AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 5. No 11. November ,2025

THE IMPACT OF ENVIRONMENTAL FACTORS ON WOMEN'S REPRODUCTIVE FUNCTION

Mamasoliyeva Sabohat Janobiddin kizi

INTRODUCTION. In modern society, the deteriorating environmental situation has become a global problem. According to the World Health Organization (WHO), more than 90% of the world's population breathes polluted air. Industrial development, urbanization, widespread use of chemicals, and other anthropogenic factors are causing serious damage to the environment.

Environmental factors affect almost all aspects of human health, but the female reproductive system is particularly sensitive. Reproductive function is regulated through complex hormonal, neuroendocrine, and immunological mechanisms, and these systems are highly susceptible to environmental stress.

In recent decades, a deterioration in reproductive health indicators has been observed: infertility rates are increasing (15-20% of couples), menstrual cycle disorders, endometriosis, polycystic ovary syndrome (PCOS), pregnancy complications, and birth defects are becoming more common. Many studies link these trends to environmental factors.

1. Main Types of Environmental Factors

Air Pollution. Air pollution is associated with particulate matter (PM2.5, PM10), nitrogen oxides, sulfur dioxide, ozone, and other toxic substances. Studies show that:

Long-term exposure to PM2.5 increases the risk of menstrual cycle disorders by 20-30%

Women living in areas with high air pollution experience infertility 10-18% more often

Exposure to air pollution during pregnancy increases the risk of preterm birth, low birth weight, and birth defects

Mechanism: particles enter the system, causing oxidative stress, inflammation, and endocrine dysfunction.

Endocrine Disrupting Chemicals (EDCs). EDCs are chemical substances that affect the hormonal system and disrupt the functioning of natural hormones. They include:

Bisphenol A (BPA): Found in plastic containers and can linings. BPA has estrogenic effects and negatively impacts ovarian function and the implantation process.

Phthalates: Used in plastics, cosmetics, and perfumes. They increase the risk of ovulation disorders, endometriosis, and PCOS development.

Dioxins: Released from industrial waste and combustion processes. They cause reproductive toxicity, miscarriage, and birth defects.

Studies show that women with high blood BPA levels have a 30-40% increased risk of infertility.

Pesticides and Agrochemicals

Pesticides used in agriculture – insecticides, herbicides, fungicides – have reproductive toxic effects:

Organophosphate and organochlorine pesticides disrupt hormonal balance

Women exposed to pesticides have 2-3 times more menstrual cycle disorders

Exposure to pesticides in early pregnancy increases the risk of birth defects and stillbirth

Heavy Metals

Lead, mercury, cadmium, copper, and other heavy metals enter the body through industrial waste, contaminated water, and food:

Lead: Disrupts ovarian function, reduces sperm quality, causes developmental delays during pregnancy

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Mercury: Has neurotoxic effects, causes pregnancy complications and fetal developmental disorders
Cadmium: Disrupts estrogen metabolism, increases the risk of endometriosis and ovarian cancer
Radiation
Ionizing radiation (from medical, industrial, natural sources) damages reproductive cells:
Damage to ovarian tissue
Genetic mutations and chromosomal abnormalities
Risk of infertility and early menopause
2. Mechanisms of Environmental Factors' Impact on Reproductive Function
Hormonal Imbalance
EDCs affect the hypothalamic-pituitary-ovarian axis by:
Disrupting gonadotropin secretion
Altering estrogen and progesterone metabolism
Disrupting the ovulation process
Oxidative Stress
Toxic substances generate free radicals that:
Damage cell membranes
Lead to DNA damage
Reduce ovarian reserve
Inflammatory Processes
Ecotoxicants activate the production of proinflammatory cytokines:
Contributing to the development of endometritis and endometriosis
Disrupting the implantation process
Making pregnancy maintenance difficult
Epigenetic Changes
Environmental factors affect DNA methylation and histone modification, altering gene expression and potentially being passed down through generations.
3. Clinical Consequences
Menstrual Cycle Disorders
In women exposed to environmental toxicants:
Increased frequency of amenorrhea and oligomenorrhea
Irregular menstrual cycles observed
Possible development of dysmenorrhea
Infertility
Decreased ovarian reserve
Ovulation disorders
Implantation problems
Reduced ART effectiveness
Pregnancy Complications
Preterm birth (15-20% higher risk)
Preeclampsia
Miscarriage
Placental dysfunction
Birth Defects
Cardiovascular system defects
Neural tube defects

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Urogenital abnormalities
Metabolic disorders
Long-term Consequences
PCOS development
Endometriosis
Fibroids
Early menopause
Ovarian cancer risk
4. Prevention and Recommendations
At the Personal Level:
Prefer organic food products
Limit use of plastic containers
Use natural cosmetics
Use air purifiers
Avoid toxic chemicals
Undergo regular medical checkups
At the Social Level:
Develop environmental monitoring systems
Strengthen sanitary-hygienic standards
Special protection programs for pregnant women
Public awareness programs
Clean up contaminated areas
At the Medical Level:
Collect environmental history
Monitor biomarkers
Early diagnostic programs
Detoxification therapy
Use of antioxidant medications

CONCLUSION. Environmental factors pose a serious threat to women's reproductive health. Air, water, and soil pollution, endocrine-disrupting chemicals, pesticides, heavy metals, and radiation have multifaceted negative effects on reproductive function. These factors lead to the development of menstrual dysfunction, infertility, pregnancy complications, and birth defects.

Modern scientific evidence confirms the role of environmental factors in reproductive health and requires a comprehensive approach to this problem. Preventive measures, environmental monitoring, public awareness, and improvement of medical services are crucial in reducing the burden of environmental reproductive diseases.

In the future, epigenetic research, biomarker development, and creation of new detoxification methods are necessary. Environmental reproductive medicine requires a multidisciplinary approach and should be a priority in public health.

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