

SHORT ARTICLE

A Cross-sectional study to assess knowledge, practice and self- reported morbidity symptoms of pesticide use among farm women.

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Abstract

Background: Inevitable pesticide use in Indian agriculture has posed an increased risk of exposure to the farmers, which may lead to adverse health manifestations. Therefore, it is essential that the farmers must be aware of the harmful effects of pesticides. **Aims and Objectives:** To assess knowledge, practice and identify self-reported morbidity symptoms associated with pesticide use among farm women in the identified villages of Telangana, India. **Materials and Methods:** Community based cross-sectional study was conducted using a pre-tested questionnaire to carry out the survey among farmwomen. **Results:** 129 women working in agricultural farms were included in the study. Meagre knowledge regarding route of pesticide exposure was observed. Majority of them were not aware of toxicity symbols and never read the precautions on the pesticide containers. Inaccessibility was the main reason for insubstantial use of personal protective equipments (PPEs). Unsafe storage and disposal practices of containers were observed. Weakness (57.3%), headache (52%) and itching of skin (51.1%) were the common morbidity symptoms. Significant association was found between morbidity symptoms and use of PPE and hygienic practices, indicating importance of such practices. **Conclusion:** Improving knowledge which influences their practices and encouraging PPE use might be useful to remediate these issues. Monitoring studies may further aid to obtain the outcome of the awareness programmes and subsequently improved intervention methods can also be implemented.

Keywords

Pesticide; farm women; knowledge; hygienic practices; morbidity symptoms

Introduction

Majority of Indian population depend upon agriculture and use of pesticides has become a

requisite part of agriculture, which were introduced for improving crop production and quality of yield. However, despite their enormous benefits in agricultural intensification, the unregulated and repeated pesticide application has raised serious concerns about environment and human health (1). Ill health effects due to exposure through ingestion, inhalation and skin may differ according to the specific active ingredient and duration of exposure. Acute effects include symptoms like irritation/burning/stinging of eyes, blurred vision, dermatitis, headache, dizziness, excessive sweating/salivation, asthma and disorders associated with motor functioning, neurobehavioral changes (2). Long term exposure at even low concentrations can cause developmental disorders, immune-suppression, hormone disruption, reproductive abnormalities and cancer (3). Several non-occupational exposure pathways like residential pesticide use, air-drift and dietary ingestion play a significant role in pesticide exposure (4). Increased risk of adverse health effects occurs due to occupational exposure and is seen among the farmers and the workers of pesticide manufacturing units (5). In view of the possible increased health risks due to unavoidable pesticide use, there is an escalating necessity that farmers should be aware of the ill effects of pesticides, if not handled properly. Hence, the present study was planned to assess the level of awareness and various practices followed while handling pesticides by the farmers.

Aims & Objectives

1. To assess the knowledge and practices relating to pesticide handling.
2. To identify self-reported morbidity symptoms associated with pesticide exposure.
3. To identify possible associations between the reported symptoms and usage of personal protective equipments (PPEs) and hygienic practices

Material & Methods

Study type and area: Community based cross sectional study. Telangana is one of the top three regions in India which contribute to about 45% of pesticide usage and crops like rice and cotton involve major pesticide application (6). Cotton is one of the major crops produced in Ranga Reddy district of Telangana. Hence, five villages of Ranga Reddy district were randomly selected for including in the study.

Study size: Sample size has been calculated aiming to study the alterations in reproductive hormone functioning in farm women due to pesticide exposure. Assuming the follicle-stimulating hormone (FSH), mean \pm standard deviation value to be 4.2 ± 1.5 in farm women (7) with 95% confident interval, the calculated sample size was 120 subjects. The data reported in the present manuscript is a part of a larger research project and is based on the information obtained from the same study subjects. Study subjects and sampling technique: 221 female farm workers were identified from the villages who were engaged in various agricultural farming activities. 130 subjects were randomly selected by using simple random sampling technique. As one subject was not willing to participate, the data was collected from 129 farm women only.

Data collection: Information on socio-demographic particulars, duration of the exposure to pesticides, knowledge about route of their entry, toxicity symbols and precautions on labels of containers. Data on various practices like use of PPEs, storage/disposal of containers and hygienic practices followed after pesticide usage were also documented from the farm women at their farm sites using a pre-tested questionnaire. Other data collected included self-reported morbidity symptoms.

Standardization, training for data collection: Epidemiologists and bio-statisticians of National Institute of Nutrition (NIN), Indian Council of Medical Research, Hyderabad were involved in the preparation, pre-testing and standardizing the questionnaire. Training was also imparted to the project staff for collection of the data and administering the questionnaire through the interviews under the supervision of the concerned scientists.

Ethical clearance and Consent: The study protocol was approved by the Institutional Ethical Committee, NIN. The farm women were explained regarding the purpose of the study in their native language and a written informed consent was also obtained before the commencement of the questionnaire administration.

Statistical analysis: All the data were coded, entered in computer and database was prepared. Statistical analysis was performed using SPSS 21.0 version software. Chi-square test was used to determine the association between morbidity symptoms and PPE

use and hygienic practices. Statistical significance was fixed at $p < 0.05$ and $p < 0.01$.

Results

All the 129 farm women (mean age 32.6 years) were found to have reported using pesticides for the majorly cultivated crops like cotton, maize, tomato, okra, brinjal and cabbage. Of them, 62.8% were illiterates, 20% with primary level, 9.3% with secondary level, 6.2% with intermediate and only 2% had education up to Bachelor's degree. About 68.2% farm women possessed a semi-pucca house and only 31.7% had pucca houses. Further, 87.5% informed that they reside nearer to the farms. Majority (86%) of the farm women mentioned that their duration of work in the farms ranged from 4 – 8 months a year, with about 76% of them having worked for about 5 – 10 years.

About 68.2% of farm women lacked knowledge regarding route of entry of pesticides into human body. Of the 31.8% respondents who were aware of the exposure route, 26.8% felt that it may be through a combination of routes like, skin and eyes and 24.3% through inhalation and skin. Only 28.7% respondents were aware of the toxicity symbols provided on the labels of the pesticide containers. Of them, 33 respondents were aware of only the red symbol (indicate extremely hazardous nature of pesticides), but not about the other toxicity symbols. Further, none of the respondents were habituated to read the precautions given on the label of the containers prior to their use.

As regards to the use of PPEs, about 59% respondents mentioned that they do use PPEs and 41% reported non-use of any PPEs. Of the 59% using PPEs, about 80.2% respondents informed using shirts while working in the farms and about 20% of them using proper masks. None of them used gloves while working in the farms. About 49% respondents have indicated that their inability to use any PPEs is because of their inaccessibility or unavailability. Inconvenience (28.3%) and perception of not being able to arrive at proper mixing/spraying of the pesticide with PPEs on (22.6%) were also the other reasons. Further, it was found that about 72% of them mixed the formulations with bare hands and only 28% were found to be using gloves.

About 49% respondents stored pesticide containers in the house along with other items, while 21% stored them in a separate room and 30% in the farms. Disposal and dumping of empty pesticide

containers in the fields was reported by 50.4%, water bodies by 45% and or in open ground along with other waste material by 4.6%. Majority (98.5%) of the respondents have mentioned that they wash their hands with water after handling pesticides and about 56.5% used soap for hand wash. However, few also used mud (14%) and kerosene (5.4%) to wash their hands. Further, about 86.4% respondents wash their hands only after reaching their respective houses.

The most frequently reported morbidity symptoms were weakness (57.3%), headache (52%) and itching of skin (51%). Few of them also reported nausea (48%), dizziness (46%), lacrimation (46%), running nose (36.4%), red eyes (33.3%), blurred vision (31%) and vomiting (24%). About 17% of the farm women mentioned that they seek medical attention after experiencing these symptoms. 86.3% respondents reported to have visited primary health care centres located in their villages and very few (13.7%) visited a private clinic.

Chi square test was performed to know the association between usage of PPEs and morbidity symptoms reported by the farm women and significant association was observed between them (Figure 1). There found to have been a significant association between morbidity symptoms and adoption of hygienic practice such as taking bath after the use of pesticides ([Table 1](#)). Practices such as changing of work clothes had a significant association with symptoms like weakness, headache, itching of skin, nausea, dizziness, lacrimation, running nose and red eyes. While other symptoms viz., weakness, headache, skin itch, lacrimation, blurred vision and vomiting were also significantly associated with hygienic practice like washing of work clothes after the pesticide application ([Table 2](#)).

Discussion

Pesticides remain as an essential tool in modern agriculture and play a significant role in crop yield and improvement in the quality. However, repeated and improper use of pesticides is of critical concern with regard to public/farmer's health and also environmental contamination. Farm workers being the major users of the pesticides, knowledge related to usage, precautionary measures while handling, spraying and post-usage hygienic practices is essentially a prerequisite. The study examined knowledge and practices related to pesticide usage among farm women from the identified villages of

Ranga Reddy district by administering a questionnaire.

Demographic information reported that most of the farm women were illiterates. The study also revealed that most of them reside nearer to farms. Agricultural field's proximity to houses of people residing in that area may be a key factor to pesticide exposure and phenomenon of pesticide drift which further plays a crucial role (8). Majority of them lacked the knowledge pertaining to the route of pesticide entry into the body and also about the toxicity symbols indicated on the containers and no one was habituated to read/know the precautions printed on the labels of the pesticide containers. However, illiteracy or low level of education by majority of the farm women was also the other self reported reasons for their inability to read the precautions. While, few literate farm women found to have been not reading the labels which was explained due to their reluctance or lack of awareness and inattentive attitude.

The main reasons for meagre use of PPEs include inaccessibility and inadequacy in the proper judging of mixing/spraying the formulations. Although the farm women appreciated the beneficiary effects of using PPEs, their availability is another important dependent factor associated with the usage as well as provision of the same so as to minimize the exposure (9). However, few farm women also felt that the use of PPEs is a cumbersome task because of physical discomfort based on the self experience in field conditions (10). Another study in India also revealed no use of PPEs (11). Therefore, creating awareness and imparting proper training on the benefits of PPEs is an essential tool so as to develop a positive inclination towards their use.

Earlier study indicated that farmers lack awareness on the storage of pesticide containers and thus are habituated to store them in their houses within the easy accessible range of other family members including children (12). The present study indicated the disposal of the empty containers in the fields or into the water bodies which can lead to environmental contamination and in turn affect the food chain in the ecosystem. The study also revealed that majority of the farm women washed their hands with soap and very few changed or washed their work clothes after handling pesticides. Most of them wash their hands after reaching their houses indicating inadequate hygienic practices which may give rise to increased risk of exposure through 'take-

home' pathway for the other family members in the house (13). These practices call for the need for training and awareness campaigns on the proper disposal and adoption of good hygienic practices.

Majority of the farm women reported morbidity symptoms such as weakness, headache and itching of skin, in addition to the other symptoms like nausea, dizziness, lacrimation, running nose, red eyes, blurred vision and vomiting. The results of the present study have been found to be similar to epidemiological studies done elsewhere (14). Self reported morbidity symptom such as weakness may be due to exhaustion from attending to heavy tasks in the farms as well as homes in combination with tropical climatic conditions. Factors contributing to the morbidity symptoms might include non-use or inadequate use of PPEs and poor hygienic practices which influence the exposure time. Improper storage and inappropriate disposal might also be a causative factor associated with morbidity symptoms.

The significant association between morbidity symptoms and PPEs use support the widely known fact that proper use of PPEs reduces the exposure related symptoms. Thus, use of PPEs is recommended but the type and compliance is a crucial factor for their efficacy as incorrect or wrongly worn PPEs can also cause more harm than the protection (15).

Conclusion

Farm women play a pivotal role in contributing to back breaking agricultural farming tasks. The present study observed that illiteracy and lack of awareness are the main reasons for not knowing the exposure routes, toxicity symbols and precautionary measures given on the containers. Further, inaccessibility and affordability of PPEs are the major barriers for their meagre usage. The study revealed poor storage practices and improper disposal of the empty containers indicating lack of knowledge concerning environmental contamination. Commonly self reported morbidity symptoms like weakness, headache and itching of skin were significantly associated with use of PPEs in field and the adoption of hygienic practices which have an influence in decreasing the occurrence of such morbidity symptoms.

Recommendation

Primarily, there is a need to impart knowledge, create awareness on the adverse health effects of

the pesticides in order to bring about attitudinal change and also educate on the proper hygienic practices. Advising use of appropriate PPEs coupled with emphasizing the need for periodical replacement of the same. Monitoring and intervention studies can also be conducted to evaluate the awareness programmes, further, which may help to attain ecological balance by healthy ways of farming and for the quality livelihood of the farm women.

Limitation of the study

The present study accentuates results of only one part of India, hence may have limited generalizability. However, studies from other parts of India also suggested similar findings.

Relevance of the study

The women play a major role in agriculture and pesticide exposure can cause adverse health impacts on them and as well their off springs. Limited studies are available on the farm women and their knowledge and practices in attending to the farming activities. The findings of the present study emphasized the need for education and training to the farm women for increasing their awareness and also improve their behavioral and attitudinal change so as to minimize the exposure to pesticides.

Authors Contribution

All authors have contributed equally in this study.

References

1. Singh B and Jajpura L. Sustainable Agriculture: A Key to the Healthy Food and Better Environment, Economic Prosperity for Farmers and a Step towards Sustainable Development. *Int J Curr Microbiol App Sci* 2016;5:148-56.
2. Mohsen MM, Mohamed RSE, Hafez SH. The Effect of Health Hazards Intervention on the Farmer's knowledge, Practice and Self Reported Symptoms of Pesticides Exposure. *International Journal of Novel Research in Healthcare and Nursing* 2016;3:196-209.
3. Kim KH, Kabir E, Jahan SA. Exposure to pesticides and the associated human health effects. *Science of the Total Environment* 2017;575:525-35.
4. Damalas CA, Eleftherohorinos IG. Pesticide exposure, safety issues, and risk assessment indicators. *Int J Environ Res Public Health*. 2011;8(5):1402-19. doi: 10.3390/ijerph8051402. Epub 2011 May 6. Review. PubMed PMID: 21655127; PubMed Central PMCID: PMC3108117.[PubMed].
5. Glass CR, Machera K. Evaluating the risks of occupational pesticide exposure. *Hell Plant Prot J* 2009;2:1-9.
6. A report on Indian Agrochemical Industry [Internet]. India: Ushering in the 2nd Green Revolution – Role of Crop Protection chemicals [cited 2015 Nov]. Available from: <http://ficci.in/spdocument/20662/Agrochemicals-Knowledge-report.pdf>
7. Ibrahim KS, Amer NM, El Tahlawy EM and Abdualah HM. Reproductive outcome, hormone levels and liver enzymes in agricultural female workers. *Journal of Advanced Research* 2011;2:185-189.
8. Ward MH, Lubin J, Giglierano J, Colt JS, Wolter C, Bekiroglu N, Camann D, Hartge P, Nuckols JR. Proximity to crops and residential exposure to agricultural herbicides in iowa. *Environ Health Perspect*. 2006 Jun;114(6):893-7. PubMed PMID: 16759991; PubMed Central PMCID: PMC1480526.[PubMed].
9. Lee S, Obendorf SK. Statistical model of pesticide penetration through woven work clothing fabrics. *Arch Environ Contam Toxicol*. 2005 Aug;49(2):266-73. Epub 2005 Jul 27. PubMed PMID: 16059749.[PubMed].
10. Obendorf SK, Csiszár E, Maneefuangfoo D, Borsa J. Kinetic transport of pesticide from contaminated fabric through a model skin. *Arch Environ Contam Toxicol*. 2003 Aug;45(2):283-8. PubMed PMID: 14565588.[PubMed].
11. Lavanya Kumari P, Veeraiah A, Krishna Reddy G, Giridhara Krishna T. Safety use of Pesticides in Southern Zone of Andhra Pradesh – KAP Analysis, *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)* 2015; 8:47-58.
12. Chowdhury AN, Banerjee S, Brahma A, Biswas MK. Pesticide poisoning in non-fatal deliberate self-harm: A public health issue: Study from Sundarban delta, India. *Indian J Psychiatry*. 2007 Oct;49(4):262-6. doi: 10.4103/0019-5545.37666. PubMed PMID: 20680138; PubMed Central PMCID: PMC2910349.[PubMed].
13. Curwin BD, Hein MJ, Sanderson WT, Nishioka MG, Reynolds SJ, Ward EM, Alavanja MC. Pesticide contamination inside farm and nonfarm homes. *J Occup Environ Hyg* 2005;2:357-67.
14. Nigatu AW, Bråtteit M, Moen BE. Self-reported acute pesticide intoxications in Ethiopia. *BMC Public Health*. 2016 Jul 15;16:575. doi: 10.1186/s12889-016-3196-5. PubMed PMID: 27422555; PubMed Central PMCID: PMC4946227.[PubMed].
15. Cataño HC, Carranza E, Huamaní C, Hernández AF. Plasma cholinesterase levels and health symptoms in peruvian farm workers exposed to organophosphate pesticides. *Arch Environ Contam Toxicol*. 2008 Jul;55(1):153-9. Epub 2007 Dec 19. PubMed PMID: 18157496.[PubMed].

Tables

TABLE 1 ASSOCIATION BETWEEN TAKING BATH AND MORBIDITY

Hygienic practice	Morbidity symptoms		Chi square	P value
	Yes	No		
Take bath	Weakness		21.07*	< 0.01
	Yes	21 (35.6 %)		
	No	53 (75.7 %)		
		38 (64.4 %)		
		17 (24.3 %)		

	Headache				
	Yes	23 (39 %)	36 (61 %)	7.31*	< 0.05
	No	44 (62.9 %)	26 (37.1 %)		
	Itching of skin				
	Yes	20 (33.9 %)	39 (66.1 %)	12.97*	< 0.01
	No	46 (65.7 %)	24 (34.3 %)		
	Nausea				
	Yes	11 (18.6 %)	48 (81.4 %)	37.69*	< 0.01
	No	51 (72.9 %)	19 (27.1 %)		
	Dizziness				
	Yes	14 (23.7 %)	45 (76.3 %)	21.21*	< 0.01
	No	45 (64.3 %)	25 (35.7 %)		
	Lacrimation				
	Yes	16 (27.1 %)	43 (72.9 %)	15.18*	< 0.01
	No	43 (61.4 %)	27 (38.6 %)		
	Running nose				
	Yes	9 (15.3 %)	50 (84.7 %)	21.06*	< 0.01
	No	38 (54.3 %)	32 (45.7 %)		
	Red eyes				
	Yes	10 (16.9 %)	49 (83.1 %)	13.13*	< 0.01
	No	33 (47.1 %)	37 (52.9 %)		
	Blurred vision				
	Yes	13 (22 %)	46 (78 %)	4.09*	< 0.05
	No	27 38.6 %)	43 (61.4 %)		
	Vomiting				
	Yes	3 (5.1 %)	56 (94.9 %)	21.37*	< 0.01
	No	28 (40 %)	42 (60 %)		
*indicates significance					

TABLE 2 ASSOCIATION BETWEEN OTHER HYGIENIC PRACTICES AND MORBIDITY SYMPTOMS

Hygienic practices	Morbidity symptoms		Chi square	P value	
Change work clothes	Yes		No		
	Weakness				
	Yes	11 (35.5 %)	20 (64.5 %)	7.98*	< 0.05
	No	63 (64.3 %)	35 (35.7 %)		
	Headache				
	Yes	11 (35.5 %)	20 (64.5 %)	4.42*	< 0.05
	No	56 (57.1 %)	42 (42.9 %)		
	Itching of skin				
	Yes	7 (22.6 %)	24 (77.4 %)	13.34*	< 0.01
	No	59 (60.2 %)	39 (39.8 %)		
	Nausea				
	Yes	3 (9.7 %)	28 (90.3 %)	24.08*	< 0.01
	No	59 (60.2 %)	39 (39.8 %)		
	Dizziness				
	Yes	5 (16.1 %)	26 (83.9 %)	14.41*	< 0.01
	No	54 (55.1 %)	44 (44.9 %)		
	Lacrimation				
	Yes	3 (9.7 %)	28 (90.3 %)	21.37*	< 0.01
	No	56 (57.1 %)	42 (42.9 %)		
	Running nose				
	Yes	4 (12.9 %)	27 (87.1 %)	9.75*	< 0.01
	No	43 (43.9 %)	55 (56.1 %)		
Red eyes					

	Yes	4 (12.9 %)	27 (87.1%)	7.66*	< 0.05
	No	39 (39.8 %)	59 (60.2 %)		
Wash work clothes	Weakness				
	Yes	9 (37.5 %)	15 (62.5 %)	4.75*	< 0.05
	No	65 (61.9 %)	40 (38.1 %)		
	Headache				
	Yes	6 (25 %)	18 (75 %)	8.57*	< 0.05
	No	61 (58.1 %)	44 (41.9 %)		
	Itching of skin				
	Yes	7 (29.2 %)	17 (70.8 %)	5.71*	< 0.05
	No	59 (56.2 %)	46 (43.8 %)		
	Lacrimation				
	Yes	5 (20.8 %)	19 (79.2 %)	7.36*	< 0.05
	No	54 (51.4 %)	51 (48.6 %)		
	Blurred vision				
	Yes	3 (12.5 %)	21 (87.5 %)	4.72*	< 0.05
	No	37 (35.2 %)	68 (64.8 %)		
	Vomiting				
Yes	1 (4.2 %)	23 (95.8 %)	6.37*	< 0.05	
No	30 (28.6 %)	75 (71.4 %)			

* indicates significance

* indicates significance

Figures

FIGURE 1 ASSOCIATION BETWEEN USE OF PPEs AND MORBIDITY SYMPTOMS

