Original Article

Evaluating Farmers' Knowledge, Attitude and Practice Regarding Pesticide Use and Its Impact on Human Health in Northern Karnataka — A Cross Sectional study

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Background : In India, a significant agricultural workforce operates with many relying on Pesticides for Farming. However, handling pesticides during mixing and spraying poses high exposure risks. Detecting these hazards early falls under occupational hygiene. Our study aims to assess rural Farmers' understanding, attitudes and behaviours concerning pesticide usage. This exploration is crucial for developing strategies to promote safer agricultural methods and protect Farmers' health.

Aims and Objectives : Assessing the Knowledge, Attitude and Practice of Farmers concerning pesticide usage and its harmful effects on human health.

Methodology : In Vijayapura district, a cross-sectional survey of Farmers was conducted. Convenience sampling was used to select study participants. Data was gathered from June, 2023 to October, 2023 using a semi-structured, pre-tested questionnaire. The data was then imported into Excel. Data analysis was done using SPSS V.26.

Results : Most of the Farmers commonly report symptoms like skin irritation, headaches and burning sensation of eyes after pesticide usage. In 51% lacked knowledge of the chemical names of pesticides and this was found to be statistically associated with their level of education. In Practice, 87.3% not using long gloves it was statistically associated with income. Over 61.8% of Farmers indicated that they would rinse their eyes with water in case of accidental pesticide spillage into their eyes. Farmers noted that Grapes, Toor dal and cotton require higher pesticide application compared to Jowar and Wheat, which requires less. While over 65% of participants do not use Personal Protective Equipment (PPE), a majority adhere to changing their clothes after Pesticide usage.

Conclusion : The majority of Farmers demonstrated a positive attitude and inadequate pesticide usage procedures; they did not wear PPE when mixing or spraying. Therefore, ongoing instruction in safe mixing or spraying will broaden their understanding and aid in preventing negative health effects.

[*J Indian Med Assoc* 2024; **122(12):** 57-60]

***Key words* : Occupational Health, Pesticides, Farmers Knowledge, Health Awareness, Occupational Hazards.**

The highest concentration of agricultural labourers exists in Asia, notably in India, which harbours over 20% of the global agricultural workforce[1]. A significant portion of these workers in India regularly uses pesticides. Over the last decade, there has been a significant surge in pesticide usage, leading to enhanced crop yields and decreased postharvest losses. Nonetheless, this extensive application has raised apprehensions about potential adverse effects on human health[2].

In India, inadequate safety measures taken by those who use or manufacture pesticides, incorrect product labelling, improper home storage of chemicals and industrial pollution of the environment, often as a result of improper waste disposal, are the main causes of Occupational [h]azards[2]. Mixing and spraying are the tasks associated with the highest intensity of pesticide exposure because in this stage, Farmers come into contact with the concentrated product and often have high exposure episodes[3].

The significance of spray deposition on the bodies of those applying pesticides is highlighted in studies on pesticide dermal contamination. These studies indicated that the Pesticides used by farmers posed significant risks to all individuals involved[4]. Occupational hygiene encompasses the early identification and evaluation of workplace hazards[5]. Therefore, it becomes imperative to understand Farmers' perceptions of Pesticides and their safety

Editor's Comment :

- Farmers face health risks because of low awareness, limited income and not using safety gear, showing the need for better support and education.
- Promoting organic farming, safer pesticide options, and regular training can protect farmers and the environment.
- Stronger laws and enforcement are crucial to improve safety and encourage sustainable farming practices.

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Received on : 13/12/2023
Accepted on : 29/01/2024

procedures in order to provide critical information to avoid or lessen the dangers to the environment and human health associated with Pesticide usage.

The purpose of this study was to evaluate Farmers' Knowledge, Attitudes and Practices about the usage of Pesticides and their detrimental consequences on human health.

Materials and Methods

Study Area : Vijayapura, Northern Karnataka District.

Study Population : Farmers who have utilized pesticides in their agricultural practices previously.

Study Period : July, 2023 to October, 2023

Study Design : Cross-sectional survey

Study Technique : In the district of Vijayapura, a cross-sectional study was done on farmers. The research participants were chosen through the use of convenience sampling technique. After acquiring ethical clearance from the Institutional Ethics Committee, the questionnaire was initially created in English, then translated into the local Kannada language and subsequently administered following pilot testing. Socio-demographic details, Knowledge, Attitude and Practices about the pesticide usage and its impact on farmers health related data was obtained using pre-tested semi-structured questionnaire by conducting face to face interview.

Sample Size : Given that the anticipated proportion of farmers' knowledge on the frequency of pesticide spraying is 96.6%[6], the study would need a minimum sample size of 180 with a 96% confidence level and 3% absolute precision.

Formula used –

$$n = \frac{z^2\, p*q}{d^2}$$

Dropout rate of 10% = 180 + 18 = 198

Sampling Technique : We included Farmers who visited the District Hospital and Rural Health Centre using convenience sampling. This method was specifically chosen because it made the process convenient and accessible. During the data collection period, we focused on selecting participants who were already present at these healthcare facilities. This approach allowed us to gather valuable insights from individuals easily reachable in these particular settings.

Inclusion Criteria : Among Farmers who had used Pesticides at least once, those who gave their oral consent to participate were included.

Exclusion Criteria : Farmers who declined to give consent were excluded from the study.

Statistical Analysis :

- Microsoft Excel was used to enter the data, and SPSS (Version 26) was used for statistical analysis.
- Diagrams, percentages and frequency were used to display the results.
- Chi square test was used to determine whether Categorical Variables were associated.

Results

The study enrolled 204 Farmers, with 50.5% falling within the 26-49 age range. Over 95% of participants identified as Hindu, while 46% belonged to the general category. Among the participants, 49% had no formal education and the majority were married. Approximately 70.6% reported an annual income of less than 2 lakhs. Additionally, 27.9% had been using pesticides for over 15 years

The majority of Farmers noted that Grapes, Toor dal, and Cotton require higher pesticide application, while Jowar and Wheat demand less in this region. Regarding Farmers' awareness, 51% lacked knowledge of the chemical names of Pesticides and this was found to be statistically associated with their level of education. About 74% of farmers were aware that Pesticides should be stored separately and handled with care. Only 50% of Farmers believed it was essential to read and comprehend the Pesticide container label before use.

Regarding attitudes, 71.6% believed high-quality Pesticides pose no health risks, while 87.7% deemed Pesticide use necessary. Furthermore, 82.2% indicated that immediate bathing after Pesticide use reduces poisoning. In practice, only 33.8% used masks, statistically associated with their education level. 87.3% not using long gloves, it is statistically associated with income. While over 65% of participants do not utilize Personal Protective Equipment (PPE) and 26.5% didn't change clothes postapplication. In response to accidental Pesticide exposure in the eyes, most Farmers washed their eyes with water.

In 65.2% of Farmers clean their sprayer tanks in the fields' waterways. The majority of Farmers noted that Pesticides can penetrate the body through the nose, skin and eyes. Headache, nausea, skin irritation and a burning sensation of the eyes were the most frequently mentioned symptoms after pesticide use (Tables 1-3)(Figs 1-3).

Discussion

Farmers expressed their intention to take a Pesticide-poisoned person to the hospital when

Table 1 — *Socio-demographic Characteristics of Farmers*

Characteristics		Frequency	Percentage
Age group	26-49	103	50.5
	50-69	101	49.5
Education level	Never attended	100	49
	Pre/primary	62	30.4
	High school	27	13.2
	PUC/Diploma	15	7.4
Religion	Hindu	195	95.6
	Muslim	9	4.4
Cast	General	94	46.1
	OBC	80	39.2
	SC	20	9.8
	ST	10	4.9
Marital status	Married	197	96.6
	Un married	7	3.4
Income	≤2 lakhs	144	70.6
	> 2 lakhs	60	29.4
Duration of pesticide usage	≤15 years	147	72.1
	> 15 years	57	27.9

encountered, Referencing guidelines from a World Health Organisation report[2]. Most Farmers in the study are males aged between 26 to 50 years old and married. Similar Socio-demographic traits were observed in a study conducted in Puducherry[7].

In our research, the majority of Farmers are aware of the need to store Pesticides separately, which aligns with the findings of a study conducted in Chikkaballapur District, South Karnataka[8]. In this study, most farmers indicated that Pesticides can penetrate the body through the nose and skin. Similar research carried out in Sweden confirmed that pesticides can penetrate the body through the skin[9].

In line with study from Uganda, our research showed that 37.3% of Farmers said that Headache was a common side effect of using Pesticides[10].

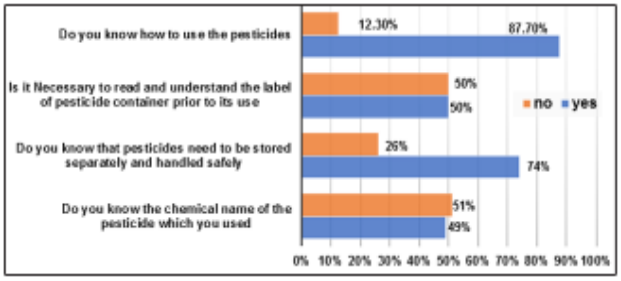

Fig 1 — Knowledge of the Farmers regarding Pesticide usage

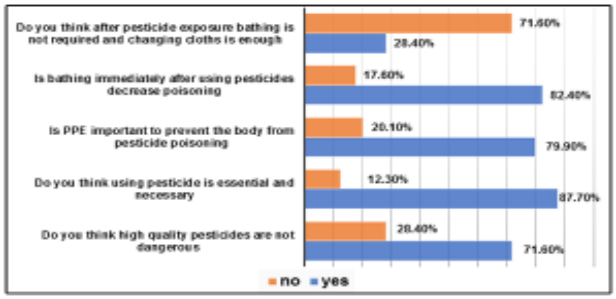

Fig 2 — Attitude of the Farmers regarding Pesticide usage

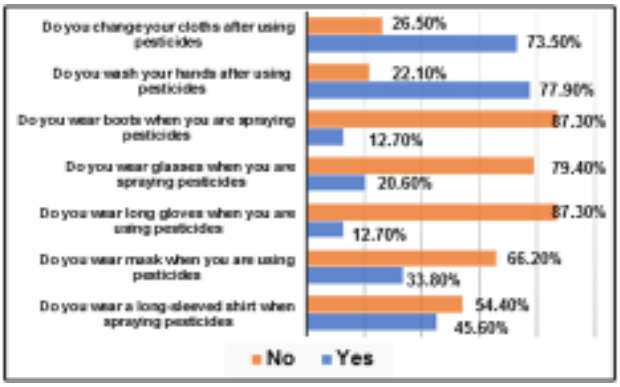

Fig 3 — Practice of the Farmers regarding pesticide usage

Table 2 — *Farmers responses about Harmful effects of pesticide Usage*

Variables		n (204)	
		Frequency	Percentage
Through which route can can pesticides enter the human body	Nose	95	46.6
	Skin	64	31.4
	Eyes	45	22.1
What are the symptoms have you experienced following pesticide usage	Headache	76	37.3
	Nausea	44	21.6
	Skin irritation	32	15.7
	Burning sensation of eyes	52	25.5
If you witnessed someone being poisoned by Pesticide, how would you respond	Take the person to hospital	182	89.2
	Find out the way how it's happened	22	10.8
How would you respond if you accidentally got Pesticide on your skin	Wash the exposed area with soap and water	58	28.4
	Wipe it off the cloths	146	71.6
What would you do, if Pesticides accidentally spilled into your Eyes	Take to nearest hospital	78	38.2
	Wash the eyes with water	126	61.8
Where you will clean the sprayer tank	Water way in the field	133	65.2
	In the Home	71	34.8

Some of the respondents among the 204 Farmers mentioned skin irritation and a burning sensation in the eyes as symptoms of Pesticide's adverse effects on health, which were similar to findings in Kuwait[11].

Over 61.8% of Farmers indicated that they would rinse their eyes with water in case of accidental Pesticide spillage into their eyes. Comparable results were reported by the Department of Agriculture Development in Greece in a review study[12].

In this region, most Farmers cultivate crops such as Jowar, Wheat, Toor dal, Groundnut, Cotton, Sugarcane and Grapes. Regarding application frequency, the majority mentioned that grapes require Pesticide application every alternate day, while Jowar and Wheat necessitate a single application or none at all. Commonly used Pesticide brands in this area include DAP,

KINGDOXA and PROCLAIM with a prevalent usage of DAP among the majority.

Following the data collection process, Farmers received in-depth instruction and awareness-raising sessions regarding the use of Pesticides, with a special emphasis on Pesticide handling and the significance of wearing Personal Protective Equipment (PPE). These education and sensitization sessions play a vital role in advocating for safer Pesticide handling methods to reduce health risks.

Limitation :

Implementing a convenient sampling technique with a limited sample size constrained our ability to precisely depict the wider and diverse Farming Community. As a result, this constraint hinders the universal application of the findings or the derivation of broad conclusions relevant to diverse farming communities or regions.

Table 3 — *Statistical association*

Level of Education *versus* Do you know the chemical name of the Pesticide						
		Do you know the chemical name of pesticide			Chi-square	P value
		No	Yes	Total		
Level of Education	Never Attended	60	40	100		
	Pre/Primary	30	32	62		
	High School	9	18	27	8.65	0.03
	PUC/Diploma	5	10	15		
Total		**104**	**100**	**204**		
Level of Education *versus* Do you wear Mask when spraying Pesticides						
		Do you wear Mask when spraying Pesticides				
		No	Yes	Total		
Level of Education	Never Attended	76	24	100		
	Pre/Primary	38	24	62		
	High School	14	13	27	9.99	0.01
	PUC/Diploma	7	8	15		
Total		**135**	**69**	**204**		
Annual Income *versus* Do you wear long Gloves when spraying Pesticides						
		Do you wear long Gloves when spraying pesticides				
		No	Yes	Total		
Annual income	≤2 Lakhs	130	14	144		
	>2 Lakhs	48	12	60	4.02	0.04
Total		**178**	**26**	**204**		

Conclusion

Majority of the Farmers are not using the Personal Protective Equipment (Mask, Gloves, Goggles, Boots) while mixing or spraying. They displayed a positive attitude but implemented inadequate practices concerning Pesticide usage. Just a small percentage of them are aware of the negative effects of pesticides and what to do in the event of accidental spills. In conclusion, Pesticide usage among Farmers is a complex issue with both benefits and drawbacks.

Along with addressing the health risks associated with Pesticide usage, initiatives should be made to promote responsible Pesticide use, provide access to safer alternatives such as natural chemicals and support organic Farming. Sustainable agricultural practices, education and Government regulations will continue to play vital role in shaping the future of Pesticide usage in agriculture.

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