

Characterization of the sociodemographic, labor and signs and symptoms profile of farmers in the Microregion of Irecê-BA

Caracterização do perfil sociodemográfico, laboral e de sinais e sintomas de agricultores da Microrregião de Irecê-BA

Caracterización del perfil sociodemográfico, laboral y de signos y síntomas de agricultores de la Microrregión de Irecê-BA

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Abstract

Introduction: Since pesticides cause numerous health problems and farmers are exposed to these substances, knowledge of the labor aspects related to the use of pesticides, their practices, as well as signs and symptoms related to possible poisoning, is essential to provide better health care. **Objective:** To characterize the sociodemographic and labor profile and the signs and symptoms of farmers in the Microregion of Irecê-BA. **Methods:** Cross-sectional study, involving 45 farmers of both sexes, over 18 years of age, belonging to the municipalities of Lapão and João Dourado, cities belonging to the Microregion of Irecê-BA. A questionnaire, prepared by the authors, was applied to obtain sample characterization data. **Results:** The study included 45 farmers, 53.3% from the municipality of Lapão and 46.7% from João Dourado, male (62.2%), age range from 50 to 59 years (33.3%), skin color/brown race (48.9%), with incomplete elementary education. Twenty-seven participants reported using pesticides,

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BAS: conception of the study; data collection, and draft

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with over 80% reporting using some form of personal protective equipment. Regarding self-perception of signs/symptoms after starting to work with pesticides, 53.8% reported headaches and 16.7% reported hearing problems. **Conclusion:** Farmers in the studied region are predominantly men between 50 and 59 years old, brown-skinned and with a low level of education, use pesticides in the workplace and incompletely use personal protective equipment and report having headaches. Four participants noticed that they began to experience hearing problems from the moment they began working with pesticides.

Keywords: Agrochemicals; Farmers; Occupational Health; Occupational Risks; Hearing.

Resumo

Introdução: Uma vez que os agrotóxicos causam inúmeros prejuízos à saúde e que os agricultores estão expostos a essas substâncias, o conhecimento dos aspectos laborais em relação ao uso de agrotóxicos, de suas práticas, bem como sinais e sintomas referentes a possíveis intoxicações, é fundamental para proporcionar uma melhor assistência à saúde. **Objetivo:** Caracterizar o perfil sociodemográfico, laboral e os sinais e sintomas de agricultores da Microrregião de Irecê-BA. **Métodos:** Estudo transversal, envolvendo 45 agricultores de ambos os sexos, com idade superior a 18 anos, pertencentes aos municípios de Lapão e João Dourado, cidades pertencentes à Microrregião de Irecê-BA. Aplicou-se um questionário, elaborado pelas autoras, para a obtenção dos dados de caracterização da amostra. **Resultados:** Participaram do estudo 45 agricultores, 53,3% do município de Lapão e 46,7% de João Dourado, do sexo masculino (62,2%), faixa etária de 50 a 59 anos (33,3%), cor da pele/raça parda (48,9%), com ensino fundamental incompleto. Relataram utilizar agrotóxicos 27 participantes, com mais de 80% referindo utilizar algum equipamento de proteção individual. Com relação a autopercepção de sinais/sintomas após iniciar o trabalho com agrotóxicos, 53,8% referiram dor de cabeça e 16,7% problemas auditivos. **Conclusão:** Os agricultores da região estudada são predominantemente homens entre 50 e 59 anos, pardos e com nível de escolaridade baixa, utilizam agrotóxicos no ambiente ocupacional e equipamentos de proteção individual de maneira incompleta e relatam sentir dor de cabeça. Quatro participantes tiveram a percepção de passar a apresentar problemas auditivos a partir do momento em que começaram a trabalhar com agrotóxicos.

Palavras-chave: Agroquímicos; Agricultores; Saúde Ocupacional; Riscos Ocupacionais; Audição.

Resumen

Introducción: Dado que los plaguicidas causan numerosos problemas de salud y los agricultores están expuestos a estas sustancias, el conocimiento de los aspectos laborales relacionados con el uso de plaguicidas, sus prácticas, así como los signos y síntomas relacionados con una posible intoxicación, es fundamental para brindar una mejor atención en salud. **Objetivo:** Caracterizar el perfil sociodemográfico y laboral y los signos y síntomas de los agricultores de la Microrregión de Irecê-BA. **Métodos:** Estudio transversal, que involucró a 45 agricultores de ambos sexos, mayores de 18 años, pertenecientes a los municipios de Lapão y João Dourado, ciudades pertenecientes a la Microrregión de Irecê-BA. Se aplicó un cuestionario, elaborado por los autores, para obtener datos de caracterización de la muestra. **Resultados:** participaron del estudio 45 agricultores, 53,3% del municipio de Lapão y 46,7% de João Dourado, varones (62,2%), grupo de edad de 50 a 59 años (33,3%), color de piel/raza mixta (48,9 %), con educación primaria incompleta. 27 participantes informaron haber usado pesticidas, y más del 80% informó haber usado algún equipo de protección personal. Respecto a la autopercepción de signos/síntomas tras iniciar el trabajo con plaguicidas, el 53,8% refirió dolores de cabeza y el 16,7% problemas de audición. **Conclusión:** Los agricultores son predominantemente hombres entre 50 y 59 años, mestizos y con bajo nivel de escolaridad, utilizan pesticidas y equipos de protección personal de manera incompleta y refieren experimentar dolores de cabeza. Cuatro participantes notaron que comenzaron a experimentar problemas de audición desde el momento en que empezaron a trabajar con pesticidas.

Palabras clave: Agroquímicos; Agricultor; Salud Laboral; Riesgos Laborales; Audición.

Introduction

Brazil's agriculture is responsible for more than 20% of the country's Gross Domestic Product (GDP)¹. This sector has been important for the country's economy and development since the colonization period to the present day. Today, Brazil is the second-largest exporter of products in this category, and in the future, it may have an even greater presence, given the growing global demand for food². Consequently, the number of workers directly involved in agriculture or livestock is substantial. According to the 2017 Brazilian Agricultural Census³, there are more than five million agricultural establishments in the national territory.

Due to the ever-increasing need for production, agrochemicals, more commonly known as pesticides, are widely used, especially in the agricultural sector, to combat pathogens that affect crops and animals⁴. On the other hand, pesticides are known to cause numerous health hazards due to their ability to enter the body through the digestive, dermal, and respiratory tracts, resulting in acute and/or chronic poisoning. Acute poisoning is characterized by the appearance of clinical symptoms minutes or hours after contact, and may, depending on the severity of the poisoning, result in sequelae or even death⁵. Chronic poisoning occurs through continuous exposure for months or years, and can lead to several complications, such as cellular changes. Such exposure may culminate in cancer in several organs (esophagus, brain, lymphoid tissue, digestive system, urinary system, respiratory system, and reproductive system). Furthermore, research shows that occupational exposure to pesticides during pregnancy increases the risk of childhood cancer, especially leukemia^{6,7}.

The chemical substances present in pesticides can cause dysfunction in the peripheral and central nervous system, which may trigger neurobehavioral, cognitive, and sleep changes, Parkinson's disease, dementia, anxiety, depression, and suicidal ideation. Pesticides may also cause kidney failure, liver and immune system problems, infertility, mutations, and chromosomal and DNA alterations^{4,8,9}.

Furthermore, there is a consensus in the literature that occupational exposure to chemical products can lead to hearing loss, as the harmful effects of numerous products on hearing have been duly recognized¹⁰. Organophosphates, paraquat, pyrethroids, hexachlorobenzenes, and polychlori-

nated biphenyls are some of the harmful chemical compounds¹¹.

Concerning hearing, these substances can affect everything from the inner ear, including hair cells and ganglion cells, and vascular striae, to the auditory brain areas¹². Ototoxic chemicals can have temporary or permanent effects, affect hearing sensitivity, and result in significant changes in the hearing threshold¹¹. The degree of impairment can range from moderate to severe¹³, with greater impairment and the presence of an audiometric notch in high frequencies¹⁴.

Also noteworthy are aspects related to neurodegeneration, neuropathy, and dysfunctions in the auditory system that manifest as difficulty in discriminating sounds (mainly in the presence of competitive noise), changes in frequency resolution abilities, temporal resolution, spatial resolution, and the occurrence of tinnitus. Even if peripheral hearing loss is not verified in pure tone audiometry (PTA), damage at the cellular level exists and can be evidenced in high-frequency audiometry, Evoked Otoacoustic Emissions (EOE), and Brainstem Auditory Evoked Potential (BAEP)¹⁵.

Among all exposed populations, farmers are the most susceptible to these health problems. Furthermore, aspects such as income and education, associated with precarious environmental and health surveillance, a lack of education about safety practices, and inadequate technical assistance and training, further increase the exposure of this group¹⁶.

Since pesticides are a recognized public health problem in Brazil, understanding farmers' use of pesticides and their workplace practices, as well as the signs and symptoms of work-related health issues, is crucial for providing this population with effective health strategies and a better quality of life. Given the above, the objective of this study was to characterize the sociodemographic and labor profiles, as well as the signs and symptoms of farmers from the Irecê Microregion, in the state of Bahia.

Methods

This study is a cross-sectional research approved by the Human Research Ethics Committee of the Federal University of Santa Catarina under protocol number CAAE.7124372340000121.

Before the research, participants signed the Free and Informed Consent Form (FICF).

This study involved the application of a health education (HE) action developed by the researchers for farmers in the municipalities of Lapão and João Dourado, located in the Microregion of Irecê (BA), Brazil.

The municipality of João Dourado is located in the north-central part of the state, 455 km from Salvador. It has a resident population of 24,854 people, according to data from 2022¹⁷, and 1,347 agricultural establishments—18.26% of which use pesticides—and 3,591 people employed in them. Onion is the main crop in João Dourado, which gave it the title of the Capital of the Onion of the Northeast region³.

The municipality of Lapão is also located in the north-central part of the state, 500 km from Salvador, and has 25,736 inhabitants¹⁷. Over 5,000 people are employed across 2,000 agricultural establishments, with 18.70% of these establishments reporting the use of pesticides. The city stands out regionally in the planting of fruits and vegetables³.

The research included a non-probabilistic convenience sample, composed of farmers of both sexes, over 18 years of age, regardless of the characteristics of the agriculture carried out. Based on these criteria, the agricultural departments of the municipalities of Lapão and João Dourado recruited participants by sending invitations directly to farmers or leaders of farmers' associations via WhatsApp. This process resulted in the full participation of 45 farmers.

To obtain the data, the authors prepared a questionnaire to characterize the sample, which contained 12 questions related to sociodemographic and work-related aspects, and signs and symptoms related to occupational exposure to pesticides. The questionnaire was administered in person, in groups, and farmers were given proper guidance on how to complete it correctly. For participants who reported reading difficulties, one of the researchers assisted in the process.

The sociodemographic variables analyzed in this study were: municipality of the interviewee (Lapão; João Dourado), skin color/race (white; black; yellow; brown; indigenous), sex (male; fe-

male), education (illiterate; incomplete elementary school; complete elementary school; incomplete high school; complete high school; incomplete higher education; complete higher education) and age group (20 to 39; 40 to 49; 50 to 59; 60 or older).

The work-related variables were: time working in agriculture in years, use of pesticides on the farm (no; yes), responsible for preparing the product (no; yes), proximity to the pesticides or the applicator (no; yes), responsible for disposing of or washing the packaging (no; yes), responsible for cleaning or washing the clothes used to work on the farm (no; yes), whether the products are applied (no; yes), whether the products are stored (no; yes) and the use of protective equipment when working with pesticides (never; rarely; sometimes; always). For those who reported using protective equipment, the question was which type of equipment (glasses, mask, boots or shoes, pants, long-sleeved shirt, gloves, overalls, or apron), with all options categorized as either 'no' or 'yes'.

Regarding health characteristics, signs and symptoms were investigated, including headache, stomach/abdominal pain, dizziness, urge to vomit, blurred vision, difficulty hearing, burning in the throat and lungs, memory problems, difficulty sleeping, and difficulty breathing. In addition, the participant was asked whether they had noticed any hearing problems since starting work with pesticides, such as strange noises in the ear, hearing loss, and difficulty understanding what people are saying, with all options categorized as either no or yes.

The qualitative variables of the sample were expressed through absolute frequencies (n), relative frequencies (%), and 95% confidence intervals (95%CI). Quantitative variables were presented using measures of central tendency (mean and median) and dispersion (standard deviation [sd]), in addition to minimum and maximum values. "Not reported/ignored" values were disregarded in the presentation of results (considered as *missing* in the database). The data were tabulated in Microsoft Excel spreadsheets and then exported for statistical analysis through Stata 14 software.

Results

Forty-five farmers participated in the study, 53.3% from Lapão and 46.7% from João Dourado. The majority were male (62.2%), aged 50-59 years

(33.3%), of brown skin/race (48.9%), with incomplete primary education (29.6%). Almost half of the sample consisted of individuals with brown skin color/race (48.9%), and a higher frequency of people with incomplete elementary education was also identified (29.6%) (Table 1).

Table 1. Description of the sociodemographic characteristics of the sample. Bahia, 2024

Variable	n	%	95%CI
Sex (n=45)			
Male	28	62.2	46.8-75.5
Female	17	37.8	24.4-53.2
Age range (n=45)			
20 to 39	9	20.0	10.4-34.8
40 to 49	13	28.9	17.2-44.2
50 to 59	15	33.3	20.7-48.8
60 or older	8	17.8	8.8-32.4
Skin color/race (n=45)			
White	5	11.1	4.5-24.7
Black	17	37.8	24.4-53.2
Brown	22	48.9	34.2-63.7
Asian	1	2.2	0.2-15.1
Indigenous	-	-	-
Education (n=44)			
Illiterate	1	4.5	1.0-17.2
Incomplete elementary school	13	29.6	17.6-45.1
Complete elementary school	8	18.2	9.1-33.0
Incomplete high school	6	13.6	6.0-27.9
Complete high school	12	27.3	15.8-42.8
Incomplete higher education	-	-	-
Complete higher education	3	6.8	2.1-19.9
Municipality (n=45)			
Lapão	24	53.3	38.3-67.7
João Dourado	21	46.7	32.2-61.6

Caption: 95%CI = 95% Confidence Interval.

Table 2 presents the occupational characteristics of the sample. The average time spent working in agriculture was 33.3 years (SD=14.9), and the number of hours worked in agriculture/farming was on average 8 hours per day. Regarding the

use of pesticides, 27 of the 45 participants (60.0%) reported using the substance. Regarding the form of contact with pesticides, 65.4% of farmers reported applying the product.

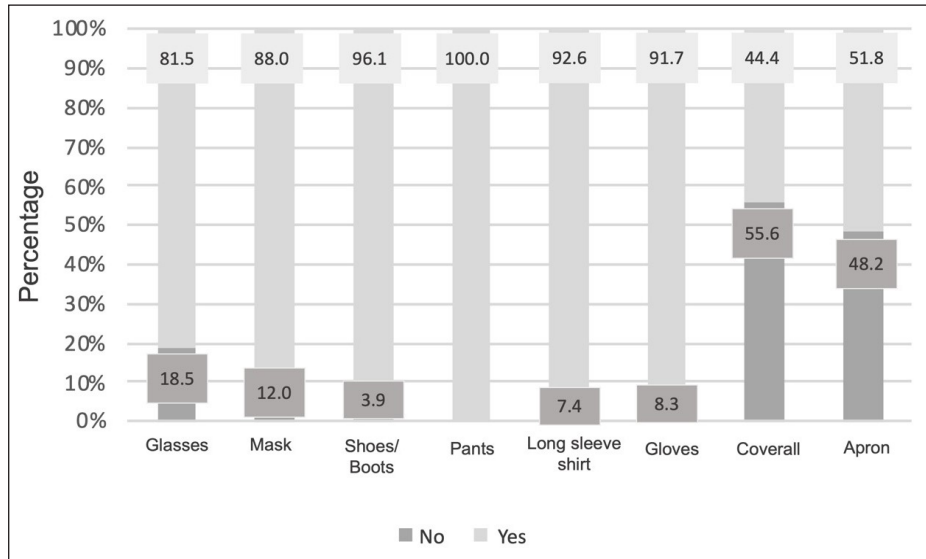
Table 2. Description of the occupational characteristics of the sample. Bahia, 2024

Variable	n	%	95%CI
Performance in the agricultural sector			
Uses pesticides (poison) on the farm (n=45)			
No	18	40.0	26.4-55.3
Yes	27	60.0	44.6-73.6
Contact with pesticides			
Product preparation (n=26)			
No	10	38.5	21.1-59.3
Yes	16	61.5	40.7-78.8
Proximity to pesticides or applicator (n=27)			
No	11	40.7	23.2-60.9
Yes	16	59.3	39.0-76.7
Disposal or washing of packaging (n=26)			
No	13	50.0	30.5-69.5
Yes	13	50.0	30.5-69.5
Cleaning or washing clothes used for work (n=26)			
No	7	26.9	12.7-48.2
Yes	19	73.1	51.7-87.3
Performs the application of the product (n=26)			
No	9	34.6	18.2-55.7
Yes	17	65.4	44.2-81.8
Performs product storage (n=26)			
No	6	23.1	10.1-44.4
Yes	20	76.9	55.6-89.8
Uses protective equipment when working with pesticides (n=27)			
Never	-	-	-
Rarely	1	3.7	0.4-24.5
Sometimes	8	29.6	14.8-50.4
Always	18	66.7	45.9-82.5
	Mean (dp)	Median	Min.-Max.
Time working in agriculture (in years) (n=43)	33.3 (14.9)	36.0	8-67
Number of hours worked per day in agriculture/farming (n=45)	8.0 (2.7)	8	3-20

Caption: 95%CI = 95% Confidence Interval. Min.= Minimum value; Max.= Maximum value.

Of the 27 farmers who used pesticides, more than 80% reported using some form of personal protective equipment (PPE) to work with pesticides (glasses, mask, shoes/boots, pants, long-sleeved

shirt, and gloves). However, more than half of the participants (55.6%) reported not using overalls, and 48.2% mentioned not using an apron, as shown in Figure 1.



Note: This analysis only includes individuals who reported using pesticides (n=27).

Figure 1. Description of the use of protective equipment for working with pesticides. Bahia, 2024

Regarding noticing any signs/symptoms after starting to work with pesticides, one participant did not answer the question, accounting for 26 responses. Thus, 53.8% of these individuals report experiencing a headache, as shown in Table 3.

Table 3. Description of health characteristics/signs and symptoms self-reported by the sample. Bahia, 2024

Variable	n	%	95%CI
Headache (n=26)			
No	12	46.2	27.2-66.2
Yes	14	53.8	33.8-72.7
Belly/abdominal pain (n=26)			
No	26	100.0	-
Yes	-	-	-
Dizziness (n=26)			
No	20	76.9	55.6-89.8
Yes	6	23.1	10.1-44.4
Feeling like vomiting (n=26)			
No	21	80.8	59.6-92.2
Yes	5	19.2	7.7-40.4
Blurred vision (n=26)			
No	20	80.0	58.2-91.9
Yes	5	20.0	8.0-41.7
Difficulty hearing (n=26)			
No	22	84.6	63.7-94.5
Yes	4	15.4	5.4-36.2
Burning in the throat and lungs (n=26)			
No	23	88.5	67.8-96.5
Yes	3	11.5	3.4-32.1
Memory problems (n=26)			
No	21	80.8	56.9-92.2
Yes	5	19.2	7.7-40.4
Difficulty sleeping (n=26)			
No	19	73.1	51.7-87.2
Yes	7	26.9	12.7-48.2
Difficulty breathing (n=26)			
No	20	76.9	55.6-89.8
Yes	6	23.1	10.1-44.4

Caption: 95%CI = 95% Confidence Interval.

Note: This analysis only includes individuals who answered the question (n=26)

Table 4 presents the hearing problems reported by the sample. Of the 27, three did not answer the question, leaving 24 responses. Of these, 16.7% ($n = 4$) of participants reported experiencing hearing problems from the moment they began working

with pesticides. Half of the 16.7% reported hearing strange noises, while the other half reported hearing them less frequently. Only one person (25.0%) considered having difficulty understanding what people are saying.

Table 4. Description of hearing problems self-reported by the sample. Bahia, 2024

Variable	n	%	95%CI
Started having hearing problems since he started working with pesticides (n=24)			
No	20	83.3	61.1-94.0
Yes	4	16,7	5.9-38.8
Strange noises in the ear (n=4)			
No	2	50.0	24.7-97.5
Yes	2	50.0	24.7-97.5
Started to hear less (n=4)			
No	2	50.0	24.7-97.5
Yes	2	50.0	24.7-97.5
Difficulty understanding what people say (n=4)			
No	3	75.0	41.3-99.5
Yes	1	25.0	4.7-95.8

Caption: 95%CI = 95% Confidence Interval.

Note: This analysis only includes individuals who answered the question ($n=24$).

Discussion

This study characterized the sociodemographic and labor profiles, as well as the signs and symptoms, of farmers in the Irecê (BA) Microregion through the application of a questionnaire developed by the researchers. Despite receiving proper guidance on how to complete the questionnaire, which stated that all questions should be answered, some participants left questions blank, thereby hindering the collection of research data.

In this study, males aged 40-59 years predominated. Although women also work in agriculture, the 2017 Brazilian Agricultural Census revealed that 81% of the country's agricultural producers are male. In this same survey, the predominant age group is between 45 and 54 years old for both sexes³.

Regarding working time, the average was 33.3 years. Data also reveal that most farmers begin their work at a young age, being exposed to pesticides for many years, which increases the health risks associated with these substances¹⁸. A study con-

ducted in the community of Tracuateua, in Moju (PA), with 46 families, showed that 21.34% of the family workforce consists of children between 7 and 13 years of age¹⁹.

Regarding education, most farmers did not complete elementary school, while another portion completed high school, a profile similar to that found in another study²⁰. In Brazil, farmers have an average of 3.4 years of schooling, and this low level of education can increase the risk of pesticide poisoning²¹. A survey of 50 farmers in the Coruripe region (AL) observed a negative correlation between education and working time: the lower the level of education, the longer the participants worked²².

Most participants reported using pesticides (60%). It is currently known that Brazil is the world's largest consumer of these products²³ and that this consumption has increased every year. A study²⁴ carried out with farmers from the Chapada Diamantina region (BA) found that 25 of the 31 participants used pesticides.

A large proportion (65.4%) of those interviewed confirmed that they wash their personal protective equipment (PPE). Handling empty packaging and triple washing constitutes a risky situation for the farmer and the environment, due to exposure to pesticides²⁵, which reinforces the need to use PPE at all times, not just when applying the product.

In this sense, the results obtained regarding the use of PPE are worrying, as only 66.7% of participants stated that they always use them, albeit incompletely. These results were also observed in research conducted with farmers in Rio Grande do Sul²⁶ and Rio de Janeiro²⁵. There is a need to broaden farmers' understanding of the importance of using PPE in full, as well as monitoring and controlling pesticides. These aspects, associated with the discomfort generated by use, exposure to the sun, and physical effort²⁷, can justify the farmer's decision not to fully use PPE, disregarding the potential risks to their health and the environment²⁵.

Regarding the signs and symptoms reported by the interviewees, headache and difficulty sleeping stand out. A study carried out with fruit farmers in the municipality of Bento Gonçalves (RS)²⁸ demonstrated that 11% of participants were classified as probable cases of poisoning, presenting ocular symptoms, headache, dizziness, and dermatological symptoms. Another survey conducted in 2019¹⁶ described pesticide poisonings that occurred in Brazil and found a positive and significant correlation between poisoning, consumption, and environmental exposure to pesticides sprayed on crops, concluding that there is a higher incidence of poisoning in regions with the highest agricultural production and pesticide spraying.

Regarding hearing problems, 16.7% of respondents reported noticing the manifestation of some auditory sign or symptom due to occupational exposure to pesticides. A 2020 study²⁹, which analyzed three cases of tobacco growers exposed exclusively to pesticides, found the following auditory and neurovegetative symptoms reported by the subjects: discomfort with sounds ($n=2$), difficulty understanding speech ($n=3$), dizziness ($n=2$), and imbalance ($n=2$). Another study³⁰, which analyzed the audiological characteristics of high frequencies of farmers, with and without exposure to pesticides, observed that 94% (46) of the exposed farmers and 87% (33) of those not exposed to pesticides considered their hearing to be normal ($p = 0.225$),

with dizziness during and/or after the application of pesticides being reported by 33% of the 49 exposed workers.

One factor hindering better indicators of the effects of pesticides on hearing is the absence (to date) of mandatory labor legislation in Brazil for hearing monitoring of workers exposed exclusively to chemical products, as the current legislation also includes those who are exposed to high sound pressure levels^{15,30}.

Nevertheless, this research presents some limitations. As this study employs a non-probabilistic sample, its findings cannot be generalized to other populations. Furthermore, being a cross-sectional and descriptive study, it is not possible to establish causal relationships. The possibility of memory bias is also highlighted, since this is self-reported information from participants. Furthermore, although this is less frequently the case, the presence of missing data partially compromises the completeness of the analyzed information. It is suggested that future research delve deeper into aspects related to the occupational health of farmers, such as: whether regular analysis are carried out, whether the recommendation for the use of personal protective equipment (PPE) comes from the worker's health team or on personal initiative, in addition to the level of awareness regarding the hearing risks associated with work activities. The inclusion of these variables can contribute to a more comprehensive understanding of the working conditions and risk factors involved in the hearing health of this population.

Conclusion

The data from this study demonstrated that the participants were predominantly men between 50 and 59 years old of mixed race, and with a low level of education. They use pesticides in the workplace, often fail to use complete personal protective equipment, and report headaches resulting from occupational exposure to pesticides. Furthermore, four participants reported a subjective perception of hearing problems after starting to work with pesticides. Understanding the numerous losses to farmers resulting from occupational exposure to pesticides, as well as the work profile and health-related aspects of these workers, is considered essential to support the development of strategies, actions, and health programs aimed at reducing

occupational risks and improving the quality of life for this group.

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