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.
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), Carbmates (Aldicarb), Organophosphates (Chlorpyriphos, Acephate, Ethion, Triazophos) and Synthetic pyrethyroids (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), Jajal (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...
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; Subratty 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 sperm. Other disorders like decline in neuropsy-chological 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).

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

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

Figures in parentheses are percentages.
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 of compensation for three years to the farmers in the local vernacular language. Special package of compensation for three years to the farmers of the cotton belt area, which assures them of compensation for three years to the farmers in the local vernacular language.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


Srivastava AK, Gupta BN, Bihari V, Mathur N, Pangtey BS et al. 1995. Organochlorine pesticide exposure

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.