

Epidemiological Studies in Women Occupationally Exposed to Pesticides in Cotton Fields of Parkal, Warangal District

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ABSTRACT

The world health organization has been recommending increased efforts to generate data on individuals with different occupational exposures. The Human exposure to environmental and occupational chemicals has increased considerably in past 55 years. Pesticides are among the most produced and used chemicals all over the globe. Pesticides constitute a heterogeneous category of chemicals specifically designed for the control of pests, weeds or plant diseases. Exposure to pesticides at any point in the life cycle has the potential for causing a range of short term health problems. The risk and severity of adverse health effects from pesticide exposure varies significantly depending on many factors including individual characteristics such as age and health status, duration of exposure etc.,. The women workers working in the agricultural fields form a high risk group as the main crops are Paddy, Cotton and Chillies are grown in Parkal Mandal, Warangal District. The present study consists of 100 pesticide women workers and 100 controls with no exposure of pesticides. The epidemiological data was collected from the exposed and control groups using a standard questionnaire. The results showed an increased incidence of health problems and impaired reproductive performance in women occupationally exposed to pesticides when compared to controls, which might be due to the prolonged exposure of workers to pesticides in the cotton fields.

Keywords: Pesticides, Health problems, Reproductive performance.

INTRODUCTION

Pesticide usage in India is a year round activity. Pesticide workers log in 8h/day, 6 days/week. These workers are constantly exposed to a variety of organo phosphates like Monochrotophos, Acephate, which are being used in agricultural fields. They have been considered as potential chemical mutagens. Exposure to pesticides at certain developmental stages of life might cause irreversible damage to organ structure and function. The effect of exposure to pesticides during the reproductive cycle from pre conception to breast feeding may possibly lead to poor birth outcomes, congenital anomalies and developmental deficits (Sanborn et al 2004).

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Few studies are available on women workers occupationally exposed to pesticides from abroad (Medina et al 2002) and very few studies are also available on pesticide workers from India (Jamil Kaiser et al 2006 and 2007). Hence, the present study is taken up with a view to study genetic damage and health status of women occupationally exposed to pesticides in cotton fields of Parkal Mandal, Warangal District.

The organo phosphorous insecticides used to control a variety of sucking chewing and boring insects and spider mites on cotton fields. These pesticides directly act as cholinesterase inhibitors and penetrate through the skin and cause weakness, loss of appetite, behavioural changes, muscle tremors, diarrhea, breathing difficulties and low birth weight in children and in more severe cases it can lead to cause paralysis and death. Earlier studies revealed that organo phosphorous pesticide residues like DMP, DETP etc., were found in blood samples of individuals occupationally exposed to pesticides and caused adverse health effects.

The undesirable health effects caused by pesticides in women are of special concern. Toppari et al (1996) indicated that pesticides may operate through hormonal or genotoxic pathways to affect male reproduction. In men they may penetrate the blood testes barrier to potentially affect spermatogenesis, either by affecting genetic integrity or hormone production. These effects may be at

different stages of the cell cycle such as during meiotic disjunction and such abnormalities can have deleterious effects on reproduction and offspring. Hence the present study hypothesizes that hormonal or genotoxic pathways could also affect female reproduction and needs evaluation for genotoxic effects.

The studies on health risks associated with pesticides are meagre. In view of the above facts the present study is aimed to evaluate genetic damage in women occupationally exposed to pesticides in the villages of Parkal, Warangal District of Telangana State.

Objectives:

- To Collect and evaluate data on reproductive epidemiology
- To screen the health issues of women exposed to pesticides.

Pesticides are used in agriculture and public health to control insects, weeds, animals, and vectors of disease. The Food and Agriculture Organization of the United Nations (FAO) defined a pesticide as 'any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood, wood products or animal feedstuffs, or which may be administered to animals for the control of insects, mites/spider mites or other pests in or on their bodies' [1]. Next to these intended effects, pesticides may also have adverse health effects for human beings. The main adverse health effects are difficulty in breathing, headaches, neurological or psychological effects, irritation of skin and mucous membranes, skin disorders, effects on the immune system, cancer, and reproductive effects. The manifestation of these effects depends on the type of pesticide and on level and duration of exposure. In this review, we will only focus on potential reproductive effects of pesticide exposure. Pesticides may cause reproductive toxicity through several different mechanisms: direct damage to the structure of cells, interference with biochemical processes necessary for normal cell function, and biotransformation resulting in toxic metabolites. Reproductive effects that have been associated with pesticide exposure in women are decreased fertility, spontaneous abortions, stillbirth, premature birth, low birth weight, developmental abnormalities, ovarian disorders, and disruption of the hormonal function [2,3]. Pesticides that may disrupt the hormonal function are often called endocrine disrupting chemicals (EDCs), just like other agents with similar mechanisms of action. An ECD may be defined as an exogenous agent that interferes with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body that are responsible for the maintenance of homeostasis, reproduction, development and/or behaviour [4,5]. Endocrine disruptors are usually either natural products or synthetic chemicals that mimic, enhance (agonists), or inhibit (antagonists) the action of endogenous hormones [5].

Body burden, dose, timing, and duration of exposure at critical periods in life are important considerations for assessing the risk of an adverse effect of endocrine disruptors. The way in which pesticides may disrupt the female hormonal function of the reproductive system on the basis of experimental animal studies (*in vivo*) and cell culture studies (*in vitro*), that often provide the first indications of potential reproductive effects. We only describe possible mechanisms of disruption mentioned in the literature to indicate hazards, without judgement about human risks based on dose-response relations.

All hormones differ in their chemical structure and have a different route of synthesis with innumerable different steps. If one substance or link is disturbed in the chain of hormone synthesis, the hormone may not be produced or may get different properties. Some pesticides, such as fenarimol, prochloraz, and other imidazole fungicides possess the ability to inhibit estrogen biosynthesis through CYP19 aromatase inhibition *in vitro* [6-8], preventing the conversion of androgens to estrogens. Vinggaard *et al.* hypothesized that compounds which can inhibit aromatase activity *in vitro* may be able to cause local changes in estrogen and androgen concentrations *in vivo* [6]. Aromatase induction is a physiological mechanism to deactivate xenobiotics, which does not inevitably cause a toxic effect. The pesticides atrazine, simazine, and propazine (2-chloro-triazine herbicides) induce aromatase activity *in vitro* [9]. For p,p-DDE, the induction of aromatase has been demonstrated *in vitro* and *in vivo* [10]. In addition, the pesticides methomyl, pirimicarb, propamocarb, and iprodion can weakly stimulate aromatase activity [11], whereas heptachlor may act as an inducer of testosterone 16-alpha and 16-beta hydroxylases [12].

MATERIAL AND METHODS

Study Group:

The study group consists of 100 women workers exposed to pesticides in cotton fields of the villeges including Essipet, Nagaram, Sagara Veedhi, Chennure and Erukapally of Warangal District. The equal no. of age and sex matched controls with same socio economic status living in the same area with no history of occupational exposure to pesticides. The workers work for 8 hours a day and 6 days/week.

Reproductive Epidemiology:

Data on reproductive epidemiology was also collected from 100 women workers occupationally exposed to pesticides and 100 controls. The information on their age, nature of occupation, years exposure and personal habits like smoking/tobacco chewing, consumption of alcohol and pan chewing etc., and health status, medication was collected using a standard questionnaire. Reproductive data on no. of live children, no. of abortions, no. of still births, no of pre mature births, no. of neonatal deaths and congenital defects was also collected. The type of marriage was also noted to know the effect of consanguinity.

RESULTS AND DISCUSSION

The present study revealed that the women workers with increased incidence of health problems like headache, joint pains, body pains, burning sensation in urine, white discharge, skin allergy and burning sensation on skin, hypertension and heart problems etc., when compared to the control group.

Table 1: Health Problems in Women Occupationally Exposed to Pesticides

S.No.	Health Problems	Exposed Group (%)	Control Group (%)
1	Headache	52	12
2	Joint pains	40	8
3	Body pains	34	6
4	Skin allergies	16	-
5	Neurological problems	10	-
6	Urinary tract problems	8	-
7	Acidity	14	2
8	Asthma	16	2
9	Hypertension	12	4
10	Heart problems	2	-
11	Thyroid	11	5
12	Diabetes	19	11

Table 2: Reproductive Epidemiology of Women Exposed to Pesticides

S.No	Reproductive epidemiology	Exposed group	Control group
1	Total No.of pregnancies	298	270
2	No.of live births	257(86.24)	259(95.92)*
3	No.of abortions	15 (5.03)*	6(2.22)
4	No.of still births	2(0.67)	-
5	No.of neonatal deaths	18(6.04)*	7(2.59)
6	No.of premature births	2(0.67)	-
7	No.of congenital defects	6(2.01)	2(0.74)

*P<0.05

Percentages are given in parentheses

The genetic study revealed that the increased frequency of abortions in women occupationally exposed to pesticides and neonatal deaths in their offspring when compared to the control group. There was a decrease in the frequency of live births in the exposed group when compared to the control group.

CONCLUSION

The present study indicated that the increased incidence of health problems and impaired reproductive performance might be due to the prolonged exposure of women to pesticides when compared to the control group. This study suggests that, the women workers should use mosquitoes and gloves while working in the fields. They should also wash their hands properly with soap while eating.

Conflicts of Interest

Authors declare that there is no conflict of interests regarding the publication of this paper.

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