ROLE OF POLLUTION ON INFERTILITY – A REVIEW

Abstract

There are various external or environmental, genetics factor that influences the fertility. Beside this, our dietary habits, our lifestyle also decline the rate of fertility. Now - a – days, adulteration in food, junk food and/ or processed food, drinking alcohol canned juices or beverages , greatly affects the fertility. Along with these, our daily exposure of smoking, food additives, drug abuse, dyes, dioxins, pesticides like DDT and even dust of our home contains the toxic mixture that affects negatively on the body, specially fertility. But in this review , we are mainly focused on the role of pollution on fertility.

Keyword: Fertility, Environmental chemicals, ROS, Reproductive disorders etc.

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I. INTRODUCTION

There are a lots of environmental chemicals that are found in food and water, that affects the fertility. Daily used products have various kinds of chemicals that greatly affects the fertility outcomes. This fertility problem is facing every one couple out of six couples in India. Not only India, this problem is worldwide shared by all the developing and developed countries. The physical, chemical and or biological substances declines the rate of fertility. (1) (2) Various kinds of female reproductive conditions like endocrine problems, damaging the reproductive organs like vagina, cervix, uterus, tubal or pelvic peritoneal problems, are directly or indirectly affected by environmental conditions. POI, STDs, PCOS are greatly influenced the failure of fertility. (3) In males, environmental pollution affects the process of spermatogenesis in a permanent manner. On the other hand, in females, the pool of oocytes is fixed at birth, female produces a very low number of oocytes that is able to fertilise with sperm cells, from menarche to menopause, also affecting the process of follicular degeneration, known as atresia occurs throughout the fetal and adult life.

II. EFFECTS OF HEAVY METALS ON FERTILITY

Have you metals problem is the one of the biggest health problem because the heavy metals are found in soil water food and thus transport with a higher traffic levels of food chain and/or food web. All the heavy metals are not harmful, but some metals like Cu, Cr, Mn, Zn and so on, are good for health, but at low concentrations. Metals like Cd, Hg, Pb, etc., are toxic for human health, even at low concentrations. (4) (5) One of the major another important cause of infertility is smoking, fumes of traffic and industrial chimneys, organic and inorganic wastes of industries, utilise these metals, rechargeable Ni - Cd batteries, jewellery, dyes, alloys etc. These heavy metals causes the production of ROS which are responsible for the production of OS in the trophoblastic placental tissue. (6) (7)

1. **Lead (Pb):** Toxicity of baby is greatly affected the infertility. Lead levels of blood are described in 4 different kinds : normal (Value range : <4 μg/dL), Mild (Value range : 5 – 9 μg/dL), moderate (Value range : 10 – 14 μg/dL), high (Value range : 15 – 20 μg/dL). If any amount is either increase or decrease, their imbalancing leads to severe effects on the health. Prolonged exposure of lead, may lead to the irregularities in the menstrual cycle, spontaneous abortion, foetal abnormalities. (8)

2. **Cadmium (Cd):** The accumulation of cadmium in body also alters the reproductive processes. This may lead to delaying in the puberty / menarche, loss of pregnancy, disorders of menstruation cycle, premature birth, reduced birth weight of foetus or infant. (9)

3. **Mercury (Hg):** Exposure of Hg is associated with pathologies of like PCOS, and endometriosis, premenstrual syndrome, dysmenorrhea, amenorrhea, breast disorder, abnormal lactation. (10) Hg also induces spontaneous abortions, premature birth, congenital defects. (11)

III. EFFECTS OF PHTHALATES , BPA AND PFC ON FERTILITY

Certain chemicals like phthalates and BPA are mostly used in our daily products. Phthalates are extensively used as plasticizers in the products of PVC and produced by the process of esterification. BPA is negatively affects our reproductive health. This will lead to increase in the production of ROS. (12) Then, this will cause decline in the number of Oocytes, follicles, imbalancing in meiotic reactions. Exposure of Phthalates to infant during maternal exposure and /or breastfeeding. It is very interesting to know that the levels of breastfeeding of the metabolites of phthalates are positively correlated with the maternal diet and also consumption of water.

Phthalates is like a Female reproductive toxicant. (13) It causes folliculogenesis, steroidiogenesis, oocyte maturation and also development of an embryo and thus reducing the fertility. (14) (15) Researchers reveals that metabolites of phthalates also reduces the expression of cell cycle regulators, anti apoptotic regulators, inhibit the follicles. (16) In males, metabolites of phthalates Is directly associated with lowering the motility of sperm cell, decline the number of sperm cells, reduces sperm viability and thus affecting the fertility. (17)

BPA targets the function of endocrine reproductive system in case of males. BPA is also extensively used in the manufacturing of various products like polycarbonate plastic, epoxy resin boundary of canned or processed food etc. (18) BPA is also used in worldwide products like toilet papers, plastic bottles and containers, envelopes, printer link etc. Some studies reveals that the BPA causes the adverse conditions like decline the sperm count, (19) (20) (21) (22) (23) impaired the motility of sperm cells, (19) (21) (22) (24) damage the DNA of sperm cells. (21) (24) (25) (26) (27) (28) (29) (30) (31) BPA also responsible for decreasing the level of testosterone. (22) (29) (32) (33) (34) So we say that the BPA is a testicular toxicant. (35) (36) (37) (38) In females, BPA in utero, alters the mammary gland's morphology in foetus. BPA also causes the ovarian steroidogenesis by altering the steroidogenic enzymes. Some studies suggest that the increased level of BPA causes lower number of oocytes retrieved, a smallest number of mature metaphase II oocytes, level of lower serum E2 and also reduces the formation of blastocyst.

PFC are long chlorinated hydro carbon chemicals. PFC Are widely used in industries and also in so many daily products like oil and water repellents, coating for cookwares, carpets and textiles. PFC are long chain, non biodegradable and showing bioaccumulation in environment. (39) (40) A lots of PFC occurs in human serum, (41) seminal fluid, (42) breast milk (43) and also in umbilical cord (44); showing the long exposure of PFC. PFC also causes neonatal mortality, neurotoxicity, immunotoxicity in this causing developmental defects. (45)

IV. CONCLUSION

Studies suggest that we should limits or restricts the use of these chemicals for our upcoming generations. Otherwise, day – by - day , we ultimately loss our fertility. So, we should consume more and more fruits and vegetables. Avoid processed or canned food, drug abuse, drinking alcohol for the better outcomes of fertility. Intake of vegan products, dairy

products for the maintenance of fertility. Intake of vitamin- rich, mineral- rich, citric food and or Zaid crops (which are rich in water content; like muskmelon, watermelon, cucumber etc.) for the better outcome of fertility.

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V. ABBREVIATIONS

1. POI : Premature Ovarian Insufficiency
2. PCOS : Polycystic Ovarian syndrome
3. STD : Sexually Transmitted Diseases
4. ROS : Reactive Oxygen Species
5. OS : Oxidative Stress
6. BPA : Bisphenol A
7. PVC : Polyvinyl Chloride
8. PFC : Perfluoroalkyl Compounds
9. Zn : Zinc
10. Mn : Magnese
11. Pb : Lead
12. Cu : Copper
13. Cr : Chromium
14. Hg : Mercury
15. Ni : Nickel

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