

A Health Surveillance of Pesticide Sprayers in Talwandi Sabo Area of Punjab, North–West India

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ABSTRACT Human pesticide poisoning has become major public health issue these days. Throughout the world highest levels of pesticide exposure are found in the farm workers, applicators and people living adjacent to heavily treated agricultural land. Pesticides are linked to various chronic diseases like cancers, infertility, kidney failure, reproductive problems and nervous disorders. The present study had been carried out to examine the acute symptoms of pesticide spraying in the farm workers of three villages in Talwandi Sabo block of Bathinda district of Punjab, a cotton growing area with high usage of pesticides. This is an exploratory health study recorded face-to-face on pre-tested questionnaire. A total of 108 male sprayers from villages Bangi Nihal Singh (34), Jajjal (39) and Mahi Nangal (35) were field interviewed about the immediate impact of pesticides during spraying season from September-October 2003. Majority of the sprayers complained of having nausea, itchiness of the eyes, pain while urinating, discolored nails, nails dropping off, swollen fingers, sleeplessness, headache, excessive sweating and skin rashes. Immediate attention should be given to the implementation of proper awareness programs to pesticide workers. Also, practices like Integrated Pest Management, Organic Farming, Biopesticides, and Crop Diversification should be promoted.

INTRODUCTION

Pesticides are toxic chemicals deliberately added to our environment. These chemicals by design are meant to kill or harm living organisms. Anything that can kill or harm living organisms has a potential to harm or kill human beings too. Pesticides are supposed to kill unwanted pests on the crop, but they also kill the natural predator of crop pests, which protect the crop and prevent serious pest outbreaks. The pests targeted by the pesticides quickly develop resistance and in order to prevent frequent attacks from pests, the farmers are encouraged to spray higher and higher doses of toxic pesticides. Thus, this pesticide treadmill has put them in a very vulnerable position, completely dependent on pesticides.

Though 80 percent of pesticides produced annually in the world are used in developed countries, yet less than half of all the pesticides induced deaths occur in these countries. A

higher proportion of pesticide poisonings and deaths occur in developing countries where there are inadequate occupational safety standards, ineffective protective clothing and washing facilities, insufficient enforcement, poor labeling of pesticides, illiteracy and insufficient knowledge of pesticide hazards (Pimental and Greine 1996). Because farmers and farm workers directly handle seventy to eighty percent of the pesticides they use, they are at the greatest risk of exposure (McDuffie 1994). Most people do not realize that they are being poisoned by the pesticides because many symptoms of pesticide poisoning are similar to other health problems, for example, skin rashes and dizziness. Apparently, therefore a large number of acute pesticide poisonings each year go undiagnosed and unreported. Due to heavy pesticide exposure, various chronic effects such as brain and nervous system damage, cancer, birth defects, miscarriages and still births have been reported. Few surveillance studies have been conducted in India on high risk population groups involved in the spraying of pesticides in field conditions (Mishra et al. 1985; Rastogi et al. 1989; Rupa et al. 1991; Gupta et al. 1995; Srivastava et al. 1995; Chaudhuri 2000).

The use of chemical pesticides in India has increased by more than seventeen times since

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1955. The state of Punjab is one of the highest users of these pesticides, especially after the ushering in of the green revolution. Though the state has only 1.5 percent landmass of the country, it consumes about seventeen percent of pesticides used in India. As Punjab recovers from the ecstasy of the green revolution, it is now battling with residual effects of extensively used chemical pesticides in environment and food products. For the general population, diet has become a major exposure route for most known toxic contaminants. With the ban on highly persistent organochlorine pesticides in agriculture, in Punjab there has been a decline in their residues in food. However, the incidence of contamination by less persistent but more toxic organophosphates and carbamate pesticides is on the rise in the state.

Cotton cultivation implies high use of a dangerous cocktail of pesticides - Organochlorines (Aldrin, Heptachlor), Carbamates (Aldicarb), Organophosphates (Chloropyrifos, Acephate, Ethion, Triazophos) and Synthetic pyrethroids (Fenvelrate, Alphametharin, Cypermetharin). In view of this, the present study proposes to examine acute symptoms (that is, effects seen within a very short time after exposure to pesticides) of pesticide poisoning amongst the farm workers belonging to three villages of the cotton belt area of Punjab.

MATERIAL AND METHODS

For evaluation of immediate effects of pesticides, a total of 108 farmers in the age group of 25-45 years from three villages, namely, Bangi Nihal Singh (n=34), Jajjal (39) and Mahi Nangal (n=35) of Talwandi Sabo block of Bathinda district of Punjab, which is heavily exposed to pesticides, were visited during peak spraying season of September to October, 2003. They were interviewed for various acute symptoms of poisoning such as nausea, dizziness, chest tightness, eye itchiness, discolored nails, nails dropping off, sleeplessness, excessive sweating and excessive salivation etc. mostly in the evening hours while returning home after whole day's spraying. Addiction of various types of drugs such as alcohol, smoking, tobacco and opium husk was very common. If the poisoning is severe and proper treatment is not available, death can occur. During the study period of one

month, ten cases of hospitalization were recorded with two deaths in the previous year.

The only way to ensure the correct diagnosis of acute or immediate pesticide poisoning is to maintain high index of suspicion and take a screening of occupational and environmental history from any patient who presents suggestive symptoms. Brief questions about occupation, household exposures and any other potential exposures to fumes, dust or gases will allow rapid assessment of the likelihood that an illness could be related to pesticides or other toxic chemicals.

RESULTS AND DISCUSSION

The health survey of farmers associated with pesticides is presented in Table 1. It shows that 94.4% of farmers interviewed were reported with skin rashes and itchiness, followed by nails dropping off (93.5%), discolored nails (92.6%), nausea and eye itchiness (88.9%), excessive sweating (87.9%), blurred vision (77.8%), dizziness (72.2%), sleeplessness (67.6%), headache and chest tightness (63.9%), excessive salivation (58.3%), pain while urinating (49%), swollen fingers (41.7%), breathing difficulty (39.8%), muscular cramps/pain (36.1%), joint pain (33.3%), muscular twitching (30.6%), lower abdominal pain (26.9%), white/red patches on skin (19.4%), backache (12.9%), body tremor and swollen knee (12%). Besides these, Rastogi et al. (2008) found productive cough, dyspnea, basal crepitation of both lungs and dry cough. These are various acute health effects of a combination of pesticides which in low level over a long period of time lead to chronic effects such as cancer, reproductive and endocrine disruption, neurological and immune system damages etc.

The maximum intensity of impact was seen in the form of skin rashes and itchiness as the primary route of pesticide exposure is the skin, and not the respiratory system as is commonly believed. Pesticides remain persistent on skin for many months after the last known exposure. Besides, cleaning equipments, disposing off empty containers, spraying farmers also have to mix pesticides and load them into spray containers, which pose even more serious health risk, since they are handling the concentrated products. Almost all the pesticide sprayers studied did not practice precautionary principles

Table 1: A health survey of pesticide workers of three villages in Talwandi Sabo area of Punjab

S. No.	Symptoms of poisoning	Bangi Niha Singh	Jajjal	Mahi Nangal	Total	Percentage %
1	Nausea	32 (94.12)	35 (89.74)	29 (82.86)	96	88.9
2	Dizziness	27 (79.41)	23 (58.97)	28 (80.00)	78	72.2
3	Headache	21 (61.76)	24 (61.54)	24 (68.57)	69	63.9
4	Breathing difficulty	16 (47.05)	8 (20.51)	19 (54.28)	43	39.8
5	Chest tightness	22 (64.70)	23 (58.97)	24 (68.57)	69	63.9
6	Backache	3 (8.82)	8 (20.51)	3 (8.57)	14	12.9
7	Body tremors	3 (8.82)	6 (15.38)	4 (11.43)	13	12.8
8	Swollen knee	6 (17.64)	1 (2.56)	6 (17.14)	13	12.8
9	Lower abdominal pain	11 (32.35)	9 (23.07)	9 (25.71)	29	26.9
10	Pain while urinating	16 (47.05)	18 (46.15)	19 (54.28)	53	49.0
11	Eye itchiness	31 (91.17)	34 (87.18)	31 (88.57)	96	88.9
12	Blurred vision	27 (79.41)	30 (76.92)	27 (77.14)	84	77.8
13	Discolored nails	33 (97.05)	36 (92.31)	31 (88.57)	100	92.6
14	Swollen fingers	19 (55.88)	11 (28.20)	15 (42.86)	45	41.7
15	Nails dropping off	31 (91.17)	35 (89.74)	35 (100.00)	101	92.5
16	Rashes/Itchiness	34 (100.00)	38 (97.43)	30 (85.71)	102	94.4
17	Joint pain	12 (35.29)	14 (35.89)	10 (28.57)	36	33.3
18	White/Red patches on skin	4 (11.76)	7 (17.95)	10 (28.57)	21	19.4
19	Sleeplessness	23 (67.64)	23 (58.97)	27 (77.14)	73	67.6
20	Excess sweating	29 (85.29)	35 (89.74)	31 (88.57)	95	87.9
21	Excessive salivation	23 (67.64)	19 (48.72)	21 (60.00)	63	58.3
22	Muscle twitching	11 (32.35)	13 (33.33)	9 (25.71)	33	30.5
23	Muscle tremors/Pain	13 (38.23)	12 (30.77)	14 (40.00)	39	36.1

Figures in parentheses are percentages.

such as protective clothing, gloves, direction of wind etc. Prevalence of dermatoses and skin sensitization associated with use of pesticides was reported by earlier investigators (Gupta et al. 1995; Guo et al. 1996; Meulenbelt J de Vries I 1997; Spiewak 2001). The observed vision problems (eye itchiness, blurred vision) can be attributed to direct contact of pesticides with eye because of non-observance of eye protecting measures such as goggles. Continuous and direct pesticide exposure of eyes leads to complications like inability of the pupil to dilate fully in darkness, blurred vision, and pain around eyes (Mishra et al. 1985; Dementi 1994; Gupta et al. 1995; Gomes et al. 1998).

Respiratory problems like chest tightness (64%) and breathing difficulty (40%) reported in farm workers may be due to the practice of not wearing respiratory masks while handling the pesticides. Biological monitoring of exposure to pesticides among agricultural workers by other investigators also showed respiratory problems like relative persistence of coughing, bronchial obstructions and ventilatory defects (Rastogi et al. 1989; Subraty et al. 1998).

Body tremors observed among 13 of the farmers (12%) can be attributed to the impact of

pesticides on the nervous system. Nervous disorders were also reported among plantation workers of India exposed to pesticides (Rupa et al. 1991; Gupta et al. 1995). A survey of published literature also revealed a number of other pesticides related occupational problems. The epidemiological evidence suggests a significantly higher rate of cancer incidence among farmers and farm workers (Cantor 1992; Spiewak 2001). Studies have shown a link between a variety of reproductive health impacts in women and pesticides exposure. These studies have documented increased incidence of miscarriages, still births, delayed pregnancy and spontaneous abortion among women agricultural workers and wives of men employed in pesticides mixing and spraying. There are many possible reasons for these problems, among them one could be the abnormalities or errors in genetic information carried in the sperm. Exposure to toxic agents during three months prior to conception could cause this type of damage to the sperms. Other disorders like decline in neuropsychological performance (Baldi et al. 2001), increased risk of mild cognitive dysfunction associated with subtle changes in brain function (Bosma et al. 2000), cardio-vascular diseases (Kashyap 1986)

and decrease in TSH level (Srivastava et al. 1995) were also reported due to pesticide exposure. This study is supported by Tiwana et al. in 2007 who reviewed various studies carried out in Punjab on the pesticide residues found in different food items (like wheat flour, human milk, vegetables, etc.) and their effect on human health.

CONCLUSION

In general, the present results question the wisdom of selected pesticide workers in non-compliance with proper protective measures advised for them and thus, highlight the importance of observing basic protective measures during pesticide spraying, as their non-observance was found to be associated with various symptoms observed. So, immediate attention should be given to the implementation of proper awareness programs for farmers and pesticide workers regarding pesticides, their impact on human beings, their storage and usage of safety measures to be practiced while handling, like protective clothing, nose cover, gloves, facial masks and boots, washing, decontamination and safe disposal of containers; first-aid and required anti-dotes in case of poisoning and covering nearby drinking water resources like wells. Information about the banned or restricted pesticides and pesticide formulations, along with the authentic rate list should be published from time to time by the government in the local vernacular language. Special package of compensation for three years to the farmers of the cotton belt area, which assures them against any financial loss, should be provided during the process of switching over from pesticides to organic farming to protect them from being the victim of pesticide treadmill, committing suicides and being unable to go on living with the humiliation of debt.

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REFERENCES

- Baldi I, Filleul L, Mohamed-Ibrahim B, Fabrigoule C, Dartigues JF et al. 2001. Neuropsychologic effects of long term exposure to pesticides: Results from the French Phytoneer study. *Environ Health Perspect*, 109: 839-844.
- Bosma H, VanBoxtel MPJ, Ponds RWHM, Houx PJ, Jolles J 2000. Pesticides exposure and risk of mild cognitive dysfunction. *Lancet*, 356: 912-913.
- Cantor KP, Blair A, Everett G, Gibson R, Burmeister LF et al. 1992. Pesticides and other agricultural risk factors for non-Hodgkinson lymphoma among men in Iowa and Minnesota. *Cancer Research*, 52: 2447-2455.
- Chaudhuri RN 2000. Occupational health problems among agricultural and plantation workers. *J Occup Environ Med*, 42: 982-992.
- Dementi B 1994. Ocular effects of organophosphates in historical perspective of Saku disease. *J Appl Toxicol*, 14: 119-129.
- Gomes J, Lloyd O, Revitt MD, Basha M 1998. Morbidity among farm workers in a desert country in relation to long-term exposure to pesticides. *Scand J Work Environ Health*, 24: 213-219.
- Guo YL, Wang BJ, Lee CC, Wang JD 1996. Prevalence of dermatoses and skin sensitisation associated with the use of pesticides in fruit farmers of southern Taiwan. *Occup Environ Med*, 53: 427-431.
- Gupta BN, Mathur N, Rastogi SK, Srivastava AK, Chandra H et al. 1995. Socio-economic, environmental and health aspects of farm workers engaged in mango plantations. *Biomed Environ Sci*, 8: 301-309.
- Kashyap SK 1986. Health surveillance and biological monitoring of pesticide formulators in India. *Toxicol Lett*, 33: 107-114.
- MacDuffie HH 1994. Women at work: Agriculture and pesticides. *J Occup Med*, 36: 1240-1246.
- Meulenbelt J de Vries I 1997. Acute work-related poisoning by pesticides in the Netherlands: A one year follow-up study. *Przegl Lek*, 54: 665-670.
- Mishra UK, Nag D, Misra NK, Mehra MK, Ray PK 1985. Some observations on the macula of pesticides workers. *Hum Toxicol*, 4: 135-145.
- Pimental D, Greiner A 1996. Techniques for reducing pesticides: Environment and economic benefits. In: D Pimental (Ed.): *Environmental and Socio-economic Costs of Pesticide Use*. England, Chichester: John Wiley and Sons.
- Rastogi SK, Gupta BN, Hussain T, Mathur N, Garg N 1989. Study of respiratory impairment among pesticide sprayer in mango plantations. *Am J Ind Med*, 16: 529-538.
- Rastogi SK, Singh VK, Kesavachandran C, Jyoti, Siddiqui M K J et al. 2008. Monitoring of plasma butyrylcholinesterase activity and hematological parameters in pesticide sprayers. *Indian J Occup Environ Med*, 12(1): 29-32.
- Rupa DS, Reddy PP, Reddy OS 1991. Reproductive performance in population exposed to pesticides in cotton field in India. *Environ Res*, 5: 123-128.
- Spiewak R 2001. Pesticides as a cause of occupational skin diseases in farmers. *Ann Agric Environ Med*, 8: 1-5.
- Srivastava AK, Gupta BN, Bihari V, Mathur N, Pangtey BS et al. 1995. Organochlorine pesticide exposure

- and thyroid function: A study in human subjects. *J Environ Toxicol Oncol*, 14: 107-110.
- Subratty AH, Burakuth S, Reesaul C 1998. Biological monitoring of pesticides exposure among agricultural workers in Mauritius. *Poll Res*, 17: 295.
- Tiwana NS, Jerath N, Singh G, Singh R 2007. Pesticide pollution in Punjab: A review. *Asian Journal of Water, Environment and Pollution*, 6(1): 89-96.

APPENDIX

Case Studies

Village Jajjal

Date of interview: 25.09.2003 Working hours: 9.00 a.m. to 6.00 p.m.

Nirmal Singh (28 years) s/o Ganga Singh said he suffered from throat swelling, breathing difficulty

and chest tightness after spreading Acephate (powdered form).

Village Mahi Nangal

Date of interview: 27.09.2003 Working hours: 6.00 a.m. to 5.00 p.m.

Jagga Singh (34 years) and Gurdip Singh (42 years), both brothers complained about losing eye sight due to pesticides, experienced joint pain, dizziness, headache and itching on body. They said their life expectancy has been reduced by 10 years.

Village Bangi Nihal Singh

Date of interview: 28.09.2003 Working hours: 10.00 a.m. to 4.00 p.m.

Tej Kaur (44 years) w/o Ajaib Singh, working as a labourer during cotton-plucking season for the last 25-30 years, grumbled of nausea, headache, eye-itchiness, discolored nails, nails dropping off, excessive sweating, skin rashes and chest tightness.