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Review Article

Health Determinants Associated with Pesticide Use in the Population of Miraflores, Ecuador

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Abstract

Pesticides are widely used to improve crop production; however, their impact on human health remains a concern. This study aimed to assess the level of knowledge about pesticide use, identify symptoms after exposure, and evaluate biosecurity measures among farmers in Miraflores. A descriptive, cross-sectional study was conducted in 2025 with 50 participants selected from a population of 4,118 inhabitants. Data was collected through a structured survey. Results showed that 85% of participants had some level of education, but only 35% used complete protective equipment. The most common symptoms reported were headache (60%) and dizziness (30%). A significant proportion of farmers used incomplete or no protection. In conclusion, despite having basic education, farmers lack adequate training in pesticide use, which increases the risk of health problems. Strengthening education and promoting proper biosecurity measures are essential to reduce exposure risks.

Introduction

Over the years, in the quest to preserve and increase harvests and combat pests that threaten crops, measures have been implemented using chemical substances against insects and other harmful organisms. However, although these have been effective, their effects on human health and the balance of the ecosystem continue to be debated [1]. According to the World Health Organization, pesticides are used for crop protection, but they can be toxic depending on the amount and type of exposure, direct or indirect, as evidenced by the numerous cases of poisoning reported worldwide [2,3]. In Ecuador, a significant portion of agricultural land uses chemical pesticides, while the rest is managed organically [4]. In recent decades, their accelerated use, along with the lack of protection for workers, has turned these substances into a public health problem due to their short- and long-term effects. Furthermore, they affect living conditions by causing soil, water, and air pollution [5,6]. Therefore, this study seeks to determine the level of knowledge about pesticide use in the population of Miraflores, identify the symptoms after exposure, and evaluate the biosecurity measures used by farmers.

Methodology

Type of study:

A descriptive, observational, cross-sectional study was conducted from January to August 2025 to determine the level of knowledge regarding pesticide use and its impact on health in the population of Miraflores.

Type of research:

A theoretical, analytical, and synthetic method was employed, in addition to an empirical method, which was a survey. The survey instrument contained questions that constituted the objective of the research.

Description of methods:

The community of Miraflores, comprised of 4,118 inhabitants, was selected for the survey. The sample consisted of 50 people who were interviewed voluntarily and were fully informed about the objectives of the research and the benefits derived from the study. After obtaining informed consent from each participant and emphasizing data confidentiality, a structured survey was administered, asking about: level of education, symptoms experienced in cases of pesticide poisoning, biosafety measures used when exposed to or handling these chemicals, and the most commonly used pesticide in the local agricultural community.

Results

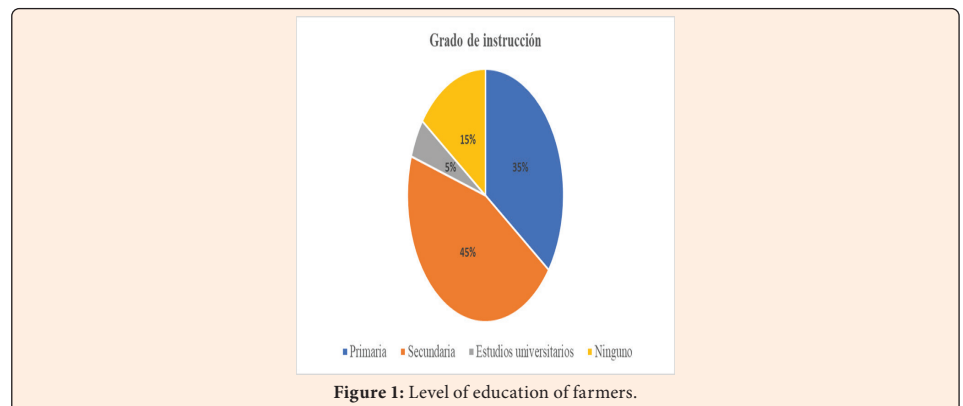
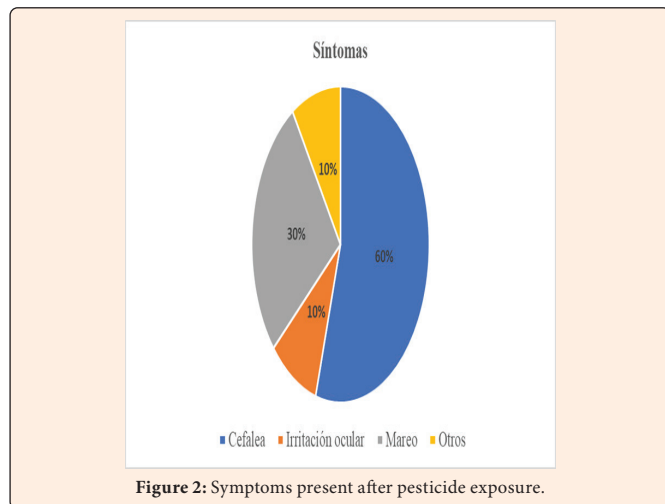
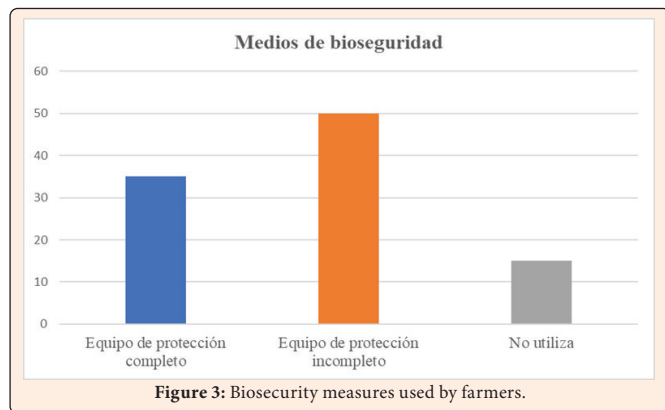


Figure 1: Level of education of farmers.

17 (35%) had only primary education, only 3 (5%) had university studies, and 7 (15%) had no formal education. 85% of the population has some level of education, which is beneficial for the development of the community, as it allows for expanded knowledge about chemical products. Although these percentages do not demonstrate the population's knowledge regarding pesticide use, it is a fundamental element for preventing risks. Education allows people to read, understand, and reproduce information, thus enabling them to differentiate the classification of pesticides according to their toxicity.



Of 50 people, 30 (60%) presented with headache, 15 (30%) dizziness, 5 (10%) eye irritation, and 5 (10%) had other symptoms such as weakness, difficulty breathing, cyanosis, and blurred vision. Symptoms that appear after pesticide exposure can occur minutes or days after contact; however, these raise concerns for public health, since, being common symptoms with other health problems, they can be underestimated and ignored, thus increasing the effects of poisoning. By ignoring the symptoms, people do not go to the health center, and this is the reason why there are insufficient records of poisoning in Miraflores.



According to this graph, approximately 17 people (35%) use complete biosecurity equipment, 25 people (50%) use incomplete equipment, and 8 people (15%) do not use any. Biosecurity measures are essential for handling pesticides; therefore, it is alarming that approximately 33 people do not use complete protective equipment or any protective measures at all and do not take all the necessary precautions to prevent exposure. This increases the risk of poisoning, since, by not complying with the requirements, not only the farmers but also the rest of the population could be affected.

Discussion

The findings of this study reveal that although most farmers in Miraflores have some level of formal education, this does not necessarily translate into adequate knowledge regarding the safe use of pesticides. Similar studies have shown that educational level alone is not sufficient to ensure proper handling of agrochemicals,

as specific training and continuous education are required to reduce health risks associated with exposure [7,8]. The high prevalence of symptoms such as headache and dizziness reported by participants is consistent with previous research, where these manifestations are identified as common signs of acute pesticide exposure [9,10]. However, these symptoms are often nonspecific and can be confused with other health conditions, leading to underreporting and limited access to medical care [11]. This situation coincides with what was observed in Miraflores, where individuals tend to underestimate symptoms and do not seek timely medical attention, contributing to insufficient epidemiological records. In relation to biosecurity measures, a considerable proportion of the population reported using incomplete or no protective equipment. This finding is consistent with studies conducted in agricultural communities in Latin America, where inadequate use of personal protective equipment (PPE) remains a persistent issue due to factors such as lack of resources, limited awareness, and discomfort during use [12,15]. The improper use of PPE significantly increases the risk of both acute and chronic intoxication, affecting not only workers but also their families and surrounding communities through environmental contamination [16]. Furthermore, the results highlight the impact of pesticides on environmental determinants of health. The contamination of soil, water, and air caused by these substances has been widely documented and represents a major concern for public health, particularly in rural areas where exposure is more frequent and prolonged [17,20]. This reinforces the need for integrated strategies that address both occupational safety and environmental protection. Although some farmers rely on empirical knowledge gained through experience, this study demonstrates that such knowledge is insufficient to ensure safe practices. Other authors have emphasized that combining traditional knowledge with formal training programs significantly improves risk perception and promotes safer behaviors in pesticide use [21,24]. Finally, the findings of this study are consistent with global reports indicating that pesticide exposure continues to be a significant public health issue, especially in developing regions where regulatory enforcement and access to training are limited [25-30]. Therefore, it is essential to implement educational interventions, strengthen preventive measures, and promote the correct use of biosecurity equipment to reduce the risks associated with pesticide exposure in communities such as Miraflores.

Conclusion

Most farmers have some level of formal education, which allows them to expand their knowledge of pesticides; however, some farmers indicated they did not have sufficient training on the product used and, therefore, were unaware of the consequences of its use. This lack of education puts the health of the population at risk. Although experience provides them with adequate knowledge about agricultural activity and pesticide use, some actions require formal training. A large percentage of the population experienced headaches after exposure to pesticides; however, the symptoms that appear after contact with these products are common with other illnesses. This is why people do not go to the health center and are unaware of the effects. These symptoms allow for the identification of poisoning in its early stages, so it is necessary to give greater importance to understanding them. A large percentage of the population was unaware of protective measures, and only a small percentage took the necessary precautions when handling these chemical products. Farmers must comply with biosecurity measures before, during, and after any practice involving pesticide use. These measures include protective equipment, numerous actions to protect themselves from product exposure, and hygiene.

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