

REVIEW ARTICLE

Infertility and Environment

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Abstract:

Environment is coming up as one of the causative factors for many physical and mental diseases. Infertility is not only a medical problem; it is a social and psychological problem as well. Air and soil pollutions are disturbing the male and female reproductive processes in various ways. Endocrine disruptors otherwise called Estrogen Mimics not only induce endometriosis, but can influence the reproductive process by competing with estrogen receptors. Insecticides and environmental toxicants also disrupt the reproductive process. Psychological stress is an important factor for infertility. This is also a stimulating factor for many gynecological conditions like Polycystic Ovary Syndrome (PCOS). In treating the infertile couples, psychological treatment & support are of equal importance as that of medical treatment.

Key Words: Infertility, Environment, Endocrine Disruptors, Psychological Support

Introduction:

Many diseases develop due to parental exposure to offending agents during peri-conceptional or pre-natal period. The affected individual may be exposed to agents during post-natal or childhood period, too. The former may be called foetal origin of adult disease or Baker's hypothesis, which states that the process in which stimulus or insults at a

critical or sensitive period of development of peri-natal life has permanent effect on the structure, physiology and metabolism of the individual. This can be called the Critical Window of Susceptibility.

Environmental influences may be on the behaviour or on health. The former may be the lifestyle, motivation or interest. Health may be affected by environmental toxicants, environmental hazards, or by endocrine disruptors. Environment may be external or internal (psychological). External environmental effects may be due to nature, people and happenings around. Influence in the workplace is also important. Internal environment comprises of mood, stress, understanding, tranquility and tolerance. Amongst nature, geographic & temporal trends affect fertility, e.g. high temperature affects the testicular function, thereby affecting fertility. Good association is supportive. Criticism, faulty advice is common among women, as it happens in women's college in girl's schools or in ladies clubs, which increases stress. Stress in the corporate world & information technology (IT) industry disrupts personal life due to hectic schedule and target fulfilling.

Environmental toxicants are of endless lists, new being added daily. They are found in water, air, soil and food. So, their exposure is almost unavoidable. The pesticides used in crops and the additives used in processed foods are some

of these. The ingredients in personal care products like perfumes, soaps and shampoos contain Pthalates, which are detrimental. Exposure to x-rays imposes health hazards, so also some specific medicines and those used for chemotherapies. Some environmental contaminants are also related to infertility. Heavy metal solubles like lead, mercury, cadmium, arsenic and pesticides like DDT, methoxychlorlindane (HPTE), diamethoate, chlordecon; Polychlorinated biphenyls (PCB) in electronic transformers and their metabolites are some such contaminants. Polybrominated Diphenyl Ethers (PBDEs) used in flame-retardants, computer, furniture, clothes and carpets, and Polyvinyl Chlorides (PVCs) and plastics used as containers for food storage are other environmental contaminants. Pthalates used to soften plastics, make-up lotions, shampoos, nail polishes, IV bags, gelatin pill capsules and building materials also act as such contaminants. Bisphenol A, a plastic monomer used in hard polycarbonates, in sports and baby bottles, dental sealants, food and milk carton lining and lenses are important environmental toxicants. Perfluorinated Compounds (PFCs) in Teflon are also very important.

Air pollution is another way of affecting the fertility in both males and females. The car and factory exhausts contain carbon mono-oxide, disulphide and other pollutants, which cause constant air pollutions. Passive smoking, when staying in smoking zones is another way of environmental pollution. Occupational hazards or diseases due to workplace exposure to lead and other heavy metals, as it happens in the paint

factories or in farmers using pesticides are also of importance.

Environmental toxicants certainly affect fertility in many ways. In males, they lead to diminished sperm counts and motility, DNA damage and diminished fertilisability. In females, disturbed folliculogenesis, Pre-mature Ovarian Failure (POF), diminished ovarian volume, disturbed oocyte pick-up, unexplained reproductive failure and impaired early embryo developments are some of them. Increased foetal loss, stillbirths, and birth defect syndrome happen more in areas close to agricultures, where pesticide spray is random [1, 2]. Early breast development is also linked to endocrine disrupting chemicals or endocrine disrupting compounds (EDCs) [3]. In-utero exposures to Dichloro Diphenyl Trichloroethane (DDT) have raised the risk of breast cancer in adult life [4]. Thrombotic Thrombocytopenic Purpura (TTP)) is a rare disorder of the blood-coagulation system, causing extensive microscopic thromboses to form in small blood vessels throughout the body (thrombotic microangiopathy) [4]. Diethylstilbestrol (DES) has a higher incidence of vaginal cancers, infertility, ectopic pregnancy, pre-term delivery, endometriosis and uterine fibroids. Pthalates in women are now linked to pre-term births and pre-cocious puberty [3]. Polychlorinated biphenyls (PCBs), other organochlorines and fine particulate matters are linked to low birth weight and pre-maturity [5].

In recent days, infertility is developing with endocrine disruptors otherwise called endocrine disrupting chemicals, or compounds

(EDCs). They are also called Estrogen Mimics. These agents compete with the body's estrogen receptors and cause mutation of genes in lower animals. They are found in personal care products, toiletries, spermicides and pesticides. Butylated Hydroxyanisole (BHA), the abandoned form of PVC plastic is one such example. Endocrine disrupting chemicals cause defects as an exogenous agent that interferes with synthesis, secretion, transport, metabolism, binding action or elimination of hormones that are present in the body, and are responsible for metabolic homeostasis, reproduction and developmental process. Endocrine Disrupting Chemicals, or Compounds (EDCs) are largely related to precocious puberty, abnormal menstruation, endometriosis, pregnancy loss as well as male infertility. Endocrine disruptors can re-programme genes of developing foetus permanently, and the effect can be passed to at least 3 more generations. This is proved in lower animals. In the females endometriosis, ectopic pregnancy, recurrent abortions and lactational failure are considered to be the ill-effects of EDCs. In males, undescended testis, testicular agenesis, hypospadias, micro-penis and poor sperm quality are related to EDCs. With recent decades, the adverse trends in male reproductive health has become evident. In this connection, the a syndrome has been hypothesized as Testicular Dysgenesis Syndrome (TDS) which results from a disturbance in the development of testes during foetal life. This results in declining sperm quality, certain congenital malformations etc. which appears to be

probably because of lifestyle and environmental factors than genetic factors. A similar form in female called Ovarian Dysgenesis Syndrome has also been suggested, though the evidence is limited [6].

Diethylstilbestrol (DES) exposure demands special mention. Between 1938-1971, the American gynecologists prescribed DES to pregnant women to prevent recurrent abortion and premature labor, but in 1971, Food & Drug Administration (FDA) banned the use of DES for the above-mentioned indications, because it was found that DES exposure in utero causes a typical vaginal adenosis and some form of malignancy of the lower genital tract [7]. DES causes changes in expression of Wnt 7A, Hoxa 10 and Hoxa 11 genes, which are involved in tissue patterning of the genital tract. Hence altered uterine morphogenesis occurs with DES [8, 9, 10]. DES-induced developmental programming requires Estrogen Receptors (ER), suggesting that this signaling is important to establish developmental programming [11]. DES- exposed daughters have abnormal vaginal adenosis. Vaginal adenosis was also found in 80% of the stillborns & neonates exposed in-utero to DES. Endometriosis also requires special mention. The evidence is overwhelming in adult laboratory animals, that endometriosis can be promoted by many OrganoChlorines (OCs). Dioxin (TCDD), Methoxychlor and DDT, polychlorinated biphenyls are examples of OCs. Data linking OC exposure and endometriosis in adults women are equivocal, but DES to endometriosis are compelling. Limited sample size and confounding variables, are the

weaknesses of observational epidemiologic studies.

Lifestyle affects fertility to a great extent. Smoking, consuming alcohol, the use of recreational drugs, so also unbalanced diet, over or under nutrition, all influence fertility. The former three affect sperm and egg qualities, as well as the reproductive process (due to presence of cadmium and cotinine). Both underweight and overweight women suffer from hormonal dysfunctions, hypertension, Recurrent Spontaneous Abortions (RSAs), Polycystic Ovarian Syndromes (PCOs) and Diabetes Mellitus (DM).

Infertility per se can cause psychological upset. It has been observed that 40% of infertile women meet the criteria of psychiatric disorders, as compared to 3% in community samples. Infertility along with the stress of treatment procedure can cause disturbed relationship with partners, family and friends, and also with the God. There may be disturbed sex life due to loss of interest. These can lead to severe financial insecurities as well as poor performance in job.

Stress itself is another factor for lowering the success rate in infertility treatment. More ovulatory dysfunction (PCO), tubal dysfunction, impaired spontaneity about the attempt of pregnancy can happen due to stress. Stressed individuals have less sexual arousal, and ultimately end up in treatment dropout. It has been suggested that psychological stress exerts its effect through a reduction of pulsation frequency in Gonadotropin-Releasing Hormone (GnRH) release [12]. Stress can impair not only spontaneous

reproduction procedures but also the reproductive technologies. It has been documented that in In-Vitro-Fertilization (IVF) programme, less number of oocytes are obtained from women under stress. They also produce diminished number of fertilized eggs along with diminished pregnancy rates, live birth rates as well as low birth weights [13].

As medical personnel are attending the infertile population, an extensive search has been undertaken to find the way outs. Primarily, psychological support in organized forms is found to be offered to the population suffering from infertility. Counseling is to be offered to individuals or in groups. The induction of positive approach, relaxation exercises, weight reduction, combined approach to family making are to be discussed. The development of couple communication, use of humour to reduce stress and goal setting are also important steps.

Psychological support in the infertility clinic is offered in an informal way. Easy and relaxed environment in the infertility clinic along with friendly behaviour from all the clinic staffs are encouraging. Help is given in decision-making. All the information is made available through website as well as discussion, and answers are provided to all questions. All telephone calls are attended with care and if necessary, counseling over the telephone is also offered. There should always be approach of tender loving care.

One should offer counseling in the following ideas in mind and try to convey many examples. Infertility is not a disease and it requires more supportive treatment. One should follow

relaxed approach and try to be more of a friend and a guide than a doctor or a nurse. One should try to create confidence of the affected couple on the treating team as well as on themselves (self-confidence) and allay apprehensions about the treatment procedures.

One should convey to the infertile couple that pregnancy is a natural process, and the aim of the treatment should be to create an environment conducive for pregnancy to occur. One should not be crazy about pregnancy and let it happen itself naturally. Discussing personal experiences and informing case histories of the successful couples in the form of story telling also helps to build the confidence.

Induction of positive approach is another way of psychological supportive approach. Getting up early in the morning and doing some light exercises helps a lot. Avoidance of watching tele-serials showing family complications, rather seeing light entertainment shows or animal world cheers up the mind. The couples should avoid discussing treatment details with everyone, and avoid involving senior members of the family in decision-making. The couples should start preparing themselves to become true parents.

Setting up a goal is another important step. This means discussion regarding acceptance of the treatment procedures and how long the treatment procedure should be continued. A thorough information about the treatment modalities are to be provided, along with the standard outcome and success rates. The couples should understand the reasons for their own infertility and its expected outcome. Upto what level and how long the treatment may be

accepted, are to be determined. The decision regarding alternative ways like adoption, doner oocyte programmes or third party reproduction (surrogacy) are to be discussed and determined.

Conclusion:

In conclusion, we should think about the ways to overcome the ill-effects of environment on infertility. Following may be some wayouts. The avoidance of stress, listening to music, more engagements with different jobs, like computer works, creative writing, distance and informal educations, community work, working with NGOs may help to elevate the confidence level. Help from the supportive groups may be of use. Less use of cosmetics and preserved foods may be helpful for future. Lifestyle modification, exercise, healthy food and drinks and avoidance to drugs should be practiced. Eating more organic food materials and creating a pleasant environment at home are very helpful. The stress of workplace should not be brought back to home. The treatment of infertility is a long war, which requires patience and perseverance to win over.

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