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PREVALENCE OF PESTICIDES USAGE AND ITS EFFECT ON THE HEALTH OF FARMERS ABOVE 18 YEARS IN VILLUPURAM DISTRICT-A CROSS SECTIONAL STUDY

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Abstract

Background: Pesticide exposure poses significant health risks, with developing countries experiencing an estimated 10,000 annual fatalities. This cross-sectional study aims to evaluate the prevalence of pesticide use among farmers in Villupuram district, assessing their awareness regarding protective measures during pesticide application, and examining the health effects resulting from pesticide use. **Methodology:** A cross-sectional study conducted over one year in Villupuram District involved farmers from Gingee Panchayath. Participants over 18 years expressing willingness to participate were included in the study. A sample size of 190 was calculated using a structured questionnaire consisting of demographics, farming practices, and health-related aspects. Statistical analysis employed SPSS version 21. **Results**: Of 190 participants, 61.6% reported pesticide usage, with 50.4% employing protective measures. Awareness varied across practices, indicating the need for education. Symptoms post-spraying was observed in 14.5% of participants. Association analysis revealed significant gender-based disparities in pesticide usage. **Conclusion:** The findings underscore the importance of targeted educational interventions and gender-specific strategies to mitigate the risks associated with pesticide exposure.

Keywords: Pesticide Exposure, Agricultural Practices, Health Effects, Awareness, Farmers.

INTRODUCTION

A variety of adverse health effects are brought about by occupational and environmental pesticide exposure-related issues. An estimated 10,000 fatalities occur annually in developing countries due to the use of chemical pesticides worldwide; approximately three-quarters of these deaths occur in developed countries.[1]

At present, India holds the distinction of being the foremost producer of pesticides in Asia and is positioned twelfth globally in terms of pesticide usage, with an impressive annual output of 90,000 tonnes.[2]

Due to the fact that 56.7% of the population in India are involved in agriculture, they are consequently exposed to agricultural pesticides.[3]

Agricultural pesticides are discharged into the environment and may come into direct or indirect contact with humans. The available evidence indicates that farmers may inadvertently come into contact with treated vegetation during spraying operations, while mixing, loading, or sprinkling, while clearing up spraying equipment, or due to vapour dispersion from volatilized pesticide deposits resulting from the lack of personal protective equipment (PPE).[4]

In addition, the occupation of agriculture, proximity to agricultural fields, and the consumption of contaminated food were all potential routes of pesticide exposure for small-scale producers.[5] Nevertheless, the exposure risk was contingent upon the nature, duration, and pathway of the exposure. Common routes of occupational pesticide exposure include inhalation, dermal contact, and ingestion; these routes of entry occur during the formulation of solutions and application procedures.[6] As a result, farmworkers are regarded as a high-risk population due to their substantial pesticide exposure.

Objectives:

1. To assess the prevalence of pesticide, use among farmers in Villupuram District, A Cross sectional study
2. To find out the awareness about using protective measures while using pesticide
3. To find out the health effects after pesticide use

MATERIAL AND METHODS

Study Design: This was a cross sectional study conducted in Villupuram District of Tamil Nadu for a period of 1 year

Study Participants: The study was conducted among the farmers residing in Villages in Gingee panchayath in Villupuram District of Tamil Nadu.

Inclusion Criteria: Farmers above the age of 18 who expressed willingness to participate in the study were included.

Exclusion Criteria: Individuals who did not provide permission to participate in the study were excluded.

Sample Size:

From a study done by Chitra GA et al[8] prevalence of pesticide usage was found to be 68.6% among famers in South India. Taking this prevalence value and applying in the formula Z^2PQ/L^2 where Z = 1.96 (95% CI), P= 68.6, Q= 31.4 and absolute precision (L) was taken as 6.8% the required sample size was calculated as 190.

Study Instrument:

Data collection was carried out using a pre-tested structured questionnaire. The questionnaire covered information such as village name, personal details, farming practices, pesticide usage, protective measures, awareness, signs and symptoms after pesticide spraying, and long-term health effects.

Ethical Considerations: Written informed consent was obtained from each participating farmer before enrolling them in the study. Ethical clearance for this study was obtained from the Institutional Human Ethics committee on Human subjects (Approval. No: 002/SBMCH/IHEC/2023/2091).

Statistical Analysis:

The collected data were entered into Microsoft Excel and analysed using SPSS software version 21. Frequency/Percentage and Mean/SD was used to express the categorical and continuous variable respectively. Association between the variables was done using Chi Square test and p value less than 0.05 was considered significant.

RESULTS

The mean age of the study participants was 49.73 ± 11.13 years. Majority of the study participants were males (71.1%). 47.4% of the study participants were illiterate. 26.8% and 25.8% of the study participants had primary and middle school education. Prevalence of pesticide usage was seen among 61.6% (117) of the study participants. Out of the 117 participants, only 50.4% use the protective measures.

Table 1: Usage of Pesticide (N=117)

S No	Variable	Frequency	Percentage
1	**Years of using pesticide**		
	1 – 5	40	34.2
	6 – 10	40	34.2
	>10	37	31.6
2	**Decision on usage of pesticide**		
	Presence of pest in field	38	32.5
	After checking density	40	34.2
	Calendar method	39	33.3
3	**Number of sprayings per crop**		
	Once	24	20.5
	Twice	39	33.3
	Thrice	24	20.5
	More than thrice	30	25.6
4	**Person giving advice for the usage of pesticide**		
	Other farmers	30	25.6
	Retailer	31	26.5
	Government agencies	25	21.4
	No one	31	26.5
5	**Person spraying the pesticide**		
	Self	39	33.3
	Trained personnel	42	35.9
	Untrained personnel	36	30.8

Table 1. shows various factors related to pesticide usage among farmers. Around 34.2% of farmers had been using pesticides for more than 10 years, while an equal percentage had been using them for 1-5 years and 6-10 years. In terms of decision-making, a similar distribution was observed, with 34.2% deciding based on the presence of pests in the field, 34.2% after checking pest density, and 31.6% using the calendar method.

Regarding the number of sprayings per crop, 33.3% sprayed once, 33.3% twice, 20.5% thrice, and 25.6% more than thrice. Advice on pesticide usage primarily came from other farmers (25.6%), retailers (26.5%), and government agencies (21.4%), with 26.5% not receiving advice from anyone. In terms of who sprayed the pesticide, 35.9% used trained personnel, 33.3% sprayed themselves, and 30.8% used untrained personnel. These findings highlight the diverse practices and sources of information among farmers regarding pesticide use, which can have implications for safety and effectiveness.

Table 2: Awareness about the Usage of Pesticide

S No	Variable	Yes (%)	No (%)	Don't know (%)
1	Bath after spraying	71 (37.4)	47 (24.7)	72 (37.9)
2	Wash the apparatus post usage	66 (34.7)	71 (37.4)	53 (27.9)
3	Avoid contamination in water source	61 (32.1)	64 (33.7)	65 (34.2)
4	Dispose the empty bottle safely	69 (36.3)	57 (30)	64 (33.7)
5	Wash the clothes worn	57 (30)	73 (38.4)	60 (31.6)
6	Re-entry period after spraying	69 (36.3)	65 (34.2)	56 (29.5)
7	Avoid feeding in field	65 (34.2)	61 (32.1)	64 (33.7)
8	Spray in the direction of wind	72 (37.9)	55 (28.9)	63 (33.2)
9	Regularly service the sprayer	74 (38.9)	66 (34.7)	50 (26.3)
10	Pesticides can be explosive	65 (34.2)	62 (32.6)	63 (33.2)
11	Pesticides can be absorbed through skin	61 (32.1)	59 (31.1)	70 (36.8)
12	Placing a danger sign board outside filed after spraying	69 (36.3)	44 (23.2)	77 (40.5)

Table.2 presents respondents' behaviors and knowledge regarding pesticide safety measures. The majority (37.4%) reported bathing after spraying pesticides, while 24.7% did not and 37.9% were unsure. Washing the apparatus post-usage was practiced by 34.7%, not practised by 37.4%, and 27.9% were uncertain. Regarding avoiding contamination in water sources, 32.1% adhered to it, 33.7% did not, and 34.2% were unsure. Proper disposal of empty bottles was reported by 36.3%, not properly disposed by 30%, and 33.7% were unsure. Washing clothes worn during pesticide use was done by 30%, not done by 38.4%, and 31.6% were uncertain. A re-entry period after spraying was followed by 36.3%, not done by 34.2%, and 29.5% were unsure. Avoiding feeding in the field post-spraying was done by 34.2%, not followed by 32.1%, and 33.7% were uncertain. Spraying in the direction of the wind was practiced by 37.9%, not done by 28.9%, and 33.2% were unsure. Regular servicing of sprayers was conducted by 38.9%, not done by 34.7%, and 26.3% were unsure. Awareness about pesticides being explosive was noted by 34.2%, not by 32.6%, and 33.2% were unsure. Knowledge about pesticides being absorbed through the skin was held by 32.1%, no knowledge by 31.1%, and 36.8% were unsure. Placing danger signboards after spraying was done by 36.3%, not by 23.2%, and 40.5% were unsure. Overall, the results show varied levels of adherence to pesticide safety practices and differing levels of knowledge about associated risks among respondents. Out of the 117 study participants, 14.5% displayed one or the other symptoms immediately after spraying pesticides.

Table 3: Signs and Symptoms Immediately after Spraying Pesticides

S. No	Symptoms (N=117)	Frequency	Percentage
1	None	100	85.5
2	Burning/Stinging/Itching of eyes	2	1.7
3	Dry/Sore throat	1	0.9
4	Shortness of breath	14	12

Among 117 individuals, the majority (85.5%) reported no symptoms. Among those who reported symptoms, a small percentage experienced burning, stinging, or itching of the eyes (1.7%), while even fewer reported dry or sore throat (0.9%). Shortness of breath was reported by 12% of the individuals. This suggests that while most individuals in the sample did not experience symptoms, a notable proportion reported respiratory symptoms such as shortness of breath, indicating a potential need for further investigation or monitoring of respiratory health in this population. (table.3)

Table 4: Association between the Profile of the Study Participants and Usage of Pesticides

Profile	Pesticide usage		Chi-square	Degrees of freedom (df)	P value
	Yes n= 117 (61.5%)	No n = 73 (38.5%)			
Gender					
Male	109 (93.2%)	26 (35.6%)	72.38	1	**<0.001***
Female	8 (6.8%)	47 (64.4%)			
Education					
Illiterate	49 (41.9%)	41 (56.2%)			
Primary	33 (28.2%)	18 (24.7%)	4.156	2	0.125
Middle	35 (29.9%)	14 (19.2%)			

* P Value < 0.05 - Statistically significant at 95% Confidence Interval

The results show significant associations between pesticide usage and gender. Among the participants using pesticides, a higher proportion were male (93.2%) compared to females (6.8%). This gender difference was statistically significant (Chi-square = 72.38, df = 1, p < 0.001), indicating that males were more likely to use pesticides than females. Regarding education, the distribution of pesticide usage across different educational levels did not show a statistically significant difference (Chi-square = 4.156, df = 2, p = 0.125). However, there is a trend suggesting that individuals with lower education levels (illiterate, primary, and middle) had a slightly higher prevalence of pesticide usage compared to those with higher education levels. (table.4)

Table 5: Association between the Profile of the Study Participants and Prevalence of Symptoms after the Usage of Pesticides (N=117)

Profile	Pesticides usage symptoms		Chi-square	Degrees of freedom (df)	P value
	Yes N= 17 (14.5%)	No N = 100 (85.5%)			
Gender					
Male	17 (100%)	92 (92%)	1.459	1	0.227
Female	0	8 (8%)			
Education					
Illiterate	9 (52.9%)	40 (40%)			
Primary	4 (23.5%)	29 (29%)	1.006	2	0.604
Middle	4 (23.5%)	31 (31%)			

There is no significant association between pesticides usage symptoms and gender, with a chi-square value of 1.459 and a p-value of 0.227, indicating that gender does not influence the presence of pesticides usage symptoms. Similarly, education level also does not show a significant association with pesticides usage symptoms, as indicated by a chi-square value of 1.006 and a p-value of 0.604. This suggests that neither gender nor education level plays a significant role in determining the presence of symptoms related to pesticide usage among the study participants. (table.5)

DISCUSSION

The present study was done with the objective to assess the prevalence of pesticide usage among the farmers in Villupuram District. The majority of farmers were men, and they worked directly with pesticides, either preparing them or applying them in the fields. Studies were out in Brazil by Oliveira Pasiani J et al. produced findings similar

to these.[9] The farmworker's experience handling pesticides has been considered in order to determine its impact on understanding and application of safe pesticide use.

Prevalence of pesticide usage was seen among 61.6% (117) of the study participants. The results reveal significant patterns in the pesticide usage practices among the study participants. A substantial portion of farmers reported using pesticides for an extended period, with 34.2% utilizing them for over 10 years. According to research by Afata TN et al.,[10] farmers use pesticides at a somewhat greater incidence (87.15%).

The ways in which participants made decisions about pesticide application varied, with an equal number relying on the presence of pests in the field, checking pest density, and following a calendar-based approach. The frequency of sprayings per crop also showed diversity, with a balanced distribution among different options. Additionally, the individuals who provided advice and carried out the spraying were also varied, showcasing the complexity of pesticide management within the studied population.

When it comes to understanding pesticide usage, the results of the study show that participants have varying levels of knowledge. Interestingly, a significant number of participants were aware of certain safety measures, such as bathing after spraying and properly disposing of empty bottles, as well as regularly maintaining the sprayer. However, it is concerning that a considerable portion of participants showed a lack of awareness, especially regarding practices like not feeding in fields and understanding the potential dangers of using explosives. These findings highlight the need for targeted education programs to increase awareness and promote safe handling of pesticides.

Mohanty MK et al. obtained similar research findings.[11] According to Karunamoorthi K et al.'s research, about 127 (81.4%) farmers used backpack sprayers, while 29 (18.6%) of them used tiny cans with several holes as an applicator for pesticides.[12] This dangerous technique endangers non-target creatures and contaminates soil, surface, and ground water, among other environmental effects.[4,10] Recena MC et al.'s investigation produced findings that were comparable.[13] It is important to follow appropriate safety protocols while cleaning equipment that contains pesticides.[14]

When it comes to the immediate health consequences of using pesticides, the majority (85.5%) reported no negative symptoms. However, a small percentage did suffer from shortness of breath (12%) and eye irritation (1.7%). These results emphasize the significance of taking protective measures while spraying pesticides to reduce the chances of experiencing harmful health effects. In research by Karunamoorthi K et al., headache (58.8%), salivation and vomiting (38.2%), nausea (36.5%), and sneezing (12.5%) were symptoms linked to pesticide usage.[12] The exposure to carcinogens and suspected endocrine disruptors may be the cause of the hazardous effects of the pesticides used in the research region.[15]

The examination of participants' demographic profiles and their use of pesticides uncovered a significant link between gender and pesticide usage. It was discovered that males had a higher incidence of using pesticides compared to females. However, no significant correlation was found between education levels and pesticide usage. This highlights the necessity for targeted interventions geared towards addressing gender-specific concerns related to pesticides. Furthermore, further analysis revealed that there were no notable discrepancies in the prevalence of symptoms after pesticide usage based on gender or education levels.

This highlights the fact that these demographic characteristics have a weak impact on one's experience of symptoms, underscoring the significance of taking into account other factors such as personal vulnerability and level of exposure.

CONCLUSION

In light of the ever-changing agricultural terrain, it is imperative that future investigations and remedial actions delve beyond the surface of pesticide utilization, carefully examining geographical nuances, unique farming techniques, and socio-economic elements. This inquiry serves as a cornerstone for tailored interventions, policy development, and educational initiatives designed to mitigate the hazards of pesticide exposure and promote sustainable farming methods. Ultimately, a comprehensive and nuanced approach to pesticide control can safeguard the welfare of farmers and the environment.

Ethics Committee Approval: This study was duly approved by the ethics committee of Sree Balaji Medical College & Hospital, Chennai.

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Conflict of Interest: None declared.

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