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GLOBAL DECLINE IN MALE INFERTILITY: THE ROLE OF ENVIRONMENT AND LIFESTYLE

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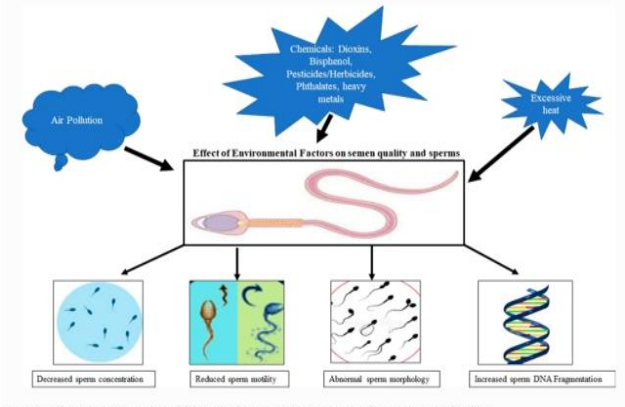
Recently it was observed that there is an increased tendency to decline life style of male partners globally, which is not only leading to socio-economic crisis but also to financial burden in the family too.

A. ENVIRONMENT AND MALE INFERTILITY

Word-wide rising trend in infertility – observed in the past few years, with male infertility arising as a major problem.
WHO, pubmed database, peer reviewed journals till June 2021 – focused on air pollution, chemicals, heat exposure and heavy metals - may cause male infertility.
Air pollution from motor vehicle exhaust, factories, oil refineries, ozone, nitrogen exude, sulfur dioxide, radiations, x-ray exposure →caused sperm dna fragmentation, morphological changes, and reduced sperm motility.
Harmful chemicals like pesticides, phthalates, heavy metals → maternal occupational exposure leads to low semen volume and total sperm count.
Dioxins → lipophilic chemicals, (TCDD), pops-> endocrine disruptions -> effects by binding to aryl hydrocarbon receptor (AHR)/ aryl hydrocarbon receptor nuclear translator (ARNT)-> damage testicular cell.
Bisphenol-> considered hazardous to human health -> leads to endocrine disruptions.
Heavy metals -> lead, cadmium, arsenic, mercury, barium -> reduce sperm viability and normal sperm morphology, dna damage etc.
Heat exposure -> normally scrotal temperature is 2-4˚C lower than the core body temperature. Any factors that cause rise of temperature (1-1.5˚c.) can result in oligospermia, teratozoospermia etc.

Hence environment increased sperm dna fragmentation which may cause male infertility and the same can be prevented and modified.

Fig. 1



Impact of environmental and lifestyle factors on semen quality and male fertility

B. **LIFESTYLE AND MALE INFERTILITY**

Smoking, alcohol, illicit drugs, obesity, psychological stress, diet, and caffeine intake are risk factors.
Testicular heat stress, intense cycling training, lack of sleep, use of mobile phone may also damage sperm.
Lavine group – studied 42935 men of 40 years, reported significant decline of 50 – 60 % in sperm count in North America, Europe, Australia and New Zealand.
Smoking → 7000 chemicals, nicotine carbon monoxide, cadmium and lead -> leucocytospermia – (ROS) reactive oxygen species -> impairing sperm function, quality, dna damage, aneuploidies, sperm apoptosis.
Alcohol →_HPG axis -> GNRH, FSH, LH, testosterone, as well as impair function leyden and sertoli cells -> semen morphology and motility.
Drugs ->__marijuana, cocaine, narcotics -> impaired HPG axis, testicular architecture and serum function.
Obesity ->_1.dna fragmentation 2. Abnormal morphology 3. Low mitochondrial membrane potential (MMP)
Psychological stress, advanced maternal age, Mediterranean diet - > enriched with omega -3 fatty acids, antioxidants, vitamins, low saturated and trans fatty acids is inversely related with low semen quality.
Western style diet -> high in red and processed meat, refined grains and high-energy drinks.
Prudent diet -> while meat, fruit, vegetables and whole grains are good for infertility
Vegetable fruits, fish & poultry, cereals and low–fat dairy products improved sperm quality.

Further scope of research

Excessive eating of broiler chicken / egg with or without alcohol, smoking → estrogen level ↑ → imbalance between testosterone & estrogen → erectile dysfunction → reduced sex drive & sperm concentration.

Conclusion

Environmental & lifestyles factors cause decreased - sperm concentration and viability of normal morphological forms. Increased – sperm dna fragmentation index mitochondrial dysfunction. Hence early counseling and clinical intervention was found to be mandatory to prevent decline in male infertility.

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