International Journal of Community Medicine and Public Health
Janekunte DB et al. Int J Community Med Public Health. 2023 Mar;10(3):1091-1096
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20230621

Original Research Article

Magnitude of pesticide use and its health effects among chilly farmers of Dammuru village, Bellary district, Karnataka, India

Dodda Basava Janekunte, Sunil Kumar Doddaiah*

Department of Community Medicine and School of Public Health, JSS Medical College, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India

Received: 15 December 2022
Revised: 22 January 2023
Accepted: 24 January 2023

***Correspondence:**
Dr. Sunil Kumar Doddaiah,
E-mail: sunilkumard@jssuni.edu.in

ABSTRACT

Background: The second-largest industry in the world in terms of employment is agriculture. In other ways, working in agriculture is among the riskiest professions in the whole world. Each year, many farm workers have illnesses and workplace accidents. All people are exposed to some degree to pesticides, but farmers are more susceptible owing to the additional danger of occupational exposure.
Methods: Purposive sampling was utilized in this cross-sectional research on chilly farm workers in the Dammuru village of Bellary district, Karnataka. An MS Excel spreadsheet was used to input the collected data, which was then analysed using SPSS version 23.
Results: Out of 220 participants, 165 (or 75% of them) utilized items that were classified as class I (very hazardous), followed by 33 (or 15%) as class II (moderately hazardous), 16 (or 7.247%) as class III (somewhat hazardous), and 6 (or 2.72%) as class U (unsafe materials) (unlikely to present an acute hazard). The majority of the 220 individuals, 202 (91.81%) experienced health concerns, whereas the minority, 18 (8.18%), had no health issues.
Conclusions: More than half of the survey participants reported having health issues, with a lack of information about the appropriate use of pesticides and improper use of protective gear being the major causes. 18 people (8.18%) did not have any health issues whereas 202 (91.81%) did.

Keywords: Adverse health impacts, Chilly workers, Farming, Knowledge, Pesticides

INTRODUCTION

The second-largest industry in the world in terms of employment is agriculture. In other ways, working in the agricultural industry is among the riskiest jobs there are. A lot of agricultural workers experience illnesses and workplace accidents every year. All people are exposed to some degree to pesticides, but farmers are particularly susceptible due to the additional risk of occupational exposure. The identification of risk groups and their preferential protection is one of the fundamental tenets of public health. Farmers are at risk for serious health problems due to illiteracy, ignorance, and unintentional application errors like careless pesticide handling. In developing nations, especially those with low levels of education and unfavorable working conditions, worries about the harmful effects of pesticides on health are growing.[1]

A pesticide's improper or excessive use can have a serious negative impact on health, including the development of cancer and other long-term illnesses.[2] Some health consequences associated with pesticide misuse include foetal death, birth defects, altered growth, dermatological issues, and acute and chronic neurotoxicity.[3]

With an annual production of 90,000 tonnes, India ranks as the twelfth-largest producer of pesticides in the world. India is one of the major producers of pesticides in Asia. In the past, India used and exported DDTs and HCHs on a large scale as organochlorine pesticides.[4]

Without pesticides, modern farming is impossible and agricultural output is much increased. But the widespread and careless use of pesticides is one of the major environmental and public health problems in the world. If pesticides are handled improperly, further insect outbreaks may result. Farmers, and those who use pesticides directly in particular, are at a high risk of exposure to pesticides because of coming into contact with pesticide residues on treated crops, unsafe handling, storage, and disposal practises, poor maintenance of spraying equipment, and a lack of protective equipment or improper use of it.

Higher education increases access to information, awareness of the risks of pesticides, and understanding of how to protect pesticide users from exposure. Farmers with less education might have a harder time understanding pesticide labels' hazard warnings, knowing how to avoid exposure, and knowing how to adhere to application and safety recommendations. The most significant obstacles to farmers adopting self-protective behaviours, such as the use of personal protective equipment (PPE), have been identified as, for instance, illiteracy and ignorance of the extent to which pesticides pose a risk.[5] The use of pesticides poses numerous risks to people's health. Since the 1940s, various pesticide types have been used in the United States and other parts of the world. The use of pesticides has significantly impacted human health. But over the past 40 years, the use of pesticides has increased quickly.

Agrochemicals are effective tools for increasing agricultural productivity in developing nations, including Nepal. However, those agrochemicals pose serious risks. In general, farmers in many regions of India do not wear safety masks, gloves, or other protective equipment while spraying pesticides, which allows pesticides to enter the bloodstream through inhalation and dermal exposure and negatively affect their eyes, skin, and respiratory system.[6]

A pesticide's improper or excessive use can have a serious negative impact on health, including the development of cancer and other long-term illnesses. Some health consequences associated with pesticide misuse include foetal death, birth defects, altered growth, dermatological issues, and acute and chronic neurotoxicity.[3] With an annual production of 90,000 tonnes, India ranks as the twelfth-largest producer of pesticides in the world. India is one of the major producers of pesticides in Asia. In the past, India used and exported DDTs and HCHs on a large scale as organochlorine pesticides.[4]

Farmers are frequently exposed to health risks as a result of mixing chemicals, applying pesticides, and discarding pesticides or their containers. Such a hazardous chemical exposure can result in pesticide poisoning, which can have immediate or long-term health effects. Approximately 20% of pesticide poisoning cases from farm use result in death, according to the World Health Organization (WHO, 1986).[7]

On a worldwide basis, it is estimated that exposure to pesticides causes thousands of deaths each year. Low to moderate levels of knowledge about pesticides, non-use of personal protective equipment (PPE), unsafe home storage of pesticides, improper disposal of empty pesticide containers, misuse of pesticides, and relatively little knowledge of pesticide safety labels have all been found in studies on farmers' practises and knowledge in developing countries.[8]

Pesticides are chemicals that kill animals, plants, insects, and pests in home, agricultural, and institutional contexts. The most popular types of pesticides are herbicides, insecticides, fungicides, fumigants, fungicides, and rodenticides. Serious questions are raised by the organochlorine, organophosphate, and carbamate pesticides' toxicity and environmental persistence. Organochlorine pesticides are prohibited for use on houses and in most industrialised countries, yet they are nevertheless used in underdeveloped countries like Nepal. The majority of pesticides are broad-spectrum, killing both targeted targets and unintended species.[9]

Using chemical fertilisers has a lot of positive effects on society, but if used excessively or incorrectly, they can also be dangerous. Chemical fertilisers typically contain the primary nutrients- nitrogen, phosphorous, and potassium (NPK)- as well as micronutrients like copper, iron, manganese, and zinc, as well as heavy metal contaminants like arsenic, cadmium, chromium, and lead (Pb).[1-3] Even at low exposure levels, these hazardous substances may have a negative impact on health. Over the past few decades, chemical fertilisers have become increasingly consumed around the world. The demand for chemical fertilisers is projected to rise from 184.6 million tonnes in 2014 to 186.6 million tonnes in 2015 and reach 199 million tonnes in 2019.[10]

Occupational and environmental pesticide exposure can result in a variety of health issues for people. The use of chemical pesticides is thought to be responsible for almost 10,000 deaths per year, roughly three-fourths of which take place in developing nations.

India currently ranks twelfth in the world for pesticide use and is the largest producer of pesticides in Asia, producing 90,000 tonnes of pesticides annually. In India, the majority of people (56.7%) are involved in agriculture and thus are exposed to the pesticides that are used in that industry.[11]

Objectives

To assess the magnitude of pesticide use among chilly farmers. To assess the health effects of pesticides among them.

METHODS

Purposive sampling was utilized in this cross-sectional research on chilly farm workers in the Dammuru village of Bellary district, Karnataka.

Study duration

This study took place for a period of 6 months (January 2022-June 2022).

Sample size

Considering the prevalence of health problem after application of pesticides as high as 17%, with an absolute precision of 5% and confidence interval (CI) 95%, a minimum sample of 220 subjects needed to be studied.

Z = 1.96 (standard)

Proportion of prevalence = 17% or 0.17

= 1-p = 0.83 D: margin of error = 5% or 0.05

$S = Z^2pq/d^2$

S = 1.96 x 1.96 x 0.17 x 0.83 / 0.05 x 0.05 = 217 rounded off to 220

Inclusion criteria

Farmers living and working in the chilly fields of Dammuru village. Workers aged 22 years and above. Chilly workers living in the Dammuru village.

Exclusion criteria

Uncooperative people, people not willing to give consent. Other farmers involved in farming activities other than chilly were excluded.

Method of data collection

Permission from the head of the institution was taken prior to the study. For collection of data from the chilly fields, necessary permission was taken from competent authority before collection of response. Written informed consent was taken from all the study participants before data collection.

Semi structured questionnaire for gathering information about socio demographic profile was given.Suitable data was collected from the selected sample chilly fields through questionnaire on a variety of health aspects among them.

Study variables

Age

Age was recorded to the completed year as told by the respondent.

Sex

Recorded by observation as male or female.

Educational status

As told by the respondent.

Illiterate

A person who could not read and/or write with understanding in any language.

Lower primary education

A person who has studied in any class between 1st standard to 5th standard.

Upper primary education

A person who has studied in class 6th and 7th.

High school

A person who has studied in any class between 8th to 10th.

Pre-university

A person who has completed a two-year course after 10th standard.

Diploma/degree

A person who has completed any degree course or diploma course

Post graduate degree

A person who has studied 2 or more years after graduation.

Type of family

The type of family of the study participant.

Nuclear family

Family consisting of a married couple and their unmarried children.

Joint family

It consists of a number of married couples, where the male members are related by blood and females are their wives, sisters or widows of male members, and their children who live together in the same household and share a common kitchen.

Data analysis

A MS excel spreadsheet was used to input the collected data, which was then analysed using SPSS version 23.

The demographic characteristics such as age, family history, personal history etc. were represented using the arithmetic mean, standard deviation and percentages. Data was represented in tables, graphs, and bar diagrams. Health aspects and the associated health factors was assessed using chi-square test. The association was interpreted as statistically significant at $p<0.05$.

RESULTS

In the WHO classification of pesticides, Out of 220 participants, 165 (or 75% of them) utilized items that were classified as class I (very hazardous), followed by 33 (or 15%) as class II (moderately hazardous), 16 (or 7.247%) as class III (somewhat hazardous), and 6 (or 2.72%) as class U (unsafe materials) (unlikely to present an acute hazard) and in chemical type of pesticides, out of the 220 participants, 47 (21.36%) made the largest use of pyrethrum, followed by 6 (2.72%) fungicide, 33 (15%) herbicide, 35 (15.90%) organophosphate, 43 (19.54%) carbamate, 16 (7.27%), fungicide + bactericide, 21 (9.54%), organophosphate + pyrethroids, and 19 (8.53) organochlorine.

Table 1: WHO classification of pesticides and chemical type of pesticides used by farmers.

Characteristics	Categories	N	%
WHO classification of pesticides	Class I (highly hazardous)	165	75
	Class II (moderately hazardous)	33	15
	Class III (slightly hazardous)	16	7.27
	U (unlikely to present an acute hazard)	06	2.72
Chemical type of pesticides	Fungicides	06	2.72
	Herbicide	33	15
	Pyrethrum	47	21.36
	Organophosphate	35	15.90
	Carbamate	43	19.54
	Fungicide+bactericide	16	7.27
	Organophosphate+ pyrethroids	21	9.54
	Organ chlorine	19	8.63

Table 2: Health problems of agricultural farmers during the last 12 months.

Health problems	N	Percentage
Yes	202	91.81
No	18	8.18
Health problems *		
Dizziness	202	91.81
Feeling tense, anxious, or nervous	171	77.72
Nausea/vomiting	193	87.72
Feeling tired, sleepy, or low energy most of the day	174	79.09
Sweating a lot more than usual	143	65
Difficulty seeing at night	30	13.63
Being absentminded, forgetful, or confused	45	20.45
Headache	194	88.18
Loss of appetite	31	14.09
Fast heart rate	41	18.63
Difficulty with balance	21	9.54
Blurred vision or double vision	21	9.54
Difficulty concentrating	38	17.27
Numbness or pins-and-needles in your hands or feet	82	37.27
Momentary loss of consciousness	96	43.63
Feeling excessively irritable or angry	35	15.9
Shaking or trembling of your hands	119	54.09
Difficulty falling asleep or staying asleep	55	25
Difficulty speaking	11	5
Weakness in your arms or legs	154	70
Changes in your sense of smell or taste	114	51.81
Feeling depressed, indifferent, or withdrawn	29	13.18

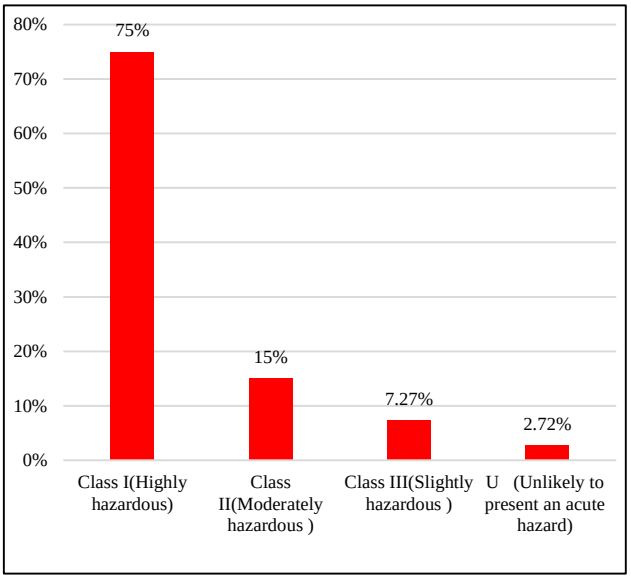

Figure 1: WHO classification of pesticides.

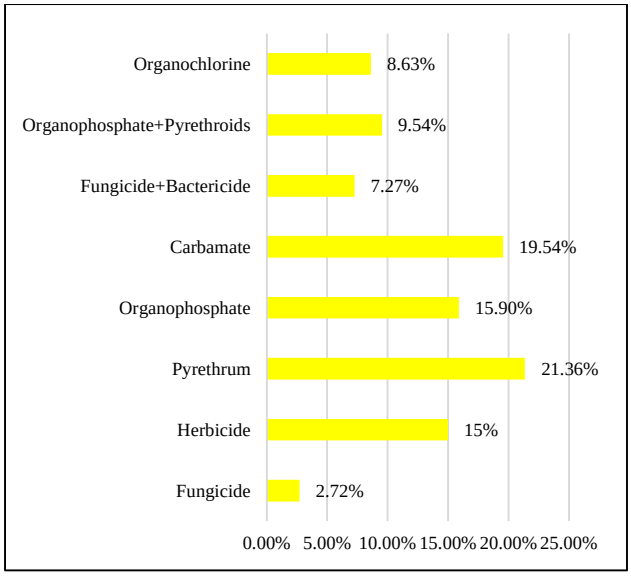

Figure 2: Chemical type of pesticide used by the farmers.

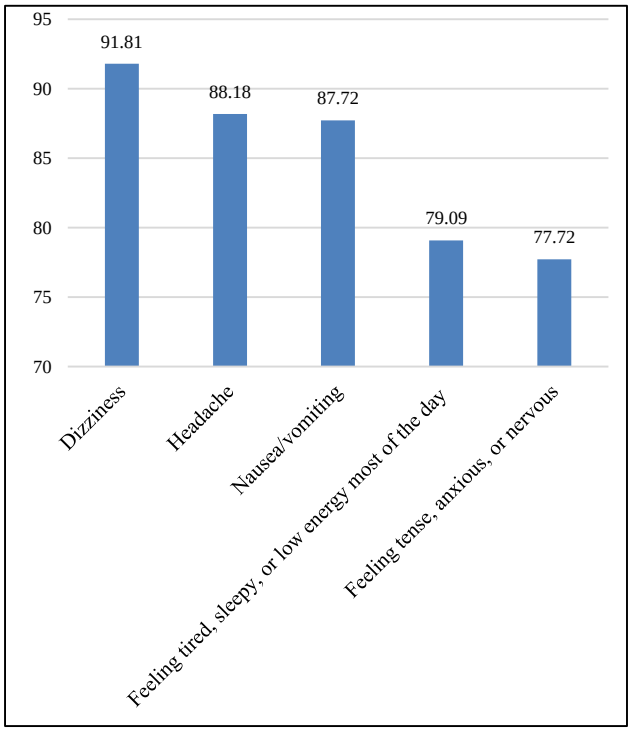

Figure 3: The top five health problems faced by participants.

DISCUSSION

This survey found that majority of the 220 participants, 202 (91.81%), had health challenges, whereas the minority, 18 (8.18%), did not. Farmers experience the following health issues, 91.81% reported experiencing dizziness, 88.18% headache, 87.72% nausea or vomiting, 79.09% said they felt drowsy or under the weather for the bulk of the day, and 77.2 percent said they felt tense, anxious, or worried. Compare to researchers Lamichhane wet al studied the relationship between farmers' usage of pesticides and health hazards in Nepal's Sunsari area.[2] With 74.5% and 58.8% of individuals reporting each, dizziness and headaches were the two most frequent health problems among those who reported experiencing them. After binary logistic regression, the kinds of pesticides used and health problems were shown to be statistically highly significant, and they were comparable to research done among farmers in a rural area of West Bangal, India, and farmers in North Gaza, Palestine. In contrast to research among vegetable growers in Bhaktapur, Nepal, where it was found to be 26%, skin irritation (19.6%) was less frequent in the study.[12]

In this study, 165 people (or 75% of them) used things that were deemed to be class I (extremely dangerous), and as a result, they had serious health issues. For the development of effective educational and policy initiatives that seek to minimize the risks that pesticides bring to human health and the environment, it is essential to understand farmers' levels of knowledge and practices about the safe use of pesticides. Contrary to expectations, the majority of farmers in this poll were fully aware of the damage that pesticides inflict to the environment and human health, but this did not result in a material change in their everyday activities or attitudes toward safe pesticide use. This implies that even while farmers may be aware of the risks associated with applying pesticides, they may regularly participate in dangerous behaviours owing to ignorance of safe pesticide usage practices or because their need for a high return on their crops outweighs their concern for their own health. Many of the research participants were illiterate or simply had basic degrees, and they had never received technical support or pesticide safety instruction. These farmers thus have trouble reading and understanding pesticide labels that describe how to apply pesticides effectively and safely or written instructions on how to reduce exposure risks.

Because most farmers wash their work clothing in the same washing machine as their family members' clothes, cross contamination is more probable. It was found that many farmers disregarded the recommendations for safe pesticide use, such as wearing personal protection equipment, washing hands with soap after spraying, avoiding eating in the fields while spraying, not washing work clothes with family clothes, and properly disposing of pesticide containers. Farmers and their families are exposed to more pesticides as a result of these practices, increasing their risk of pesticide poisoning. These farmers obviously need more knowledge, especially when it comes to the responsible use of pesticides. These sensitizations may be accomplished with the help of Krishi Vigyan Kendras.

We must look into the most promising prospects in order to maximize the advantages and minimize the hazards that pesticide usage poses to human health and the environment. It is customary for all parties to conduct studies on the risks of applying pesticides and inform

tomato producers of such risks, including Krishi Vigyan Kendras. Education is vital for reducing the use of pesticides and for encouraging farmers to adopt integrated pest and disease management practises and safe pesticide usage via capacity-building programmes.[9]

CONCLUSION

Pesticides are still an essential part of agricultural practises in many parts of Karnataka. The findings of this research suggest that pesticide safety education and the adoption of protective application methods may help to lower the incidence of acute pesticide poisoning. The next logical step is to develop instructional programmes that teach farmers in rural areas how to handle pesticides safely. The harmful consequences of pesticides are well documented. Farmers and other pesticide applicators still do not fully understand the value of protecting themselves and the environment from the hazards associated with pesticide handling.

ACKNOWLEDGEMENTS

My mentor Dr. Sunil Kumar, D Professor and Head, Department of Community Medicine, JSS Medical College, Mysore, deserves my utmost appreciation and thanks for his invaluable assistance, gracious cooperation, and encouragement in helping me carry out and finish my study effectively. I also thank Dr. Chandan N., Scientist B (Medical) for their support and guidance.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of JSS Medical College, Mysuru, Karnataka, India Approval number JSS/MC/PG/2664/2021-2022, Dated 28/08/2021

REFERENCES

1. Öztaş D, Kurt B, Koç A, Akbaba M, İlter H. Knowledge level, attitude, and behaviors of farmers in Çukurova region regarding the use of pesticides. Biomed Res Int. 2018;2018.
2. Lamichhane R, Lama N, Subedi S, Singh SB, Sah RB, Yadav BK. Use of pesticides and health risk among farmers in Sunsari district, Nepal. J Nepal Health Res Council. 2019;17(1):66-70.
3. Atreya K, Kattel K, Pandit S, Chaudhary P, Sipkhan P. Understanding farmers' knowledge, attitudes and practices of pesticide use in Nepal: synthesis of a systematic literature review. Arch Agricult Environ Sci. 2022;7(2):278-87.
4. Sharma A, Kumar V, Shahzad B, Tanveer M, Sidhu GP, Handa N, et al. Worldwide pesticide usage and its impacts on ecosystem. SN Appl Sci. 2019;1(11):1-6.
5. Jallow MF, Awadh DG, Albaho MS, Devi VY, Thomas BM. Pesticide knowledge and safety practices among farm workers in Kuwait: results of a survey. Int J Environ Res Public Health. 2017;14(4):340.
6. Basnet N, Chidi CL. Impact of pesticide and fertilizer on human health: a case study in Godawari Area, Lalitpur, Nepal. Geo Base. 2019;6:65-76.
7. Keshavareddy G, Nagaraj K, Bai SK, Kulkarni LR. Pesticides usage and handling by the tomato growers in Ramanagara district of Karnataka, India-an analysis. Int J Curr Microbiol App Sci. 2018;7(4):3312-21.
8. Thapa S, Thapa B, Bhandari R, Jamkatel D, Acharya P, Rawal S, et al. Knowledge on pesticide handling practices and factors affecting adoption of personal protective equipment: a case of farmers from Nepal. Adv Agricult. 2021;2021.
9. Mequanint C, Getachew B, Mindaye Y, Amare DE, Guadu T, Dagne H. Practice towards pesticide handling, storage and its associated factors among farmers working in irrigations in Gondar town, Ethiopia, 2019. BMC Res Notes. 2019;12(1):1-6.
10. Issa Y, Sham'a FA, Nijem K, Bjertness E, Kristensen P. Pesticide use and opportunities of exposure among farmers and their families: cross-sectional studies 1998-2006 from Hebron governorate, occupied Palestinian territory. Environ Health. 2010;9(1):1-0.
11. Nganchamung T, Robson MG, Siriwong W. Chemical fertilizer use and acute health effects among chili farmers in Ubon Ratchathani province, Thailand. J Health Research. 2017;31(6):427-35.
12. Chitra GA, Muraleedharan VR, Swaminathan T, Veeraraghavan D. Use of pesticides and its impact on health of farmers in South India. Int J Occup Environ Health. 2006;12(3):228-33.
13. Oesterlund AH, Thomsen JF, Sekimpi DK, Maziina J, Racheal A, Jørs E. Pesticides knowledge, practice and attitude and how it affects the health of small-scale farmers in Uganda: a cross-sectional study. Afr Health Sci. 2014;14(2).
14. Kim J, Kim J, Cha ES, Ko Y, Kim DH. Work-related risk factors by severity for acute pesticides poisoning among male farmers in South Korea. Int J Environ Res Public Health. 2013;10:1100-12.

Cite this article as: Janekunte BD, Doddaiah SK. Magnitude of pesticide use and its health effects among chilly farmers of Dammuru village, Bellary district, Karnataka, India. Int J Community Med Public Health 2023;10:1091-6.