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Occupational Health Risks and Safety Programs in Agriculture: A Narrative Review

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Abstract

Agriculture is among the most hazardous professions, and workers in this sector are exposed to many occupational accidents and health hazards. The misuse of harmful chemicals, frequently as a result of improper safety precautions, is hazardous to people and the environment. Agricultural work is hard work, and pesticide exposure in particular takes a terrible toll on farmers' health and quality of life. This review was conducted using databases such as PubMed and Google Scholar, and restricted to English language studies, hence eliminating studies that are in other languages. It focuses on fragile health systems for farmworkers in India and the extent to which their health needs are disregarded. Highlighting the role of health promotion, training and focused interventions play in the minimization of exposure to pesticide. It also calls for strict enforcement of existing safety laws and regulations. Additionally, the review highlights how farmers understand and follow safety practices, including the use of personal protective equipment (PPE), as well as the challenges they face in adopting adequate safety measures.

Categories: Epidemiology and Public Health; Occupational Health; Health Policy

Keywords: Occupational hazards; Morbidity; Pesticide use; Personal protective equipment (PPE); Agricultural workers

Introduction

The World Health Organization (WHO) Alma Ata declaration in 1978 marked the origin of Basic Occupational Health Services (BOHS). The declaration stated that primary healthcare is vital, and it should be based on possible, scientifically sound, and socially acceptable methods. It should be easily accessible to individuals, families, and communities and should be brought nearby able to be done where individuals live and work. Agricultural labourer is defined as "The people who are engaged in raising crops on payment of wages". The combination of high humidity, extreme ambient temperatures, intense physical labour, and insufficient fluid intake puts individuals at significant risk for heat strain and dehydration. These are serious hazards in the agricultural sector globally. Agricultural workers perform physically demanding tasks and are exposed to several health hazards and risks. Based on research findings and information from public health and disease ecology, it was believed that the development of agricultural economies would inevitably result in increased morbidity and mortality rates, as well as a range of societal issues.

The growing global population demands food production for an estimated 9.1 billion people by 2050. Workers in the agriculture industry face a high risk of illness and injury. In 2017, agricultural crop workers reported 5.2 worktime injuries per 100 workers and experienced 20.9 deaths per 100,000 workers.

Pesticide poisoning represents a major global public health concern, with up to 300,000 deaths attributed to it annually worldwide. Every year, between 500,000 and 1 million people worldwide experience health problems due to pesticide poisoning, according to the World Health Organization. In low- and middle-income countries like India and Nepal in Asia, there has been a gradual decline in the yearly consumption of food calories, ranging from 0.8% to 2.2% annually. In terms of farm outputs, India ranks second globally. According to the Indian Economic Survey 2020-21, more than 50% of the Indian manpower is employed in farming, and 20.2% of the country's gross domestic product (GDP) is contributed by it. India has the greatest net cropped area in the world, followed by the US and China. With the introduction of the Green Revolution, a program aimed at enhancing global agriculture production, the use of pesticides in modern farming has become widespread. As high as 19.4% of China's farmed land has heavy metal concentrations beyond permissible limits, according to the National Soil Pollution Survey Bulletin. However, the misuse of pesticides is a serious concern in developing countries due to potential harm to personal and environmental safety. This is crucial given current zoonotic research that predicts climate changes and further socio-ecological drivers will probably worsen the current illness burden, especially in developing countries like India with poor health structures. This review aims to Identify the diverse array of health-related problems agricultural workers encounter, including physical, mental, and infectious disease-related challenges, and also understand the impact of hazards on agriculture workers.

The Worker Protection Standard (WPS) was first published by the Environmental Protection Agency (EPA) in 1974. The standard applies to those who perform manual labour after pesticide applications. Farmers, especially those directly handling toxicants, have a higher risk of pesticide exposure. The risk of heat strain and dehydration is further exacerbated when individuals come into contact with pesticide residues on crops and engage in improper handling and storage practices. The issue is not the lack of personal protective equipment (PPE) usage rather, agricultural workers use protective devices inadequately. The education level plays a crucial role in enhancing awareness about the risks associated with pesticides. Recently, innovative and strategic international partnerships aiming for sustainable agriculture in Africa have emerged. Their goal is to increase 30 million smallholder farming households' income and food security within five agricultural hotspots. Fortunately, policymakers and developers acknowledge the necessity of supporting farmers in urban fringe regions. This support can resilience of the food mechanism and efficiently manage row materials while absorbing pressures on the framework.

Review Methodology

This review paper discusses healthcare challenges and programmes among agricultural workers. A search for peer-reviewed articles was conducted on PubMed, Google Scholar and Scopus. The relevant English language, free full text articles included in the review are from 2013 to 2023. For this review, Medical Subject Headings (MeSH) have been used as 'agricultural workers', 'occupational health' and 'personal protective equipment'. Some of the filters used to find relevant data for the review are: (agricultural workers) AND (mortality [Title/Abstract]) Agricultural workers [Title/Abstract] AND (personal protective equipment [Title/Abstract]) (agricultural workers [MeSH term]) AND occupational health [MeSH term]). In addition, some of the keywords such as personal protective equipment, morbidity, agricultural workers, health safety and occupational health have been used in the description.

Occupational Health Issues Among Agricultural Workers

Pesticide use poses a risk of harmful health effects, with workers being exposed to physical, chemical and biological health hazards. The most commonly used pesticide is glyphosate. Its formulations are dangerous to human cells when used in vitro and have been linked to various types of cancer. In addition, inadequate information and training can pose serious health risks to farmers. According to recent research, farmers commonly experience work-related skin irritation, back pain, headaches, dizziness, vision problems and breathing difficulties after spraying pesticides. Musculoskeletal pain is common among mature farmers. Pain in the back and lower limbs increases with work, while pain in the upper limbs is less common. The observed higher incidence of multiple myeloma in men in agricultural settings suggests the

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existence of both preventive and risk factors for cancer.

Pesticides have the ability to enter the human body through skin absorption, inhalation and to a lesser extent through ingestion. Acute intoxication is the result of exposure to a particular chemical for a short period of time. On the other hand, prolonged exposure to hazardous substances or various products can lead to chronic intoxication resulting in irreversible damage such as paralysis and neoplasia. 77% of farmers used hand pumps to spray pesticides while the remaining 23% used their hands.

Studies show that farm workers exposed to toxic substances have higher levels of biomarkers due to unsafe handling practices and inadequate risk perception. These chemicals may have several harmful effects, including carcinogenesis, neurotoxicity, reproductive problems and immunological effects.

Some of these effects may only become apparent after 18 years of exposure and are not well understood.

Musculoskeletal disorders

Agricultural workers frequently experience musculoskeletal disorders, including back, upper limb, and lower limb pain, caused by repetitive activities, awkward or stretched postures, and standing. The prevalence of musculoskeletal disorders is quite high in India, where 52% of farmers report lower back pain.

Pesticide poisoning

In the agricultural sector, pesticides are commonly used without the correct PPE, and this can cause acute poisoning in farmers, which manifests as symptoms such as itching, rashes, and allergies.

Prevalence

In India, about 40% of the total cultivable area is treated with pesticides.

Respiratory distress

Respiratory disorders such as cough, wheezing, rhinitis, obstructive cardiac disorder, and tachycardia are frequently observed in agricultural workers. The prevalence of these disorders in India is around 3.59%, and similar trends are observed worldwide.

Inadequate Healthcare Access Among Agricultural Workers

In rural India, agricultural workers are one of the most marginalized groups in society. Understanding farmers' knowledge and practices regarding safe use of toxic substances is essential for designing effective education and policy strategies that can reduce health and environmental risks. Globally, many agricultural safety programs are targeted at children aged five to twelve years. However, comprehensive training for adult farmers—including hazard identification, safe work practices, correct use of personal protective equipment (PPE), and emergency procedures—is a critical step toward reducing pesticide exposure.

Although protective factors for farmers' well-being are not yet fully understood, research suggests that financial security, strong social networks, and a sense of community play an important role in maintaining mental health. Enforcement of existing pesticide regulations at both the retail and farm levels, as well as strict monitoring, is also essential to ensure safe practices. Furthermore, health promotion programs that address not only physical but also mental health challenges can improve the quality of life of agricultural workers.

Government Initiatives in Agricultural Health and Safety

According to the National Institutes of Health, occupational health is a continuous effort to protect and promote the highest possible level of physical, mental, and social well-being of workers in all occupations. In India, although several laws and welfare schemes exist, limited attention is paid to the health needs of women agricultural workers. The country's first study on exposure to toxic substances at the workplace has helped improve the ambulatory care services provided by reference centres for agricultural workers.

Making pesticide and agricultural product labels easier to understand, as well as encouraging agricultural workers to obtain formal education and access basic health services, can give them the knowledge and resources they need to better protect their health and that of their families. Many farmers already take basic protective measures, such as wearing hats, and the use of wide-brimmed hats is particularly effective in reducing sun exposure and reducing the risk of skin cancer. Such findings are valuable in guiding necessary health interventions that improve the

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prevention of pesticide-related exposures and promote a better quality of life of agricultural workers.

Governments have a key responsibility to act as protectors of public health. Policies should go beyond increasing land productivity to ensuring that workers are protected from occupational hazards. For example, the Pradhan Mantri Shram Yogi Maandhan Yojana provides social security and financial support to older agricultural workers working in the unorganised sector.

Guidelines for Selecting Suitable Personal Protective Equipment (PPE)

Using personal protective equipment (PPE) is one of the best ways to stay safe from hazards while working on farms. Taking safety steps is very important to protect farm workers. When handling pesticides, farmers are advised to wear protective gear to avoid contact and contamination. PPE like full body suits, goggles, face shields, masks, earplugs, and earmuffs can help prevent both immediate injuries and long-term health problems.

However, surveys show that no farmers wear the full set of protective gear. Items like boots, gloves, safety glasses, trousers, and long-sleeved shirts are rarely used together. Instead, most farmers only wear one or two pieces of protective equipment. Many say that wearing full PPE is uncomfortable and makes it harder to do their work. Commonly used items are aprons and shoes, and some farmers change their clothes after spraying pesticides.

Women farmers in developing countries are at even greater risk. Although most farmers know how pesticides enter the body, how to store them safely, and how to protect themselves, many cannot always use PPE because of money problems or lack of awareness about the serious health risks of long-term exposure.

Table 1 shows a summary of the included studies

Sr. No.	Author Name	Year	Type Of Article	Findings
1.	Clarke, K.,	2021	Narrative review	Highlights that farmworkers face significant respiratory health risks from occupational air pollutants like dust, pesticides, and fumes, emphasizing the need for better protective measures and policies.
2.	De-Assis	2021	Health problems in agricultural workers occupationally exposed to pesticides	Agricultural workers exposed to pesticides commonly face skin, respiratory, and neurological health issues.
3.	El Khayat	2022	Impacts of Climate Change and Heat Stress on Farmworkers' Health	Heat stress from climate change harms farmworkers' physical and mental health.
4.	Khode, D.,	2024	Narrative review	Highlights health risks for farm workers and the need for training, PPE use, and better safety programs.

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5.	Molina-Guzmán, L. P.,	2020	Systematic review	Identifies major occupational health and safety risks in agriculture, highlighting high exposure to physical, chemical, and ergonomic hazards and the need for stronger preventive strategies.

Limitations

Agricultural workers often have low incomes, making it difficult for them to purchase a complete set of personal protective equipment (PPE). Many workers also lack proper knowledge and training on the safe use of pesticides, leaving them regularly exposed to a number of harmful chemicals. Furthermore, in rural areas—where most agricultural work takes place—healthcare services are typically limited, making it difficult for workers to receive timely medical care when needed.

Conclusions

In agriculture field health workers face many hazards health problem like respiratory disease and skin problem in modern time due to over use of pesticide in human health or affected including environment and farmers due to improper uses and lack of awareness regarding the importance of PPE in health safety gets more exposure to pesticides getting prone towards health problems related to pesticide due to improper use of PPE in farming and reduce health problems of farmers besides that many farmers not wearing PPE due to death heart this impact there work to reduce the risk of health issues and safety of environment we need to maintain guideline and setup of proper nouns regarding safety and uses of pesticides

We need to improve training and awareness in farmers regarding health hazards due to pesticides and reduce gas between the health issues and problems faced by agriculture workers

Disclosures

What impact can these organizations have on this study? Whether in the present or in the past, they have never confirmed that they have any financial relationship or affiliation with the author, which. And can affect the conduct or results of the research. In addition, the author has explicitly stated that there are no professional or academic relationships, affiliations or activities of any other person whose interests could reasonably be interpreted as a potential conflict of interest. This nesting has been done to maintain newness and the integrity of the study by ensuring prior transparency. The purpose of the study is to provide impartial conclusions regarding their agricultural occupational health risks and sustainability security programs by confirming the absence of financial incentives or behavioural drugs. Such transparency is necessary. Mainly in research related to public health and worker safety, so that stakeholders on the text can be assured that the conclusions drawn are entirely based on evidence and scientific analysis, not influenced by external interests.

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