fertility through various mechanisms. Excess adipose tissue disrupts hormonal balances, insulin sensitivity, and lipid metabolism, leading to menstrual irregularities, ovulatory dysfunction, and reduced fertility. Chronic inflammation and oxidative stress further compromise oocyte quality and endometrial receptivity. The interplay between obesity and conditions like polycystic ovary syndrome (PCOS) exacerbates reproductive challenges. Understanding these complex relationships is crucial for developing targeted therapeutic approaches to mitigate obesity-related infertility.

Obesity-related hormonal changes can negatively impact sperm quality. Specifically, reduced testosterone levels in obese men have been linked to impaired sperm quality. Functional hypogonadism (low testosterone) and increased estrogen levels can disrupt spermatogenesis, affecting sperm development and maturation. Furthermore, insulin resistance, high insulin levels, and chronic inflammation associated with obesity can also impair testicular function and semen quality. This chronic inflammatory state can further contribute to semen abnormalities.
Oxidative stress (OS) occurs when there's an imbalance of reactive oxygen species (ROS) in the body, often caused by factors like heat , stress, environmental toxins, unhealthy diet, substance abuse, infections, aging, and obesity. In sperm cells, ROS can damage DNA and membranes, leading to sperm DNA fragmentation. Furthermore, research suggests that obesity can have long-term effects on male fertility, potentially impacting future generations due to genetic and epigenetic changes in germ cells. Certain genetic syndromes, such as Prader-Willi and Klinefelter, are linked to metabolic and endocrine disorders that can affect fertility. [19]



Conclusion-

Fertility awareness is crucial for individuals and couples to make informed decisions about their reproductive health. Understanding the factors that influence fertility, such as age, lifestyle, and medical conditions, can help individuals take proactive steps to protect their reproductive potential. By adopting healthy lifestyle habits, such as maintaining a balanced diet, managing stress, and avoiding harmful substances, individuals can optimize their fertility. Additionally, options like social egg freezing can provide a sense of security for those planning to delay family planning. Prioritizing fertility awareness and education can empower individuals to take control of their reproductive health, ultimately leading to better family planning and healthier outcomes

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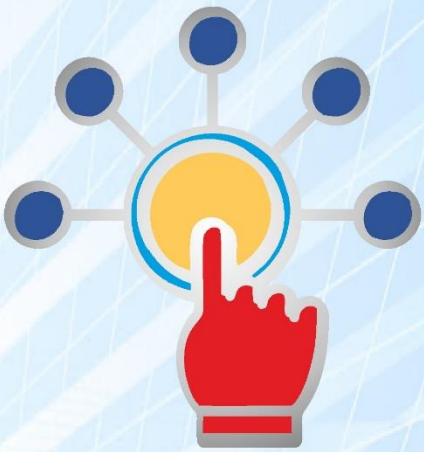

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