Effectiveness of Mobile-Assisted Teaching on Pesticide Hazard Awareness Among Farmers

Angandi A[1*], Patil B[2], Badli S[3], Devulkar N[4]

[1]Post graduate, kle's institute of nursing science, kle academy of higher education and research,neharu nagar, belagavi, Karnataka

[2]Senior tutor kle's institute of nursing science, kle academy of higher education and research,neharu nagar, belagavi, Karnataka

[3]Assistant professor, kle's institute of nursing science, kle academy of higher education and research,neharu nagar, belagavi, Karnataka

[4]Assistant professor, kle's institute of nursing science, kle academy of higher education and research,neharu nagar, belagavi, Karnataka

*Corresponding Author

Email: abhilashangadi1211@gamil.com

Received: 25th May, 2026; **Revised:** 6th June, 2026; **Accepted:** 8th June, 2026; **Available Online:** 09th June, 2026

ABSTRACT

Background: Pesticides are widely used in agriculture to improve crop yield and protect crops from pests; however, improper handling and prolonged exposure pose serious health risks to farmers. Limited awareness, inadequate safety practices, and poor use of protective equipment increase vulnerability among rural farmers. Mobile-assisted teaching offers an accessible and effective method to educate farmers about pesticide-related health hazards and safe handling practices. This study aimed to assess the effectiveness of mobile-assisted teaching on knowledge and attitude regarding pesticide health hazards among farmers in selected rural areas of Belagavi.

Objectives: To assess the existing knowledge and attitude of farmers regarding pesticide-related health hazards. To evaluate the effectiveness of mobile-assisted teaching on knowledge and attitude among farmers. To determine the association between pre-test knowledge scores and selected demographic variables.

Methodology: A quantitative pre-experimental study was conducted among 201 farmers selected through non-probability sampling from rural areas of Belagavi. Data were collected using a structured knowledge questionnaire and a Likert attitude scale. Mobile-assisted teaching was provided as an intervention, followed by post-test assessment using the same tools. Data were analyzed using descriptive and inferential statistics, including the Wilcoxon signed-rank test and chi-square test.

Results: Most participants were aged 45–54 years (58.2%), male (100%), and had secondary education (82.6%). The majority practiced subsistence farming (79.1%), cultivated food grains (73.6%), and had 11–20 years of farming experience (59.7%). Regular pesticide use was reported by 88.6% of farmers, while none had prior awareness regarding pesticide hazards. All participants had access to mobile phones.Pre-test findings showed that 93.5% had average knowledge, 5.0% had good knowledge, and 1.5% had poor knowledge regarding pesticide hazards. Following mobile-assisted teaching, 100% demonstrated good knowledge, with a statistically significant improvement ($Z = -12.581$, $p < 0.05$).Regarding attitude, 70.6% had a moderate attitude, 21.9% had a negative attitude, and 7.5% had a positive attitude during pre-test assessment. Post-test results revealed a positive attitude among all participants, with significant improvement ($Z = -12.309$, $p < 0.05$).Chi-square analysis showed a significant association between pesticide use and pre-test knowledge level ($\chi^2 = 6.643$, $p = 0.028$), whereas no significant association was observed with other demographic variables.

Keywords: Knowledge; Attitude; Pesticide Health Hazards; Farmers; Rural Areas; Belagavi; Mobile-Assisted Teaching.

How to cite this article: Angandi A, Patil B, Badli S, Devulkar N. Effectiveness of Mobile-Assisted Teaching on Pesticide Hazard Awareness Among Farmers. Int J Drug Deliv Technol. 2026;16(68s):1645-1649. DOI: 10.25258/ijddt.16.68s.192

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

India is predominantly an agricultural country, and farmers constitute the backbone of its economy and rural livelihood. The use of pesticides has become an integral component of modern agriculture to improve crop productivity and prevent pest infestation. However, indiscriminate and prolonged exposure to pesticides poses serious health and environmental hazards. India is the largest producer of insecticides in Asia and ranks twelfth globally, with nearly 90,000 tons of annual pesticide production. Since a major proportion of the population is engaged in agriculture, farmers are at increased risk of occupational exposure to harmful chemicals. Improper pesticide handling may lead to acute and chronic illnesses, environmental contamination, and adverse effects on biodiversity, soil, and water resources.[1]

Agriculture remains the primary source of income for more than half of rural households in India. Despite the benefits of pesticides in crop protection, unsafe storage, excessive usage, and inadequate awareness regarding protective measures contribute significantly to pesticide poisoning. According to the World Health Organization, approximately 500,000 to 1,000,000 cases of pesticide poisoning occur annually worldwide. Farmers in developing countries often lack adequate knowledge regarding pesticide safety practices, resulting in increased health risks and environmental pollution. Therefore, improving awareness and promoting safe handling practices are essential for protecting farmers' health and ensuring sustainable agricultural development.[2]

Globally, pesticide use has nearly doubled over the past three decades, particularly in low- and middle-income countries. Increased pest resistance, climate change, and intensified agricultural practices have contributed to this rise. Smallholder farmers frequently depend on pesticides as their primary pest-control strategy but often have inadequate knowledge regarding safe usage and personal protective equipment. As a result, occupational exposure to pesticides remains a major public health concern. Exposure to pesticides has been associated with respiratory disorders, neurological problems, endocrine dysfunction, infertility, miscarriages, hypertension, diabetes, and cancers. Organophosphates and carbamates are among the most commonly implicated compounds responsible for acute and chronic toxicities among agricultural workers.[3]

Health is a dynamic state that involves physical, mental, and social well-being rather than merely the absence of disease. Farmers exposed to pesticides commonly experience skin irritation, eye and respiratory problems, headaches, dizziness, and neurological complications. Long-term exposure may result in severe organ damage and chronic illnesses. In rural areas, lack of education, poor access to healthcare, and limited awareness regarding pesticide hazards further increase vulnerability among farmers. Therefore, improving self-care practices and encouraging safe pesticide handling behaviors are necessary to reduce occupational health risks in agricultural communities.[4]

Health education plays a vital role in improving farmers' awareness and attitudes regarding pesticide safety. Conventional educational approaches such as pamphlets and community meetings are often limited by literacy barriers and poor accessibility in rural settings. The rapid expansion of mobile phone usage in rural India provides a practical and innovative opportunity for delivering health education. Mobile-assisted teaching can offer timely information, reminders, and interactive learning regarding safe pesticide practices, thereby overcoming geographical and educational barriers. Such interventions may enhance knowledge, promote favorable attitudes, and encourage safer occupational practices among farmers.[5]

Considering the increasing burden of pesticide-related health hazards and the growing accessibility of mobile technology in rural areas, the present study was undertaken to assess the effectiveness of mobile-assisted teaching on knowledge and attitude regarding health hazards of pesticides among farmers in selected rural areas of Belagavi. The findings of the study may help in developing effective educational strategies to promote safe pesticide practices and improve occupational health among farmers.[6]

MATERIALS AND METHODS

A quantitative research approach with a single-group quasi-experimental pre-test and post-test design was adopted for the study. The research was conducted among farmers residing in selected rural areas of Belagavi. The study population included farmers aged between 18 and 60 years who actively used pesticides in their farming practices. A total of 201 participants were selected through purposive sampling. Farmers with cognitive impairment, those unavailable during data collection, and individuals unwilling to provide informed consent were excluded from the study. The independent variable of the study was mobile-assisted teaching regarding pesticide health hazards, while the dependent variables were farmers' knowledge and attitude toward pesticide-related health risks. Sociodemographic variables included age, gender, educational status, type of farming, years of farming experience, and previous exposure to pesticide safety information.

Data were collected after obtaining ethical clearance and permission from concerned authorities. Primary data were obtained directly from farmers, while secondary data were collected through review of

literature from books, journals, and online sources.

A structured tool consisting of three sections was used for data collection: Section A included sociodemographic variables, Section B comprised a self-structured knowledge questionnaire regarding pesticide health hazards, and Section C contained a standardized Likert attitude scale to assess attitudes toward pesticide use and its effects on human health. The tool was developed based on an extensive literature review and subjected to validity and reliability testing prior to implementation.

Initially, a pre-test was conducted to assess the baseline knowledge and attitude of farmers regarding pesticide hazards. Following this, mobile-assisted teaching interventions, including educational videos, messages, and awareness content, were provided to participants. After a specified interval, a post-test was conducted using the same structured tool to evaluate the effectiveness of the intervention. The collected data were organized and analyzed using descriptive and inferential statistical methods.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of Farmers

The socio-demographic profile showed that most farmers were aged 45–54 years (58.2%), while 41.8% were above 55 years, and all respondents were male. The majority had completed secondary education (82.6%), followed by elementary education (15.4%) and pre-university education (2%). Most families earned ₹20,001–30,000 per month (70.6%), while 79.1% were involved in subsistence farming. A majority of farmers had 11–20 years of farming experience (59.7%). Food grains were cultivated by 73.6% of respondents, and 88.6% reported regular pesticide use. Although all farmers had access to mobile phones, none had previously received training regarding pesticide hazards. Kannada was the preferred language for learning among 85.6% of respondents.

Socio-Demographic Characteristics of Farmers

Variable	Category	n	%
Age (years)	<25	0	0
	25–34	0	0
	35–44	0	0
	45–54	117	58.2
	>55	84	41.8
Gender	Male	201	100
	Female	0	0
	Other	0	0
Educational Qualification	No formal education	0	0
	Primary education	31	15.4
	Secondary education	166	82.6
	Pre-university / Higher secondary	4	2.0
	Graduate and above	0	0
Monthly Family Income	<10,000	0	0
	10,001–20,000	59	29.4
	20,001–30,000	142	70.6
	>30,000	0	0
Type of Farming	Subsistence farming	159	79.1
	Commercial farming	42	20.9
	Mixed farming	0	0
Years of Farming Experience	<5 years	0	0
	5–10 years	79	39.3
	11–20 years	120	59.7
	>20 years	2	1.0
Type of Crops Grown	Food grains	148	73.6
	Cash crops	40	19.9
	Vegetables/Fruits	13	6.5

Variable	Category	n	%
	Mixed	0	0
Use of Pesticides	Regularly	178	88.6
	Occasionally	23	11.4
	Rarely	0	0
	Never	0	0
Previous Training on Pesticide Hazards	Yes	0	0
	No	201	100
Access to Mobile Phone/Smartphone	Yes	201	100
	No	0	0
Preferred Language for Learning	Kannada	172	85.6
	Hindi	29	14.4
	Marathi	0	0
	English	0	0
	Other	0	0
	Good	201	100

Attitude Levels of Farmers

Pre-test findings revealed that 70.6% of farmers had a moderately favorable attitude toward the harmful effects of pesticides, 21.9% had an unfavorable attitude, and only 7.5% demonstrated a positive attitude. Following the educational intervention, all participants (100%) exhibited a positive attitude, indicating a marked improvement in perception regarding safe pesticide use.

Knowledge Levels of Farmers

Regarding knowledge about pesticide hazards, 93.5% of farmers had average knowledge, 5% had good knowledge, and 1.5% had poor knowledge during the pre-test assessment. Post-test results demonstrated that all farmers (100%) attained good knowledge scores, reflecting the effectiveness of the educational programme in enhancing awareness.

Variable	Category	Pre-test n	Pre-test %	Post-test n	Post-test %
Attitude	Poor	44	21.9	0	0.0
	Moderate	142	70.6	0	0.0
	Good	15	7.5	201	100.0
Knowledge	Poor	3	1.5	0	0.0
	Average	188	93.5	0	0.0
	Good	10	5.0	201	100.0

Comparison of Pre-Test and Post-Test Scores

A significant improvement was observed in both knowledge and attitude scores after the intervention. The mean attitude score increased from 52.67 ± 2.93 in the pre-test to 72.63 ± 1.55 in the post-test. Similarly, the mean knowledge score improved from 14.68 ± 0.59 to 19.19 ± 0.58. The Wilcoxon signed-rank test revealed statistically significant differences in attitude ($Z = -12.309$, $p < 0.05$) and knowledge ($Z = -12.581$, $p < 0.05$), confirming the effectiveness of the educational intervention.

Association Between Pre-Test Knowledge and Socio-Demographic Variables

Chi-square analysis showed no statistically significant association between pre-test knowledge and variables such as age, education, family type, monthly income, type of farming, farming experience, crop type, and preferred language ($p > 0.05$). Variables including gender, prior training, and mobile phone availability could not be analyzed because all participants shared the same characteristics in these categories. However, pesticide usage pattern demonstrated a statistically significant association with pre-test knowledge levels ($\chi^2 = 6.643$, $p = 0.028$), indicating that farmers' practical exposure to pesticide use influenced their baseline knowledge.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who contributed to the successful completion of this study.I am deeply thankful to the farmers who participated in this research for their valuable time, cooperation, and willingness to share information, which made this study possible. I also extend my appreciation for their active participation in the educational intervention and assessments.I am grateful to the academic institution and faculty members for their continuous guidance, encouragement, and support throughout the study. Their insights and suggestions were instrumental in shaping the direction and completion of this work.I would also like to acknowledge the support provided during data collection and analysis, which helped in the smooth execution of the research process.

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