Pesticide: Endangered Agricultural Workers by Causing Depression And Suicidal Ideation

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ABSTRACT

Introduction: The increased usage of pesticides is associated with the increased of neuropsychiatric disorder include depression and suicidal ideation among agricultural workers in different socioeconomic and demographic area. These studies examined symptoms of neurological and psychological distress previously exposed to pesticides that cause suicidal ideation. ***Methods***: The mean number of suicide rate on agricultural workers previously exposed to pesticides obtained from direct method using the existing data and the others were obtained from direct interview and specific questionnaires which conducted on agricultural workers. The multivariate analysis used on these studies consists of multiple linear regression and logistic regression. ***Result***: Among the agricultural workers and the data that were analyzed, it shows that pesticides exposure associated with depression and suicidal ideation. Significant characteristics of increasing symptoms with increasing number of previous exposure to pesticide were seen by the somatisation, obsessive-compulsiveness, interpersonal sensitivity, anxiety and especially depression. Moreover, the increased probability of suicidal ideation significantly associated with the increased of the episodes of exposure to pesticides. ***Conclusions***: These studies indicate that pesticides exposure can be the cause of depression and suicidal ideation in agricultural workers. When the symptoms of neurological and psychological distress are detected, a monitoring must be available to prevent the suicidal ideation. However, further appropriately designed studies are needed to confirm the causal relationships.

Keyword: pesticide, depression, agricultural worker

Introduction

The development of industrial agriculture has resulted in increased usage of pesticides. Exposure to pesticides can cause multiple human health effects. The more these pesticides are used, the higher the people's exposure to these toxins will be, with increased adverse effects on human health. A WHO task group has lately estimated that the number of pesticide poisoning may soar to three million cases and result in more than 250,000 deaths.

However, the problem is more complicated according to a recent survey in Asia, indicating that as many as 25 million farmhands suffer episodic poisoning every year[1].

Due to the changes in our lifestyles, we are constantly exposed to various chemicals. The water we drink, food we eat, the air we breathe and the environment in which we live are all might be contaminated by these pesticide toxins which can damage the mechanism of muscle, heart, lung, and even brain. The most part used in farming are Anti-cholinesterase compounds, organophosphates (OPs), and carbamates (CMs) and they can affect mammalian systems by inhibiting acetyl cholinesterase (AChE) at the synapses and muscular junctions, which may result in hyper cholinergic preponderance[1]. Careless use of pesticides like organophosphates may cause diverse health complications by upsetting the endocrine, nervous, immune systems, reproductive, and can change the human behavior[1,2].

The connection between the exposure and an associated behavioral change may not be easy to recognize, but the consequences can last for many years. Knowledge about the association between pesticide exposures and psychiatric symptoms comes from case reports, human studies, animal studies, and epidemiological evidence. Many people are at risk of pesticide exposure. Those who work in landscaping, agriculture or other settings in which pest problems are treated with chemicals are at risk. Drift from aerial spraying of pesticides puts those working, living, or playing downwind at risk. The spray and runoff can contaminate both surface and ground water. Pest control in urban dwellings can put residents around the area at risk.

Studies among farm workers have shown an association between pesticide poisoning and psychiatric problems, particularly depressive disorders[3-11]. However, this association is not so clear when analysing pesticide exposure – without poisoning – and the occurrence of psychiatric problems[6,12,13]. Several pesticides, especially organophosphates, are neurotoxic and have been associated with increased psychiatric problems, particularly depression[3-6,12-15]. These problems could contribute to the incident of suicide among exposed workers[6,12,19]. Furthermore, in several parts of the world deliberate pesticide poisoning has been the main method of suicide[12], although this is not the case in Brazil[16,17].

These studies aim to identify the depression symptoms and suicidal thoughts by the different socioeconomic and demographic characteristics of agricultural workers. Moreover, these studies will evaluate the influence of factors related to occupation and health condition on depression symptoms and suicidal ideation.

Methods

Data were obtained from the existing data to find the mean suicidal rate per micro region on agricultural workers previously expose to pesticides in one study[22]. In two studies, data were obtained from direct interview and specific questionnaires which conducted on agricultural workers[8,23].

These studies use multivariate analysis. One study uses multiple linear regression to examine the association between pesticide (pesticide exposure and pesticide poisonings) and suicide rates (for entire population include socioeconomic, demographic, and cultural factors)[22] and two studies use logistic regression to analyze all surveyed risk factors as independent variables and presence of depression symptoms and suicidal ideation as dependent variables, also to compare all poisoned and subcategories of poisoned to non poisoned agricultural workers[8,23].

Results and Discussion

Among the agricultural workers and the data that were analyzed, it shows that pesticides exposure associated with depression and suicidal ideation. The study show that there are different results in the agricultural workers (banana workers) between poisoned to never poisoned banana worker by pesticides. That can be seen on Table 1[8].

Significant characteristics of increasing symptoms with increasing number of previous exposure to pesticide were seen by the existence of the five symptom dimensions of somatisation, interpersonal sensitivity, obsessive-compulsiveness, anxiety, and depression as well as the general severity index. In the other hand, banana workers who only poisoned by carbamate pesticide have less symptoms than banana workers who poisoned by two or more types of pesticide.

Table 2 shows the prevalence of suicidal ideation by workers' exposure categories, together with the adjusted ORs for poisoned workers as compared to non poisoned reference workers[8]. Banana worker who had been poisoned by organophosphate pesticide were over three times have bigger thought of suicidal ideation in the previous month compared to the banana worker who never poisoned by organophosphate pesticide. Among those who poisoned by carbamate pesticide, the potential of having suicidal thought was also elevated but not significantly. The increased probability of suicidal ideation associated with the number of episodes of poisoning.

Prevalence of abnormal scores (T scores ≥63) for psychological distress assessed with the Brief Symptom Inventory (BSI) by number of poisonings, and adjusted ORs comparing poisoned to never poisoned banana workers

	Referents, N=130		1 Poisoning, N=43			≥2 Poisonings, N=35			
BSI dimensions	Prevalence T score ≥63, n (%)	OR	Prevalence T score ≥63, n (%)	OR*	95% CI	Prevalence T score ≥63, n (%)	OR*	95% CI	p Value (χ^2 trend)
Somatisation	46 (35.4)	1.00	23 (53.5)	2.10	1.04 to 4.22	25 (71.4)	4.57	2.02 to 10.33	<0.001
Obsessive-compulsiveness	38 (29.2)	1.00	18 (41.9)	1.97	0.94 to 4.11	20 (57.1)	3.40	1.56 to 7.43	0.007
Interpersonal sensitivity	28 (21.5)	1.00	13 (30.2)	1.57	0.72 to 3.41	15 (42.9)	2.75	1.24 to 6.11	0.036
Depression	38 (29.2)	1.00	17 (39.5)	1.58	0.77 to 3.25	19 (54.3)	2.88	1.34 to 6.18	0.019
Anxiety	36 (27.7)	1.00	18 (41.9)	1.57	0.74 to 3.31	17 (48.6)	2.25	1.03 to 4.89	0.034
Hostility	25 (19.2)	1.00	14 (32.6)	2.03	0.94 to 4.39	11 (31.4)	1.93	0.83 to 4.44	0.111
Phobia	54 (41.5)	1.00	24 (55.8)	1.78	0.89 to 3.56	16 (45.7)	1.19	0.56 to 2.15	0.264
Paranoia ideation	33 (25.4)	1.00	10 (23.3)	0.72	0.31 to 1.69	15 (42.9)	2.21	0.98 to 5.00	0.092
Psychoticism	56 (43.1)	1.00	20 (46.5)	1.15	0.58 to 2.30	19 (54.5)	1.57	0.74 to 3.32	0.494
General severity index	42 (32.3)	1.00	23 (53.5)	2.41	1.19 to 4.87	19 (54.3)	2.79	1.30 to 6.00	0.005

*Adjusted for age, education, recent and cumulative exposure, alcohol, head injury, time of day of examination and examiner.

*Table 1.

Prevalence of suicidal ideation by exposure categories of poisoned banana workers and adjusted ORs compared to never poisoned reference population of banana workers

	N	Suicidal ideation	Prevalence %	Adjusted OR*	95% CI
Type of cholinesterase inhibitor					
Referents	130	8	6.2	1.00	
All poisoned workers	78	16	20.5	3.58	1.45 to 8.84
Organophosphate poisoned	54	12	22.2	3.72	1.41 to 9.81
Carbamate poisoned	24	4	16.7	2.57	0.71 to 9.30
Number of poisonings with medical attention†					
Referents	130	8	6.2	1.00	
1	43	8	18.6	2.65	0.90 to 7.84
≥2	35	8	22.9	4.98	1.72 to 14.45

*All models adjusted for age, education, time of day of examination and head injury.
†χ^2 Trend for number of poisonings: p=0.01.

*Table 2.

Conclusion

The results of this study are consistent with other published reports on the neuropsychological effects of pesticides overexposure, including depressive symptoms and a higher prevalence of suicidal thoughts, and are supportive of the priori hypothesis that was verified in the multivariate analysis for all suicides and in the stratified analysis. This result is consistent with many studies[12,18-21] and substantiates the possible relationship with occupational pesticide exposure.

Clearly, stronger designs of study are needed to clarify the pathophysiology and prove causality, in particular intended studies among highly exposed agricultural workers. Some of data obtained from the 1990s continue to be relevant because of the continued widespread use of pesticides in different socioeconomic and demographic area in developing countries in general.

Overall, the results of this study show that we need a depression and suicide monitoring system for agricultural workers who complain of neurological symptoms caused by pesticide exposure or exhibit commonly found key symptoms.

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