

Environmental Risk on Reproductive Health

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Abstract: Over more than 85,000 chemicals registered for commercial purpose all over the world, only one-tenth have been tested for potential health effects. These chemicals are very hazardous above the threshold value and potentially harmful for human health and environment. The number of chemicals or toxicants are the integral components in production of important materials and goods and a few may adversely affect human reproductive health. Reproductive health involves all of the reproductive processes functions and systems at all stages of human life. Due to environmental contaminants during pregnancy, the risk of pregnant women susceptibility to poor outcomes increases. Exposure of toxicants and further assessment including the study of their distribution and determinants of substances or factors effecting human health is an important issue in occupational epidemiology. Reproductive toxicity caused deleterious response in post pubescent male and female and in primary infertility and sterility. Contaminants and toxicants, or their related metabolic products transport to the target organs, like thyroid, ovaries, testes etc. They exert their bio-chemical effects. Some contaminants and toxicants can be stored for prolonged periods of time in bones, muscles, adipose tissues, and other cellular tissues. These contaminants can reside in the body for prolonged time based on their half-lives. This can further continue to leach from these cellular tissues and, are transported to target site of organs leading to the change in their genetic functions and expressions. Exposures to some biological and chemical contaminants cause serious illness on reproductive and genetic disorder. Quantifying risk with traditional experimentations is challenging because of its limitations to find out precise effect for daily exposure. Due to this reason, it is difficult to create clear clinical guidance that addresses the potential health effects of lower levels of exposures, which are more common in the population

Keywords: Environmental contaminants, Toxicants, Inhalation, Reproductive system.

I. INTRODUCTION

Over the past several decades, awareness has been grown regarding the reproductive health effects of exposures to certain chemicals. Scientists, clinicians, and patients have reported their concern about a number of recently identified trends in fertility and reproduction. Some of these trends are localized to specific geographic locations; others are more widespread. Over more than 85,000 chemicals registered for commercial purpose all over the world, only one-tenth have been tested for potential health effects. Although many of these chemicals are integral components in the production of important materials and goods, some may adversely affect human health or the environment. Of those that have been tested, only a portion has been assessed for reproductive health effects. [1]

WHO defines health as a state of complete physical, mental and social well-being, and not merely the absence of reproductive disease or infirmity. Reproductive health involves all of the reproductive processes, functions and systems at all stages of human life. Reproductive health is exquisitely sensitive to characteristics of an individual's environment including physical, biological, behavioral, cultural and socio-economic factors. These factors will increase the risk of their health, likelihood that human's face during their reproductive years [2, 3].

In modern societies, mainly women suffer health problems resulting from frequent childbearing. Due to inhalation of environmental contaminants during pregnancy the risk in a pregnant women's susceptibility to poor outcomes increases. Growing body of evidence has suggested that preconception and prenatal exposure to certain environmental contaminants, chemicals and toxins may adversely impact on fetal development and lead to potentially long lasting health effects. However, most reproductive health facilitators are not technically trained in environmental health and do not have the tools to counsel patients on this particular aspect. Exposure assessment, the study of their distribution and determinants of substances or factors affecting human health, is an important issue in occupational epidemiology [Figure-1]. Biological assessment of exposure would have been more precise indicators, but this was limited by the cost and the large number of suspected contaminants that individuals were exposed to. Despite these limitations, questionnaires have provided good estimates of exposures [4].

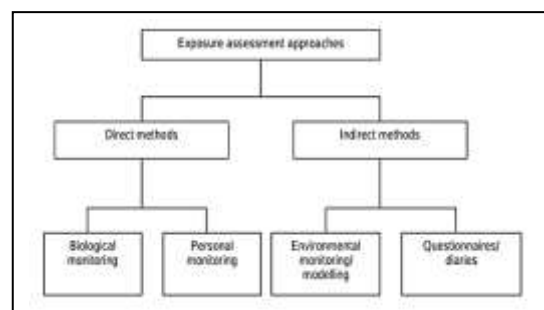


Fig. 1: Different approaches to human exposure and their assessments [5, 6]

Reproductive health describes multiple components of health status and is essential in the development of social, economic, spiritual, and mental well-being. For this reason,

reproductive health research is considered as a diverse field that encompasses numerous disciplines.

WHO has demonstrated the different components of reproductive health research and also portrayed the imperative role of society and culture on the outcome of reproductive health status. [Figure-2]. Environmental health risk and adverse effects of pollution of indoor residential are becoming increasingly recognized as sources of illness, particularly in vulnerable populations such as pregnant women, infants, children, the elderly and those living with chronic medical conditions or disabilities. A reproductive hazard interferes sexual performances and potential ability of a couple to achieve a successful birth. Reproductive hazardous effects female and male fertility and conception, pregnancy, and delivery development refers to the growth and maturation of the embryo, fetus, and infant. A congenital defect in a reproductive organs or limb or an intellectual deficit that becomes manifest after birth are example of adverse developmental effects.

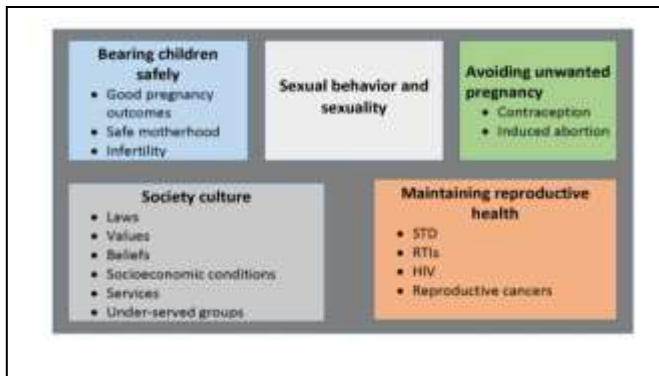


Fig. 2: Different areas of research in Reproductive health (Reconstructed and modified) [4 2]

Occupational and environmental risk on reproductive system and their organs are a concern to several male and female patients on high health priority. Number of chemicals that act as endocrine disruptors are following polychlorinated biphenyls (PCBs) and low level of certain chemicals i.e. Lead and Mercury, Cadmium. Air toxicants and pesticides also give rise to adverse effects and lead to impact on reproductive processes.

A. Reproductive Toxicity

To go through loss of pregnancy is an emotionally and physically excruciating experience for women. Number of pregnancy loss occurs prior 12 weeks before gestation period due to higher exposure of contaminants and toxicants and this phenomenon is known as early pregnancy loss. Exposure of toxicants adversely effects the reproductive organs [6].

B. Primary Infertility and Sterility

The term primary infertility is used to describe a situation where a couple is not able to conceive or failure to bear any children during reproductive time period upon unprotective sexual intercourse. In the alleged adverse reproductive health effects of chemicals or exogenous hormone-like substances included reduced number and deterioration in the quality of sperm, reduced fertility, delayed development and abnormality of the reproductive organs, increased incidence of testicular and breast cancers, and possible cardiovascular effects [7].

Fecundity is the reproductive capacity; the maximum number of live births calculated to be possible in a given population. It is being effected by several years of exposure of factors to risk of pregnancy. Fecundity, the capacity of couples to conceive and have children, depends on numerous biological processes including spermatogenesis, oogenesis, transport of gametes [8], fertilization of the oocyte, implantation of the embryo, and the development of the fetus thereafter [9].

A good measure for estimating fecundity was reported by Baird and coworkers as the time it takes to become pregnant since actively trying to conceive i.e. time to pregnancy (TTP). TTP as outcome has been extensively used in epidemiological studies to detect the effects of occupational exposures. [10-11] Fecundity may be assessed by time span between a couples' decision to attempt to conceive a successful pregnancy. Fecundity cannot be directly measured, it may assess clinically.

Female reproductive disorder linked to fertility and fecundity may occur during fetal development. Female reproductive organ develops between fourth and fifth week of pregnancy and continue till the 20th week of pregnancy. Complexity of development of reproductive system, depends on many factors may alter the healthy growth of these reproductive tissues, organs and signaling pathway [12].

Alteration results in genetic abnormalities from external factor that may change the normal development of specific tissues. It is important that female reproductive disorder may also develop during various life phases of the fetus. However, female reproductive system, is the development of many causes of specific disorders. The research pertaining to the mechanism of action for the certain pathologies is still research arena, and exposure of environmental contaminants contributed a lot for female reproductive disorders [13].

C. Chemicals Toxins and their Exposure on Reproductive Health

Fertility problems are an important health issues, as 10-15% of couples have difficulties conceiving. Reproductive function is thought to be compromised by life style behaviors, but environmental contaminants and work-related factors are also, thought to play a role. [14, 15] Reproductive health and the environment focus on exposures of environmental contaminants during the critical periods of human development. These periods are directly related to reproductive

health, including the periods before conception, fertility, pregnancy, childhood and adolescence development. Chemical toxins may potentially induce effects in human reproductive cycle. Several chemicals, compounds (both synthetic and organic), metals, and other environmental toxicants have been associated with adverse human health effects at high concentrations such as methylmercury, lead, polycyclic aromatic compounds, other air contaminants, organic solvents, pesticides, alcohols etc. [16] [Table-1].

The negative impact of environmental toxicants on human health has been grown. Exposure of number of contaminants and toxicants in uterus and childhood may be even more hazardous, with wider ranging effects. Fetuses, infants and children undergo rapid growth and development as compared with adults. The rate of cell division and differentiation may increase susceptibility to adverse effects of exposure and experiences during critical development periods, leads to permanent structural and organ system deficits. For example, environmental toxicants exposure such as poly chlorinated biphenyls tend to persists in body tissues and thereby, exposure in a fetus even after maternal exposure is eliminated. Exposure during early life could permanently affect reproductive tract structures [Table-2].

Key developmental stages occur throughout the life course: before and around the time of conception (gamete and blastocyst stages); prenatal development (embryo and fetal stages); and infancy, childhood, and puberty. These time periods are marked by extensive developmental changes, such as cellular proliferation and rapidly changing metabolic and hormonal capabilities. Exposures to environmental contaminants during this period may result in adverse, permanent, and irreversible effects that can manifest immediately or later in life or even in subsequent generations [Figure-3].

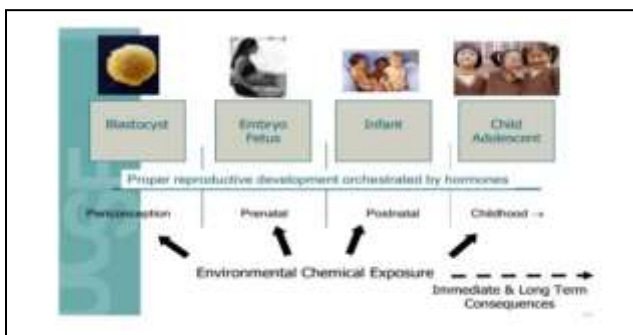


Fig. 3: Studies show the levels of chemicals an average person is exposed to can perturb biological processes [Reconstructed and modified] [43].

D. Effects of Toxicants on Reproductive Health

Reproductive toxicity is defined as conditions causing deleterious responses in the post pubescent male or female manifested by the interference with normal physiological processes or regulatory mechanism. Reproductive toxicants may contribute to spectrum of adverse effects on reproductive health. These effects include menstrual irregularities, early

pregnancy loss, fetal death, impaired fetal growth, low birth weight, premature birth and cardiac defect or learning disability and birth defects.

Substances with potentially harmful effects on reproductive health are present in water, air, soil, dust, food and consumer products. Individual may be exposed to these toxicants in the home community, school or workplace. Toxicants must come into contact with an individual and enter into the body by biological uptake (absorption, internal dose, distribution, metabolism and excretion). [17, 18] The impact of exposure to reproductive toxicants may not be immediately evident; the effects may emerge at key life transitions like attempting conception, during pregnancy; development of embryo or fetus, in the newborn, and during the offspring's childhood, puberty, and eventual fertility as an adult [19].

Toxicants enter into the body in one or more of three ways: Inhalation, ingestion, or absorption through the skin. Some toxins reside in bone like Lead (Pb) for decades. These toxins have long 'half-lives' within the body. They can continue to leach from the tissues and travel to target organs for long periods, same way all smokers do not develop lung cancer. The same way every person exposed to toxicants does not necessarily experience adverse health effect. [20] [Table-3]

The different ways a person can come into contact with hazardous chemicals are called exposure pathways. Inhalation is process of breathing or inhaling into the lungs. Ingestion is taking something in by mouth. Skin contact occurs when something comes in direct contact. Ingestion can be a secondary exposure pathway after skin contact has occurred. Some common ways a person may be exposed to hazardous chemicals. Exposure can occur when people contacted with direct exposure. People can be exposed to hazardous chemicals in soil, sediment, or dust if they accidentally ingested, breathe in, or have direct skin contact. Children are highly susceptible to these exposure pathways.

The human body has the ability to tolerate certain amounts of chemicals and the ability to excrete chemicals from the body. Once a person is exposed to a certain chemical, it may enter the blood stream, and eventually reach the liver. The liver attempts to detoxify harmful chemicals in the body by converting them to less toxic substances that could be used by the body. The body naturally attempts to eliminate substances that are harmful or are not used. The kidneys filter substances out of the blood and excrete them in urine. Also, chemicals are removed from the body in feces, sweat and exhalation. However, the body may not be able to remove all the chemicals. The amount, type, and length of time you are exposed to harmful substances will determine if you are at risk for adverse health effects [Figure-4].

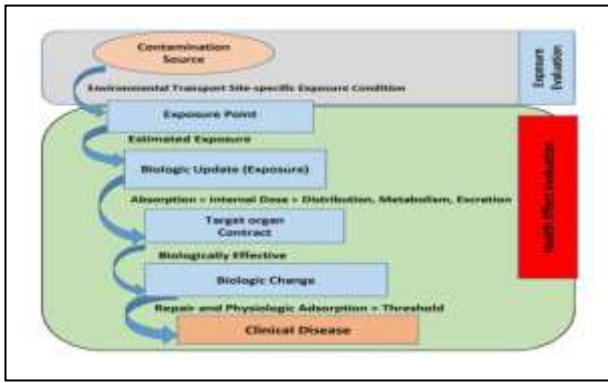


Fig. 4: Effect of contamination on Human Health (Reconstructed and modified) [44]

1. Mercury (Hg)

The mercury has been considered as developmental toxicant. Mercury has no metabolic role in the human body, in fact it is hard to determine the threshold value of Mercury. Mercury is present in the environment in complex form, and while all forms of mercury are poisonous to humans. If Mercury is ingested, it has shown very low toxicity because it is not absorbed by the gastrointestinal tract and is eliminated completely in the feces. Mercury compounds has found primarily in marine and fresh water fishes. The evidence that a mother's exposure to methyl mercury can affect the neurodevelopment of her unborn child is not disputed. During pregnancy, mercury compounds cross the placental barrier and can interfere with the development of the fetus, and causes attention deficit and developmental delays during childhood. Risk factors with heavy metal exposures during pregnancy can lead to adverse effects on neuro-developmental outcomes that include lower IQ and motor lesion developed. Methylmercury is a particularly toxic form of the chemical that bio accumulates in the tissues [21]. The toxic levels of mercury to cause acute poisoning or ill health in adults are not known. Therefore, preventing exposure to future children means reducing everyday exposure today [22].

2. Lead (Pb)

Lead is heavy metal that has use in many consumer products, such as gasoline, interior and exterior paint. Lead is persistent in the environment and continues to pose a risk on reproductive health. Lead has remained a significant reproductive health problem. From the perspective of human reproduction, lead is known to cause a number of adverse outcomes in both men and women. Reported effects in men included reduced libido, effects on spermatogenesis (reduced motility and numbers, increased normal morphology), chromosomal damage, infertility, abnormal prostatic functions and changes in serum testosterone label.

These effects have been seen in lead exposed on volunteer's workers, and exposer levels presently considered and effects of lead in women included infertility, miscarriage, premature membrane rupture, pre-eclampsia, pregnancy

hypertension and premature delivery. Again, recent research findings indicated that lead may be toxic at levels of spermiation and oogenesis. The evidence implicating possible teratogenic effects of lead is much less clear. While there is some indication of an association of lead with the production of anomalies, of any dose-response in relationship or causal mechanism has yet to be established. Therefore, lead does affect human reproduction [23].

Primary source of lead exposure into children and adults come from lead dust in homes in environmentally polluted urban areas. Lead based paint was commonly used in kitchens and bathrooms, for window and door trim, and on porches. Developing fetus is especially susceptible to harm from exposure to lead because of their smaller size and their immature neurological system. Lead has shown neurotoxin affects both central and peripheral nervous system [24, 25].

3. Cadmium (Cd)

The heavy metal Cadmium (Cd) is a pollutant associated with several modern industrial processes. Cadmium is absorbed in significant quantities from cigarette smoke, and is known to have numerous undesirable effects on health in experimental animals and humans, targeting the kidneys, liver and vascular systems in particular. However, a wide spectrum of deleterious effects on the reproductive tissues and the developing embryo stages has also been described.

In the testis, changes due to disruption of the blood testis barrier and oxidative stress have been noted, with onset of widespread necrosis at higher dosage exposures. Incorporation of Cadmium into the chromatin of the developing gamete has also been demonstrated. Ovarian Cd concentration increases with age, and has been associated with failure of progression of oocyte development from primary to secondary stage, and failure to ovulate. A further mechanism by which ovulation could be rendered ineffective is by failure of pick-up of the oocyte by the tubal cilia due to suboptimal expansion of the oocyte-cumulus complex and miss-expression of cell adhesion molecules. Retardation of trophoblastic outgrowth and development, placental necrosis and suppression of steroid biosynthesis, and altered handling of nutrient metals by the placenta all contribute to implantation delay and possible early pregnancy loss.

Cadmium has been shown to accumulate in embryos from the four-cell stage onwards, and higher dosage exposure inhibits progression to the blastocyst stage, and can cause degeneration and decomposition in blastocysts following formation, with apoptosis and breakdown in cell adhesion. Following implantation, exposure of experimental animals to oral or parenteral Cadmium causes a wide range of abnormalities in embryo, depending on the stage of exposure and dose given. Craniofacial, neurological, cardiovascular, gastrointestinal, genitourinary, and limb anomalies have all been described in placental labels with axial abnormalities and defects in somite structure noted in fish and ventral body wall defect and vertebral malformation occurring in the chick [26].

4. Pesticides

Pesticides are substance used to inhibit the growth or kill unwanted organisms, such as insect, fungi, plants and rodents. Chemicals pesticides formulation contains two types of ingredients active and inert. Active ingredients are those that exert the desired pesticide effect. Individual are exposed to pesticide through a number of different sources; food residue, contaminated tap water, occupational exposure, and community application of pesticides, they are also exposed from use of insecticides, insect repellents, rodent's traps, weed killers, and pet flea products within the home. Individual are exposed through contaminated dust in the home and pesticides tracked in from outdoors by pets and humans. Risk factors-exposure can come from eating some sources of pesticide use at home. During pregnancy period, the exposure of pesticides increases the maximum risk of intrauterine growth retardation, congenital anomalies, leukemia and poor performance on neuronal developmental processes [27,28]. It has been suggested that toxicants act on the testes and post-testicular sites, including the accessory sex glands. Exposure to pesticides associated with primary infertility in men was found to have an increased risk for anomalies, and men with secondary infertility were found to have an increased risk of low sperm motility and viability.

It has been found that the estradiol testosterone labels were significantly increased due to pesticide exposed on groups of populations, many pesticides act as direct testicular toxicants [29, 30] but some of them are now believed to exert toxicity due to their similarity to reproductive steroid hormones [31]. Pesticides can therefore bind to endocrine receptors, and may act as hormonal antagonists or agonists, disrupting biological reproductive processes [32].

5. Endocrine-Disrupting Chemicals

Endocrine glands produce a variety of hormone, each of which triggers specific biochemical responses for estrogen and testosterone control the development and functioning of the reproductive organs. In order to hormone to produce effects, once it has been released into bloodstream, a carrier protein transport it a cell wall where it's binds to a receptor, and hormones and receptor together bind to a specific region of a cell's DNA to activate particular genes. Certain endocrine disruptors bind to carrier proteins to transport hormones through the bloodstream. Other alters the level of endogenous hormones by accelerating their breakdown and their elimination or by deactivating the enzyme that facilitate breakdown; some react directly with hormones to alter their structures or affect their synthesis [33].

Endocrine disruptors, which occur naturally and others which are man-made, can be found in soil, water, air and food, as well as in commonly used industrial and household products. Photo estrogens are present in the grains, legumes, grasses, herbs and a variety of fruits and vegetables. Some fungi also produce compounds that may interfere with hormonal functions. Photo-estrogen is weaker than endogenous estrogen and is quickly excreted or broken down into other compounds, they do not accumulate into body tissue.

The best known man-made endocrine disrupters are synthetic hormonal drugs, such as birth control pills and Diethylstilbestrol (DES); Dioxin by products of waste incineration and industrial process and Polychlorinated Biphenyls (PCBs) which are widely used in electrical equipment, adhesive and plasticizer. Alkyl phenols and phthalates are compounds that disrupt hormone activity which are used in industrial and household products [34]. DES is synthetic hormone and has a proven role in reproductive health and disorder. However, a variety of reproductive disorder affecting both women and men that appear to be occurring with increasing frequency are causing some scientist to speculate that endocrine glands disrupters may be partly responsible for these activities [35].

Risk factor of Human Prenatal Phthalate exposure is associated with changes in male reproductive anatomy and behavioral changes primarily in young girls. Prenatal exposure to BPA is associated with obesity, reproductive abnormalities and neurodevelopmental abnormalities in offspring. Endocrine disrupting chemicals mimic or antagonist effects of hormones in the endocrine system and can cause adverse health effects that can be passed from one generation to other.

E. Mechanism of Effects of Chemical Toxins

The number of chemicals has direct toxic effects on the reproductive system. Endocrine disrupting chemicals can exert effects on hormone producing glands, such as the thyroid or pituitary, which in turn affect reproductive health.

Toxicants can exert negative reproductive products through several mechanisms. Some chemicals kill or damage cells; these cells are oocytes or sperm cells, exposure to the chemicals resulted the infertility, other types of cells developed lesion. For example, the anti- seizure drug phenytoin causes birth defects by disrupting normal embryonic and fetal development without causing maturation in DNA. Other chemicals alter the structure of DNA, causing gene mutation. Depending on the gene affected mutation can results in an inability to conceive or in birth defects in offspring. Some chemotherapeutic agents cause DNA mutations. A few industrial chemicals such as benzene, are mutagenic, and other chemicals such as Diethylstilbestrol (DES) cause an epigenetic effect: and has shown the changes the gene in molecular reproductive labels expressed and affect reproductive outcomes likewise the damage of oocytes and sperm production and Interference with cell divisional function [36].

Chemical substances cause adverse effects on the male and female reproductive systems. Reproductive toxicity may be expressed as alteration in sexual behavior, decrease in fertility, or loss of the fetus during pregnancy. Reproductive toxicants may interfere with the sexual functioning or reproductive ability to exposed individuals from puberty throughout adulthood. Toxicants that effect female reproductive system can cause wide variety of adverse effects on developing fetus.

There are potential manifestations of female reproductive toxicity. Exposure to lead can result in menstrual disorder and infertility. The toxicants like carbon monoxide, carbon

disulphide, mercury, and polychlorinated biphenyls (PBCs) have been shown to cause irregularities in the menstrual cycle. [37] Sources of carbon monoxide in homes, sources of co exposure includes gas, oils, or propane furnaces, space heaters, hot water heaters, gas clothes dryers, stoves, wood burning fire places and Tobacco smoke is also a major source of indoor carbon monoxide exposure and no of toxicants that target the male reproductive system can affect on Sperm count, and alteration of sexual behavior and enhanced infertility [Figure-5].

Carbon disulfide and the pesticides Chlordecone (Capone), Ethylene dibromide (EDB), and Dibromochloropropane (DBCP) are example of chemical known to disrupt male reproductive health. In recent decades, men have grown increasingly to reproductive health problems in reference of decline in semen volume,

Sperm counts, sperm density sperm vitality and effects of heavy metals such as lead is recognized first reproductive toxicants, exposure of lead disrupts all level of reproductive axis, with CNS and testis appears to be sensitive organ. Recent finding suggested that lead may also induced chromosomal abnormalities and lead to infertility by interfering with the acrosomal reactions in spermatozoa. Other heavy metals such as cadmium, boron may also harmful for male reproductive system [38].

Dibromochloropropane (DBCP) is agriculture chemical with respect to male reproductive toxicity. Exposure to DBCP produced azoospermia and oligospermia, and damaged germinal epithelium, genetic alteration in sperm chromosomal numbers, and sperm concentration, reduce to male fertility.

In female, exposed to DES in uterus during critical periods due to this region reproductive tract developed abnormalities, and increased cervical vaginal cancer. Menstrual and ovarian functional variation due to consumption of drinking water, disinfection by products (DBPs) and other pollutants such as TCDD, DDT, DDE and PCBs [39].

Applying pesticides, primarily in agriculture and horticultural works, reduce fertility and fecund ability. Environmental exposure, including solvents, radiation and other compounds are also associated with decrements in female fertility. Applying pesticides, primarily in agriculture and horticultural, works reduce fertility and fecund ability. Environmental exposure, including solvents, radiation and other compounds are also associated with decrements in female fertility. Menopause has been shown in the early stage due to adverse effects of contaminants and toxicity exposure to serum dioxin, DDT, DDE and other pesticides.

F. Environmental Exposures during Pregnancy and Adverse Birth Outcomes

Exposure to environmental contaminants during pregnancy leads to poor birth outcomes, such as low birth weight, intrauterine growth retardation, preterm delivery. Developmental toxicants are agents that adversely affect the developing embryo of fetus; mothers may expose to these in

the occupational hazards. More existing data are preconception and prenatal exposures. Data on parental exposure based on the maternal exposures of pharmaceuticals and parental alcohol used, smoking, and occupational exposures. Exposure during the postnatal period is scarce. Postnatal exposure has been examined detail for environmental agent, including lead, mercury, some pesticides and radiation. Developmental exposure observed the results on mankind.

Human beings were exposed to a combination of environmental risk factors and mixture of chemicals, and the low levels of exposure, and its effects and combined exposure of harmful contaminants and toxicants, dust particles mixtures. Exposures can inhibit or disrupts endocrine behavior interfere the production, metabolism, and action of natural hormones on target sides of the body. Disrupt hormones needed for homeostasis and developmental processes.

The risk associated with the endocrine glands and amount of secretion of hormones i.e., estrogen, progesterone, androgen, thyroid which effects neuro-endocrine behavior and metabolic signaling and finally its acts on endocrine signaling environmental risk factors.

As stated that environmental exposures effect on reproductive health of women is not always conclusive. From this discussion, it appears that a number of exposures of toxins are sufficient to warrant the maximum protection of the reproductive health. Recent research has advanced the hypothesis that the risk for a negative pregnancy outcome associated with exogenous or endogenous toxins may be modified by the presence of other maternal risk factors, including genetic variation in metabolic detoxification activities.

It has explained the work-related reproductive effects in number of women's but not in others. Environmental exposures have been linked to reproductive health effects and may affect future generations. These exposures may have more significance at critical points in an individual's lifespan.

The endocrine system is a complex network of hormones that regulate function such as growth and development. The endocrine gland includes pituitary gland, thyroid, adrenal, thymus, pancreases, ovaries and testes. These glands release the measured levels of hormones into bloodstream that act as natural chemical messenger to control important processes of vital boy organs.

II. CONCLUSION

This study has been reviewed the exposures of contaminants, toxicants and number of chemical agents, and pesticides. The present study evidenced the sufficient knowledge to warrant the maximum protection of pregnant women to several well documented contaminants on reproductive health, prevention of harmful exposure and its acute effects are paramount importance, underlying the actions of environment. The risk assessment of endocrine disrupters remains to be a field associated

Several new approaches have been developed in order to overcome these difficulties. The pregnancy as measures of interference with the endocrine system has certainly proved to be a useful tool to detect early reproductive hormonal effects in many recent studies. However, several other aspects of female reproductive organs functioning of cell cycle are not adequately studied.

It should also be remembered, however, that unreasonable overprotection of women may be scientifically unsound (men as well as women are often vulnerable to the same hazards), as well as disadvantageous to the economic well-being of women. The next step is to reach an international agreement on the classification of reproductive hazards and on the precautions to be taken for the protection of the reproductive health of both women and men. Such an agreement should include rules to safeguard the health of working men and women in polluted areas also in the developing world, similar to those adopted in the western industrialized countries.

There is limited research on pregnant women to know about exposure of environmental toxicants on reproductive health. This article describes risk factors that could be implemented to address environmental toxicants in the prenatal health. Environmental toxicants exposure has been linked to reproductive health effects and may give rise effects on future generations. This exposure may have more significant at critical points in individual's lifespan. Through this provided a view of critical scientific information that underscored the need for further efforts in areas to improve reproductive health. Scientists brought unique and important contribution to studying the impact of environmental contaminants on reproductive health. To reduce permissible exposure levels of chemicals that harms reproduction and development, so that they are more in line with environmental exposure limits. Permissible exposure limits should reflect the label of toxicity exposure to mixture of chemicals used in the workplace, rather than exposure to chemicals individually.

III. FUTURE DIRECTIONS

Recent advances in toxicity testing, risk assessment and in efforts to address shortcomings in regulatory policy related to chemicals in commerce are likely to create important change in the amount, type and availability of chemical toxicity data and related health impacts. This shall be anticipated improvements underscore the need for a methodology to ensure timely application of this data to prevention. To end of this methodology has been developed to evaluate the quality of evidence and strength of recommendations about the relationship between the environment and reproductive health in uniform, simple, and transparent summaries that integrate best practices of evaluation in environmental and clinical health sciences [41].

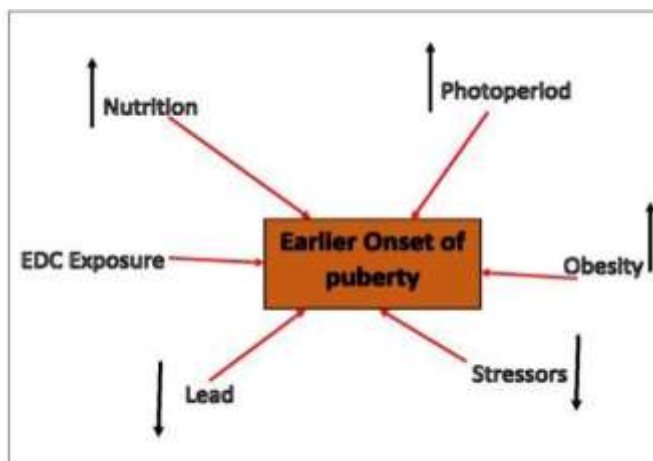


Fig.5: Effect of environmental toxicant on human health (Reconstructed and modified) [44]

Table 1: Effect of pesticides on Reproductive health [44, 55]

Compounds/ substances	example	Effects on reproductive
Pesticides	DDT(dichlorodiphenylt richloroethane)	Several case studies from wildlife exposures; some human evidence
Flame retardants	PBDEs (polybromonated diphenyl ethers)	Animals exposure models/ data
Phthalates	Pvc (polyvinyl chloride di ethyl hexyl phthalate)	Animal exposure models/ data Emerging human studies (survey)
Additives to consumer products (plasticizer)	BPA (bisphenol A)	Evidence from animal exposure models/ data
Dioxine- like substances	Pcbs (polychlorinated biphenyls)	Animals exposure models /data Wildlife exposure studies Weak human exposure data

Table 2: Effect of major chemical toxicants on Reproductive health [46]

Chemical which effects on reproductive system	Adverse effects
Carbon disulfide	Reduced male sex drive, male and female infertility
Carbon monoxide	Female infertility, spontaneous abortion
Lead	Male and female infertility, spontaneous abortion, growth retardation
Toluene	Low birth weight, developmental disorder, birth defects, menstrual disorder
Ethyl alcohol	Male infertility, premature birth, developmental disorder
Chloroform	Spontaneous abortion, birth defects
formaldehyde	Female infertility, spontaneous abortion

Table 3: Adverse Effects Caused by Reproductive and Developmental Toxicants [46]

Defects	Adverse effects
Genetic defects	Defect in germ cell that can be passed from one generation to next generation. Genetic problem that arises from point of fertilization (Down syndrome) 20% of human malformations are due to inherited genetic defects that are present in the egg or sperm cell.
Menstrual disorders	Chemical that influences the balance of sex hormones could potentially cause menstrual irregularities.
Impotence or decreased libido	Chemicals that affect the nervous system or the secretion of sex hormones have been shown to lower libido alter sexual response in both males and females
Infertility	The inability of a couple to conceive after one year of regular intercourse without the use of contraceptives. Hazardous exposures can cause infertility in males by interfering with hormones, damaging the testes (thus affecting sperm production), or by damaging the sperm leading to a reduction in sperm count, viability, motility, or functional capabilities. In women, the lack of ovulation or abnormal menstruation may cause infertility. This may be due to damage to the fallopian tubes, direct damage to the egg, or a change in the balance of sex hormones.
Stillbirth	The death occurs late in the pregnancy or during birth
Spontaneous abortion	Spontaneous abortion or miscarriage is the loss of the embryo or fetus before full term. Spontaneous abortion may be caused when toxicants: a. Cause damage to the genetic material in the egg so that the embryo cannot survive; b. Prevent the fertilized egg from implanting itself in the uterus; or c. Directly affect the developing embryo or fetus, causing a lethal toxic effect.
Birth defects	Physical abnormality or malformation present at birth, although it may not be detected. Two to three percent of all malformation present at birth defect.

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