



Understanding The Impact of Pesticides on Women's Health

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Abstract

This article explores the intricate dimensions of impact that pesticides wield on the health of women. As stewards of our environment and crucial contributors to various sectors, women encounter unique vulnerabilities, necessitating an in-depth examination of the consequences of pesticide exposure. Pesticide exposure poses significant risks for women, affecting reproductive health, hormonal balance and overall well being. This article sheds light on vulnerability and risk factors, reproductive health effects, hormonal disruptions, occupational hazards etc. of pesticide exposure. Addressing these risks requires stringent regulations, awareness campaigns, adoption of sustainable agricultural practices and other strategies for mitigating pesticide exposure and protecting women's health. Through a holistic analysis, we aim to elucidate the complex aspects of pesticide exposure and its profound implications for the well-being of women globally.

Keywords: Women Health, Pesticides, Hormonal disruptions, reproductive health.

Introduction

The advent of Green revolution in 1950 heralded a paradigm shift in agriculture, ushering in cutting edge technologies and the sophisticated modernization of agricultural practices. Among these transformative technologies are inherently toxic formulated chemicals called pesticides that are extensively employed in agriculture to safeguard crops against pests, diseases and weeds and to enhance agricultural productivity to new heights. Nonetheless, issue arises when the application of pesticides becomes indiscriminate or overly abundant, resulting in inadvertent exposure and posing potential health hazards for both humans and the environment. In recent years there has been growing concern over the potential detrimental impacts of these chemicals on human health, with a particular focus on women.



Gender Specific Factors Affecting Pesticide Exposure

Although both genders encounter these chemicals, distinct aspects of women's lives render them more susceptible to the deleterious effects of pesticides. Certain Gender specific factors can increase woman's vulnerability to pesticide exposure. Biological differences such as higher body fat percentage, hormonal variations, women's life events such as pregnancy, lactation, menopause etc. can affect how pesticides are absorbed, stored and eliminated from the body. Additionally, women's role in specific industries and household tasks can expose them to pesticides more frequently amplifying the potential risks they face. Women, owing to confluence of biological, sociocultural and occupational factors, often grapple with distinctive vulnerabilities and risks associated with pesticide exposure. The extent to which they affect women's health is often overlooked. This article endeavors to thoroughly investigate the repercussions of pesticides on women health, specifically delving into potential effects on reproductive health, disruptions in hormonal balance and occupational hazards on pesticide exposure. Through a comprehensive understanding of these multifaceted impacts, our goal is to elevate awareness, promote protective measures and advocate for safer practices in pesticide usage, thereby ensuring the well being of women worldwide. With a better understanding of the effects of pesticides on women's health, one can make informed choices to protect and work towards creating safer environment for women in pesticide related industries.

Risk Factors of Pesticide Exposure to Women

Women can be exposed to pesticides through various means, including occupational exposure, environmental contamination and household use. Exposure routes span from non occupational scenarios like domestic applications, residue presence in food and drinking water, to occupational settings where respiratory, oral and dermal sources prevail. Extensive research has predominantly focused on occupational exposure among farmworkers, revealing correlations with diseases like cancer, neurological disorders and impacts on fertility and pregnancy. Non occupational exposure, particularly through lipid rich products such as meat, fish and dairy contributes to residue intake, leading to concentration magnification.

Occupational Hazards: Women in Agriculture and Farming Activities

The global count of women in agricultural employment is rising, constituting approximately 43% of the total workforce in agriculture. Women engaged in farming, are frequently exposed directly when working as pesticide applicators and indirectly during activities like harvesting,



planting and soil preparation. These activities put them at a higher risk of pesticide exposure. Lack of proper training, protective equipment and limited access to healthcare further exacerbate the occupational hazards faced by women

Residential Exposure: Women and Household Pesticides

Women are typically responsible for household chores, including pest control. The use of household pesticides such as insecticides, rodenticides, and weed killers can lead to exposure through inhalation, skin contact, or ingestion. Women, traditionally responsible for tasks like washing pesticide contaminated clothes and reusing empty containers, face additional sources of exposure. Women living in rural areas near agricultural fields may experience environmental contamination. Without proper knowledge of safe usage and storage, women may unknowingly expose themselves and their families to potential risks. Moreover, common practices such as shaking hands for greetings, carrying babies with the hands, and eating with the hands contribute to the increased risk of pesticide cross-contamination.

Overview of Pesticides and Their Ubiquitous Use

Organophosphates, recognized for their efficacy in insect control, are among the most extensively employed pesticides in agricultural settings and can pose health risks to women due to occupational exposure and residues in food. Yet their use raises significant health concerns for those exposed. Research has associated organophosphate exposure with neurological disorders, developmental challenges in children, and specific cancer types. Mothers exposed to pesticides in their Occupation face a higher likelihood of their children developing leukaemia. Primary exposure routes encompass occupational contact, contaminated food and water, and residential usage.

Pyrethroids, derived from natural compounds in chrysanthemum flowers find common application in household insecticides, affecting women through domestic use. While perceived as less toxic than organophosphates, extended exposure to pyrethroids has been linked to respiratory issues, skin allergies and disruptions to the endocrine system. Prudent handling and adherence to safety guidelines are crucial to mitigate associated risks.

Neonicotinoids, used in agriculture, not only impact women involved in farming but also raise environmental concerns, affecting the ecosystem and potentially entering the food chain. Studies connect neonicotinoid exposure to reproductive health challenges, neurological



disorders and immune system disruptions. Prioritizing alternative pest control strategies that lessen dependence on neonicotinoids while ensuring crop protection is imperative.

Additionally, herbicides like glyphosate, extensively used in agriculture and residential landscaping, pose concerns for women due to potential exposure during application or through contaminated water sources. The diverse sources and types of pesticides emphasize the multi-faceted nature of women's exposure, necessitating a comprehensive approach to mitigate health risks associated with these chemical agents.

Reproductive Health Effects of Pesticides in Women

As women often bear the brunt of pesticide exposure due to occupational, biological, and sociocultural factors, understanding and addressing the intricate link between pesticides and reproductive health is imperative. Pesticides wield a profound influence on the reproductive health of women, raising significant concerns about their long-term impact. Long-term exposure to pesticides poses a spectrum of concerning health effects for women, encompassing reproductive, developmental, and systemic impacts. Women engaged in agricultural occupations are particularly vulnerable, facing direct contact with pesticides during application. Chronic exposure has been linked to increased risks of reproductive health complications, including elevated risk of infertility, difficulty conceiving, compromised egg quality, miscarriages, pre term births, stillbirths, early menopause, endometriosis, and adverse pregnancy outcomes in addition to liver and kidney problems. Bretveld et al. examined women employed in the Netherlands flower greenhouses where pesticides such as abamectin, deltamethrin, imidacloprid, methiocarb, and pirimicarb were regularly utilized. The researchers reported that women faced a fourfold increase in the risk of spontaneous abortion. Lindane, an insecticide alters sperm responsiveness to progesterone in vitro, affecting acrosome reaction and potentially causing infertility in women exposed to lindane. A recent study found that women currently using pesticides had longer menstrual cycles and a higher likelihood of missed periods compared to those who never used pesticides.

Research indicates that the disruption of the normal estrogen-progesterone balance crucial for maintaining pregnancy may be attributed to the lipophilic nature (tendency to combine with fats) of organochlorine pesticides. Pathak et al. suggested high β -HCH levels in cord blood were associated with pre-term labour, and in another report, they reported that high γ -HCH levels are associated with a higher risk of recurrent miscarriage. Home and workplace pesticide



exposure in postmenopausal women could be associated with autoimmune conditions such as rheumatoid arthritis and systemic lupus erythematosus.

The disruption of the delicate balance of endocrine system by certain pesticides may lead to hormonal imbalances, leading to irregular menstrual cycles such as changes in the duration and intensity of periods and contributing to increased vulnerability to conditions like polycystic ovary syndrome (PCOS). Exposure to certain pesticides may induce ovarian dysfunction, as suggested by various indications. Certain pesticides such as organophosphates, carbamates, pyrethroids and organochlorines have been found to have estrogenic effects, meaning they mimic hormone estrogen, act as agonists and promote transcriptional activation of estrogen-responsive genes. This can increase the risk of hormone-related cancers in woman. Moreover, the potential carcinogenic properties of pesticides raise concerns about heightened risks of breast, ovarian, and uterine cancers among women with prolonged exposure. The rise in thyroid disease among women was believed to be connected to their exposure to different fungicides and organochlorine insecticides. Pesticides have the potential to interfere with the thyroid gland's function, resulting in metabolic disorders. Substances like amitrole, cyhalothrin, fipronil and pyrimethanil are believed to hinder thyroid hormone. The increased occurrence of thyroid disease in women was attributed to their exposure to different organochlorine insecticides as well as the fungicides benomyl and maneb/mancozeb (carbamates). Thus women experience weight fluctuations, fatigue and other symptoms that can negatively impact their quality of life. In vitro experimental studies reinforce the observations that the exposure to certain pesticides can disturb the equilibrium of sex hormones. Additionally, there is also evidence suggesting that enhanced pesticide exposure may lead to reduced fertility in both men and women. Jurewicza et al. observed a decline in anti-Müllerian hormone (AMH) and follicle count, along with an elevation in follicle-stimulating hormone (FSH) in women exhibiting the presence of 3-phenoxybenzoic acid (3-PBA), a pyrethroid metabolite, in their urine. Respiratory and dermatological issues, immune system disruption and chronic metabolic disturbances further compound the long-term health implications for women. As women undergo menopause, their vulnerability to endocrine disruption by pesticides may exacerbate hormonal fluctuations, impacting bone health, cardiovascular well-being, and overall health. The impact of pesticide exposure on maternal and fetal health is a critical concern that warrants careful consideration.

Pesticides, when encountered during pregnancy, can traverse the placental barrier, potentially posing risks to both the mother and the developing fetus. Exposure to pesticides in nursing



mothers can lead to the transmission of these substances to their infants through breast milk. A study in Taiwan conducted between 2000 to 2001 identified organochlorine pesticides in breast milk samples from women. The main pesticides detected in the milk were p,p'- DDE, p,p'- DDT, α -chlordane, heptachlor epoxide, heptachlor, β -HCH, and γ -HCH, echoing findings from studies in Colombia, Korea and Germany. In 2003, a study in India revealed elevated levels of endosulfan in breast milk samples from women in Bhopal. Maternal exposure to certain pesticides has been associated with an increased likelihood of adverse pregnancy outcomes, including preterm birth, low birth weight, and developmental abnormalities. In the US, women who regularly used pesticides in and around their homes were two times more likely to give birth to children with neural tube defects. Newborns born to mothers consistently exposed to elevated pesticide levels may experience various birth defects, including circulatory, respiratory, urogenital and skeletal abnormalities. In a well-executed Finnish research, it was discovered that women engaged in agricultural occupations faced a nearly two fold increase in the risk of cleft lips and palates in their offspring when exposed to pesticides during the first trimester of pregnancy. Elevated levels of organophosphate pesticides in mother's urine were statistically linked to diminished intellectual development in their children at the age of seven. Offspring of mothers with the highest exposure showed an average IQ deficit of 7 points as compared to those with lower exposure. These cognitive effects were observed in children whose mother had urinary organophosphate pesticide levels near the upper end of the range commonly found in the general US population. Furthermore, some pesticides have been linked to disruptions in the endocrine system, potentially influencing hormonal balance crucial for a healthy pregnancy. The potential for developmental issues in offspring is a critical aspect, with studies suggesting a correlation between maternal pesticide exposure and neurocognitive impairments in children. The neurotoxic effects of certain pesticides may contribute to cognitive impairments and developmental issues in the offspring. Additionally, maternal exposure to pesticides has been implicated in an elevated risk of congenital anomalies.

Strategies for Reducing Pesticide Exposure and Protecting Women's Health

Implementing a comprehensive array of strategies is crucial for reducing pesticide exposure and safeguarding the health of women in agricultural settings. When it comes to handling pesticides, women deserve the same level of protection as their male counterparts. Often protective equipment is designed with a one-size-fits-all approach that may not cater to unique needs of women in terms of comfort and fit. There is need to develop protective equipment tailored specifically for female workers. Women working in pesticide related industries should



prioritize their safety by wearing appropriate protective clothing, including gloves, masks and goggles. Providing subsidies for high-quality PPE reduces direct skin contact and inhalation exposure during pesticide application.

Educational campaigns play a pivotal role in increasing awareness about safe pesticide handling, storage and disposal procedures, potential health risks, and alternative pest control methods, targeting women, agricultural communities, and the general public. Specialized and comprehensive training for women in agriculture focuses on proper pesticide application techniques, personal protective equipment (PPE) usage, and adherence to safety guidelines. Advocating for and incentivizing the adoption of organic farming practices promotes healthier alternatives, while Integrated Pest Management (IPM) encourages holistic approaches to minimize chemical pesticide use. Strengthening regulatory measures ensures compliance with guidelines to protect women's health. Research and development investments promote low-toxicity pesticides and biopesticides. Community-based initiatives empower women to collectively address pesticide concerns, and improved access to healthcare includes timely examinations for pesticide-related health issues. Policy advocacy at all levels prioritizes women's health and sustainable farming practices. Actively involving women in decision-making processes and fostering multi-stakeholder collaboration further contribute to holistic strategies addressing the complexities of pesticide exposure and women's health.

Conclusion

The present study investigates multifaceted health impacts of pesticide exposure on women health. It is a topic that necessitates attention and action. The potential reproductive health effects, hormonal disruptions, occupational exposure risks, and the suspected link to cancer highlight the need for increased awareness, regulation, and protective measures. Recognizing these concerns is paramount for developing effective policies & comprehensive strategies that prioritize women's health by advocating for safer agricultural alternatives, promoting proper handling and protective measures, fostering awareness through educational campaigns, stringent regulations and the promotion of alternative less harmful pest control methods become imperative for safeguarding both maternal and fetal health to mitigate the adverse impacts of pesticide exposure in women. Future studies should focus on assessing the potential impact of pesticide exposure on the health of pregnant women and newborns at an individual level.



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