

Knowledge and risk perception of rural workers exposed to pesticides in Teixeira/MG: a cross-sectional study

Conhecimento e percepção de risco dos trabalhadores rurais expostos a agrotóxicos em Teixeira/MG: um estudo transversal

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ABSTRACT

Introduction: Brazil is the world's largest consumer of pesticides since 2009. There is a greater risk of poisoning and death among rural workers exposed to pesticides. **Objective:** The objective of this research was to evaluate knowledge and perception of risk, as well as exposition-related mental health disorders among rural workers in the municipality of Teixeira, MG. **Methods:** A cross-sectional descriptive study was conducted. The sample consisted of 63 workers exposed to the use of pesticides and 129 not exposed. Data collection took place between March and September 2018. A semi-structured questionnaire, the Beck Depression Inventory (BDI) and the General Health Questionnaire-12 (GHQ-12) were used. **Results:** Most respondents understand that pesticides are poisons (71.4% exposed and 89.0% not exposed). They know what Personal Protective Equipment (PPE) is (65.0% exposed and 50.4% not exposed), but do not use it (66.7% exposed). Among those exposed, most showed signs of depression (BDI: 77.8%; GHQ-12: 54.0%), while the majority among those not exposed did not show (BDI 89.9%; GHQ-12: 82.4%). **Conclusion:** These results are consistent with the scientific literature. The results reinforce the social and labor vulnerability of workers in the exposed group surveyed. **Keywords:** Rural population health; Pesticides; Personal protective equipment; Depression.

RESUMO

Introdução: O Brasil é o maior consumidor mundial de agrotóxicos desde 2009. Há maior risco de intoxicação e morte entre trabalhadores rurais expostos a agrotóxicos. **Objetivo:** avaliar o conhecimento e a percepção dos riscos da exposição aos agrotóxicos e transtornos mentais relacionados à essa exposição entre trabalhadores rurais do município de Teixeira-MG. **Métodos:** Foi realizado um estudo descritivo transversal. A amostra foi composta por 63 trabalhadores expostos ao uso de agrotóxicos e 129 não expostos. A coleta de dados ocorreu entre março e setembro de 2018. Foram utilizados um questionário semiestruturado, o Inventário de Depressão de Beck (BDI) e o General Health Questionnaire-12 (GHQ-12). **Resultados:** A maioria dos entrevistados entende que os agrotóxicos são venenos (71,4% expostos e 89,0% não expostos). Sabem o que é Equipamento de Proteção Individual (EPI) (65,0% expostos e 50,4% não expostos), mas não utilizam (66,7% expostos). Entre os expostos, a maioria apresentava sinais de depressão (BDI: 77,8%; GHQ-12: 54,0%), enquanto a maioria entre os não expostos não apresentava (BDI 89,9%; GHQ-12: 82,4%). **Conclusão:** Esses resultados estão de acordo com a literatura científica. Os resultados reforçam a vulnerabilidade social e laboral dos trabalhadores do grupo expostos pesquisados.

Palavras-chave: Saúde da população rural; Pesticidas; Equipamento de proteção individual; Depressão.

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INTRODUCTION

The current model of agricultural production in the world and in Brazil has incorporated several technological and organizational changes. There were significant changes in the process and conditions of work and in the health of workers. The massive and growing use of pesticides is a part of this process¹.

Pesticides are made up of more than 600 active substances, which are included in the composition of more than 50,000 commercial products. They are chemical products used to control plant pests and diseases. They are used all over the world, including developed and developing countries^{2,3}, with the aim of modernizing the agricultural production process and increasing food production.

Thus, rural workers become more exposed to these products and, consequently, poisoning becomes more frequent. It is estimated that around 3 million poisonings occur per year, with 250,000 deaths worldwide due to the use of pesticides^{4,5}. The chronic effects can be as harmful as the acute ones and the evidence points that there are, among others, neurological, psychiatric and fertility consequences besides possibly increasing the susceptibility to neoplasm emergence⁶. Thus, individuals who participate in large application scales of these compounds are more prone to contamination and to get sick than the general population. Several studies have proved that exposure to pesticides can be harmful to human and environmental health⁷. The use of pesticides compromises the physical and psychological health of rural workers. It is noteworthy the occurrence of common mental disorder in approximately half of the participants of the research carried out by Morin and Stum (2018)⁸, with a statistically significant relationship between working time in agriculture and exposure to pesticides.

Occupational exposure of rural workers is often due to lack of information or resources, especially when it comes to precarious work contracts, where no adequate guidance is provided and the organization does not allow for adequate management of activities. The use of pesticides is a common practice although they can bring harm to health⁹.

However, as Brazil is essentially an agricultural commodities country producer, family farmers also fit into this group with poor knowledge about the potential risks of pesticides. And, in developing countries, health problems related to pesticides are quite common due to low awareness of the risk, misuse of personal protective equipment, lack of care during application, use of highly toxic pesticides and scarce mechanisms of control in health surveillance. This scenario is further aggravated by the low educational levels of most rural workers in Brazil¹⁰⁻¹². It should also be understood that occupational exposure also occurs throughout the whole production cycle and uses¹¹.

Some studies on the characterization of exposure in family farming regions have shown that contamination can occur in home environment too. Some workers store or keep pesticides inside their homes, in addition to washing their PPE almost always without any protection^{12,13}.

Given that this scenario is prevalent among most Brazilian rural workers, the objectives of this study were to assess knowledge and risk perception in pesticides use, as well as indicators of pesticides use related to mental health disorders in rural workers in the municipality of Teixeiras, MG.

METHODS

This is a descriptive and cross-sectional study, whose study population are rural workers from the city of Teixeiras/MG, located in the forest area of Minas Gerais and has an estimated population of 11,355 inhabitants, with about 33% (3,727) residents in rural areas, according to data from the Teixeiras City Hall, MG (2018)¹³. The sample calculation took into account a confidence level of 95%, a statistical power of 80%, prevalence of the event, presence of psychiatric disorders under 20% (average prevalence for the Brazilian population over 18 years of age)¹⁴, a ratio of two not exposed to one exposed (main exposure: use of pesticides), and a relative risk of 2. On the obtained estimate, 10% was added to cover possible losses, in a total of 174 (192) individuals. 58 (63) exposed and 116 (129) not exposed. As not exposed, were considered individuals from the general community of the municipality not necessarily farmers, but linked somehow to rural work, without contact with pesticides, being mostly female and farmers who carry out organic agriculture. Both groups were randomly selected from a list of citizens linked to health services provided by the Municipal Health Department. The participants in this study are rural workers, from family farming.

As inclusion criteria in this study, the following items were adopted for the exposed group: living in a rural area of the researched municipality and cultivating the land for at least 15 hours a week, and using pesticides¹⁵, and not having a current or recent report (last two years) of treatment for psychiatric disorders or cancer. For inclusion in the non-exposed group, members should not be exposed to pesticides in the work process (preparation, application and cleaning of used equipment, or in other daily activities. Workers in organic agriculture or other professions were not linked to the exposure to pesticides.

All participants were 18 years of age or older, both sexes, and agreed to participate by signing the informed consent form.

Data collection was carried out between March and September 2018, through a semi-structured questionnaire, which addressed demographic aspects (such as gender and age), socioeconomic aspects (such as family income, contribution to social security); knowledge about pesticides and frequency of its use (such as who recommends or "reads the package insert"); knowledge about PPE (if they use, what do they do when a defect occurs); knowledge about signs and symptoms of intoxication (acute and chronic); the Beck depression inventory and the General Health Questionnaire-12. The participants of the unexposed group

answered only the questions common to all participants (sociodemographic data; what is a pesticide in their understanding; if they know what PPE is; if they believe that a pesticide is hazardous for health; if they know what a pesticide poisoning is; as well as the Beck Depression Inventory and the GHQ-12). As for the knowledge and management of pesticides itself, only participants from the exposed group answered.

The Beck depression inventory is a questionnaire designed to screen for depression in public health, validated in non-psychiatric populations. A score between 10 and 18 is generally considered an indicator of mild to moderate depression; values between 19 and 29 indicate moderate depression and between 30 and 63 indicate severe depression¹⁶. As for the Beck Depression Inventory (BDI), participants could refuse to answer it. However, of the 192 participants, only 10 participants from the unexposed group chose not to respond; there were no significant differences between them and the responder group regarding sex, age and socioeconomic aspects ($p < 0.01$).

The existence of Common Psychiatric Disorder (CMD) was assessed using the 12-item version of the General Health Questionnaire (GHQ-12), adapted and validated by Mari and Williams (1985)¹⁷. It is a screening tool commonly used to identify individuals with common psychiatric disorders in communities. This shortened version has been extensively validated and used in several countries, in different languages. A cutoff point equal to or greater than four in the final GHQ-12 score was considered a potential case of CMD.

The standardization of data collection was ensured through specific training of applicators (community health agents) and the use of a guiding application manual.

STATISTICAL ANALYSIS

A descriptive analysis of sociodemographic data, awareness about pesticides and their management, knowledge about PPE and poisoning was carried out. Categorical variables were described by absolute and relative frequencies. To verify the independence of the distribution of events between exposed and non-exposed groups, the chi-square statistic was used.

Data analysis was performed using the Stata 10 statistical software (Statacorp., College Station, TX, USA).

The study was approved by the ethics committee of the *Universidade Federal de Viçosa*, under protocol 74849817.7.0000.5153.

RESULTS

A total of 193 people participated in the study, 32.8% being exposed (63) and 67.2% (129) not exposed. Among the exposed group, 95.2% (60) were male. In the non-exposed group, 66.7% (86) were female. As for education among the participants of the exposed group, the majority, 63.4% (40) had a maximum of 4 years of study; among those not exposed, 71.3% (92) had a maximum of 4 years of schooling. Checking the family income, 76.2% (48) and 88.4% (114) had an income of up to 1 minimum wage per family, respectively among the exposed and the unexposed. As for the contribution to social security, 84.1% (53) did not contribute among those in the exposed group, and 76.7% (99) among those not exposed (Table 1).

Responding to knowledge of pesticides, among the exposed group, 71.4% (45) of the members recognized them as poison, while 89.0% (115) among the participants in the non-exposed group did the same.

Table 1. Relative and absolute distribution of sociodemographic factors of rural workers, Teixeira, Minas Gerais, Brazil, 2018.

Variable	Exposed		Not exposed		p-value*
	n (63)	%	n (129)	%	
Gender					
Male	60	95.2	43	33.3	
Female	3	4.8	86	66.7	
Age group					0.588
18-30 year	6	9.5	14	10.9	
31-40 year	10	15.9	31	24.2	
41-50 year	21	33.3	34	25.8	
51-60 year	16	25.4	26	20.3	
> 60 year	10	15.9	24	18.8	
Schooling					0.080
0-4 year	40	63.4	92	71.3	
5-8 year	18	28.5	20	15.5	
>8 year	5	8.1	17	13.2	
Family income					0.029
Up to 1 minimum wage	48	76.2	114	88.4	
More than 1 minimum wage	15	23.8	15	11.6	
Social security					0.236
No	53	84.1	99	76.7	
Yes	10	15.9	30	23.3	

*X² test p-value.

Source: Elaborated by the author.

Of the exposed group, when asked about who indicated which pesticide to use, 46.0% (29) informed that a seller indicated. For the item “who recommends the dosage”, 20.6% (13) did not receive guidance; 34.9% (22) attributed it to the seller, restricting the use of pesticides, especially the most toxic, and moving towards the search for alternatives to their use. About reading the leaflet, 55.5% (35) answered that they do not read.

As for being afraid to prepare or apply pesticides, 55.5% (35) said they are afraid. As for the place where they wash the equipment, 41.2% (26) answered that they wash in the fields; 7.9% (5) in a tank suitable for this purpose; 31.7% (20) in a home tank; 12.6% (8) in lakes, ponds or streams; and 6.6% (4) do not wash. As for the destination of the water used in washing equipment, 84.1% (53) said they throw it on the floor (Table 2).

Table 2. Knowledge about Pesticides and PPE use among rural workers, Teixeiras, Minas Gerais, Brazil, 2018.

Variable	Exposed		Not exposed		p-value*
	n (63)	%	n (129)	%	
What is pesticide?					0.007
Poison	45	71.4	115	89.0	
Plant remedy	5	7.9	7	5.5	
Agricultural defensive	9	14.2	7	5.5	
Other	3	6.3			
Who indicated which pesticide to use?					
Salesman	29	46.0			
Agronomist sales house	16	25.4			
Other	18	28.6			
Who recommends the dosage?					
Does not receive guidance	13	20.6			
Salesman	22	34.9			
Farmer	7	11.1			
Other	21	23.4			
Read the leaflet					
Yes	28	44.5			
No	35	55.5			
Are you afraid to prepare or apply?					
Yes	35	55.5			
No	28	44.6			
Where do you wash the equipment?					
In the Farm	26	41.2			
Adequate container	5	7.9			
At home	20	31.7			
Streams/lakes/ponds	8	12.6			
Do not wash	4	6.6			
Destination of used wash water?					
Throw on the ground	53	84.1			
Reuse	7	11.1			
Other	3	4.8			
Are you aware of what PPE is?					0.054
Yes	41	65.0	65	50.4	
No	22	35.0	64	49.6	
Do you use PPE?					
Yes	21	33.3			
No	42	66.7			
Were you trained for PPE use?					
No	47	74.6			
Yes	16	25.4			
When there is any defect or damage to the PPE, what do you do?					
Replace it	13	20.6			
Fix it	14	22.2			
Keep using it without repair	31	49.2			
Other than that	5	8.0			

*X² test p-value.

Source: Elaborated by the author.

Among the exposed group, 65.0% (41) were aware of what PPE is. Among the non-exposed group, knowledge was practically 50.4% (Table 2).

As for the use of PPE, 66.7% (42) do not use them. When asked if they have received training on the use of PPE, 74.6% (47) answered that they did not (Table 2).

For the question “do you believe that pesticides are hazardous for your health?”, 98.4% (62) among those exposed said yes, stating that it is harmful.

When asked if they would know what a pesticide poisoning is, 77.7% (49) among the exposed group said no. Among the unexposed group, 61.2% (79) said they were not aware of what a pesticide poisoning is (Table 3).

Table 3. Rural workers' perception of signs and symptoms of pesticide poisoning, Teixeira, Minas Gerais, Brazil, 2018.

Variable	Exposed		Not Exposed		p-value*
	n (63)	%	n (129)	%	
Do you believe that pesticides can harm your health?					0,984
Yes	62	98.4	127	98.4	
No	1	1.6	2	1.6	0.984
Are you aware of what pesticide poisoning is?					
Yes	14	22.3	50	38.8	
No	49	77.7	79	61.2	0.022
Acute intoxication **					
Conjunctive irritation	22	34.9			
Sneezing	21	33.3			
Headache	17	27.0			
Weakness	16	25.4			
Spasms	12	19.0			
Dizziness	10	15.8			
Nausea	9	14.2			
Lack of appetite	8	12.7			
Tremors	6	11.1			
Muscle twitches	6	11.1			
Excitement	6	11.1			
Breathing difficulty	6	11.1			
Vomiting	5	7.9			
Nausea	5	7.9			
Carmps	3	4.7			
Conjunctivitis	2	3.2			
Hyperthermia	1	1.6			
Nosebleed	1	1.6			
Chronic intoxication **					
Allergy	11	17.4			
Mucosal irritation	7	11.1			
Liver injuries	6	9.5			
Contact dermatitis	5	7.9			
Arrhythmia	5	7.9			
Kidney injury	5	7.9			
Respiratory allergies	4	6.3			
Asthma	1	1.6			
Hypersensitivity	1	1.6			
Dermatitis	1	1.6			
Do you believe that pesticides favored the appearance of these signs and symptoms?					
Yes	39	61.9			
No	24	38.1			
When you feel these signs and symptoms, did you seek a health service					
Yes	5	7.9			
No	58	92.1			
Did a health professional talk to you and link these signs and symptoms to pesticides?					
Sim	2	3.2			
Não	61	96.8			

*X² test p-value. **Only exposed ones were asked about these questions.

Source: Elaborated by the author.

The exposed group participants answered which symptoms they felt at some point after handling and applying pesticides. Among the recognized signs, they pointed to irritation in the conjunctiva (34.9%), sneezing (33.3%), headache (27.0%), weakness (25.4%); spasms (19.0%), dizziness (15.8%), nausea (14.2%), loss of appetite (12.7%), tremors, muscle contractions, excitement and expiratory difficulty (11.1%), vomiting and nausea (7.9%), cramps (4.7%), conjunctivitis (3.2%), hyperthermia and nose bleeding (1.6) (Table 3).

The signs and symptoms of chronic intoxication showed the following results: allergies in general (17.4%), mucosal irritation (11.1%), liver damage (9.5%), contact dermatitis, cardiac arrhythmias and kidney damage (7.9%), respiratory allergies (6.3%), asthma, hypersensitivity and dermatitis (1.6%) (Table 3).

Also, among the participants in the exposed group, 61.9% (39) said they believe pesticides can favor the appearance of signs and symptoms of acute and chronic intoxication. 92.1% (58) answered that they did not seek any health service after experiencing these signs and symptoms, and 96.8% (61) said that no health professional related the signs and symptoms they presented to the use of pesticides (Table 3).

BECK DEPRESSION INVENTORY AND GHQ-12

Among the exposed group participants, 49.2% (31) had mild depression; 25.3% (16) had moderate depression; 3.3% (2) had severe depression. Among the participants in the unexposed group, 10.1% (12) had mild depression and 89.9% (107) had no depression.

For GHQ-12, 54.0% (34) among those exposed presented a result indicative of CMD. Among those not exposed, 17.6% had a result indicative of CMD.

Both scales indicated significant mean differences between groups, with $p \leq 0.01$ (Table 4).

DISCUSSION

In this study, there was a predominance of male citizens, individuals who recognize pesticides as poison and harmful to health, that buy pesticides without a prescription or expert guidance, without reading the package inserts for minimal guidance. Strong indicators, based on the use of the GHQ and BDI scales, indicate a higher prevalence of depressive conditions and common mental disorders among exposed workers.

Bedor et al. (2009)¹⁸ pointed to the predominance of male labor among rural workers, a fact corroborated by the present study and by the 2017 IBGE census, where 81.3% of rural workers were male. It is an activity that is traditionally performed by the male population on a larger scale, often leaving female work relegated to invisibility. Even when they are not directly linked to the activity, they are still not totally free from intoxication, as women are often the ones who clean the clothes¹⁹.

The workers' predominant age group was similar to other studies addressing the same issue^{20,21}.

The present study showed that a small percentage of the two groups - exposed and unexposed, had more than 8 years of schooling. This characteristic is very striking in the studied region as these workers do not have many study opportunities. Authors such as Bedor et al. (2009)¹⁸, Santana et al. (2016)²² and Brust et al. (2019)²⁰, when studying workers involved in agriculture, found similar results, indicating that these workers with low education will have difficulties in reading and in understanding the technical content of the leaflets pesticides, which makes these subjects even more vulnerable.

Most participants consider pesticides as poison. This fact can also be proven by Castro and Confalonieri (2005)²³, in their study on the use of pesticides in the municipality of Cachoeiras de Macacu (RJ), and also by Recena and Caldas (2008)²⁴, in their study on risk perception, attitudes and practices in use of pesticides among farmers in Culturama, MS.

Table 4. Relative and absolute distribution of BDI and GHQ-12 scores of rural workers, Teixeira, Minas Gerais, Brazil, 2018.

Variable	Exposed		Not exposed		p-value*
	n (63)	%	n (119)	%	
Beck Depression Inventory (BDI)					
No depression	14	22.2	107	89.9	
Mild depression	31	49.2	12	10.1	
Moderate depression	16	25.3	-	-	
Severe depression	2	3.3	-	-	<0.001
GHQ-12					
Test not altered	29	46.0	98	82.4	
Test altered	34	54.0	21	17.6	<0.001

*X² test p-value.

Source: Elaborated by the author.

Although they are aware of the risk of pesticides to health and the environment, the concrete conditions in which they live and work leave them more vulnerable and with few viable alternatives for their replacement or elimination.

Most of the interviewees obtained an indication for the use of pesticides, as the law requires, through unauthorized people. Bedor et al. (2009)¹⁸ also confirm this trend, in addition to questioning the sellers' technical capacity to indicate the most appropriate pesticide. Augusto et al. (2015)²⁵, in their study on the case of the fruit-growing export hub of Petrolina, PE, identified that 21% of the products (pesticides) are indicated by the sellers. Londres (2011)²⁶ showed that sales of pesticides indicated by vendors increase the chances of poisoning by 263% and also points out that the majority of users are small producers, who are even more vulnerable. This fact, combined with the low level of education of the individuals surveyed, brings them closer to a greater chance of exposure and risk to highly toxic pesticides.

In his study on the occupational effect of pesticide use in Piauí, Santana et al. (2016)²² demonstrated that most participants read the package insert (64.8%), while in the present study 55.4% do not. Reading the package insert could minimize the risks, if done carefully, as it contains important information, such as dosage, how to identify signs and symptoms of poisoning and the recommendation for the use of PPE. Veiga et al. (2007)¹⁰, in their essay on contamination by pesticides and PPE, warn that many package inserts and labels do not meet the requirements of the law, with letter sizes that are inadequate for users, and the wording is not easy to understand. The fact that the workers surveyed have a low level of education, which has also been demonstrated in other studies, further worsens the situation for the risk of serious poisoning. Dunck (2015)²⁷ suggests that, in addition to clearer and more precise information in the package inserts, illustrations should be included in order to improve this communication. Lopes and Albuquerque (2018)⁷ emphasize that, currently, Brazil still has public policies that encourage the use and trade of pesticides sustained by institutional policy.

Examples of this are the negligible costs of registering products in the National Health Surveillance Agency (Anvisa) and the exemption, in most states, of the tax on the circulation of goods and services (ICMS). This type of policy, while generating economic growth, poses risks to the environment and human health, mainly to exposed workers. Public policies should be designed in the opposite direction, restricting the use of pesticides, especially the most toxic, and moving towards the search for alternatives to their use.

Most participants are afraid to prepare or apply pesticides. Araújo et al. (2013)²⁸ also identified this fear of applying pesticides. This study, which focuses on working conditions in a group of workers from Teixeiras, MG, besides demonstrating that workers are afraid to apply pesticides, also shows that they recognize the products as poison and that they can be harmful to human health; even so, the vulnerable situation regarding work and production needs puts them at high risk.

Although known and considered important, PPE(s) are not used at any stage of the work. Santana et al. (2016)²², in their study in the city of Picos, PI, identified that 56.8% of workers also did not use PPE. For Silva et al. (2013)²⁹, rural workers do not use PPE due to discomfort during the working day. However, studies such as those by Monquero et al. (2008)³⁰, and by de Menegat and Fontana (2010)³¹ showed that most workers use PPE, with results above 60%. Lack of training was cited by 74.6% of participants. Another worrying factor in this study is that workers continued to use PPE even when they show some damage, compromising the possibility of protection even more²⁰. The reason for this phenomenon seems to be more of an economic or financial nature than of ignorance or denial of risk. The cost of PPE tends to be very significant for low-income workers. It must be considered that the use of PPE is not a reason or guarantee to avoid the contamination of rural workers. Their use can even mask the process by indicating that the worker is protected when using them.

Although almost all participants believe that pesticides are harmful to health, most do not know exactly what a pesticide poisoning is - a fact confirmed by the low percentage of reports of acute and chronic signs of poisoning in the study. Moreira et al. (2002)³², in a study in Nova Friburgo, RJ, found a poisoning rate among rural workers of 47.8%. Marques et al. (2010)³³ in their study at CEASA in Londrina - PR, report that many rural workers believe that poisoning is the one that requires medical help, and that 47% of the participants were intoxicated. Informing this population about the risks and ways to recognize the signs and symptoms resulting from pesticide poisoning is crucial and that is a right (right to know), provided for in Brazilian legislation. This information, besides improving the recognition of early cases, can prevent the progression from chronic cases to irreversible situations and disabling sequelae.

Although workers cite some symptoms of acute intoxication which can suggest respiratory, dermatological and even neurological damage, among others, the recognition is low, just above 20%. Mello and Silva (2013)³⁴ observed that 26.4% of men and 32.7% of women who made up their study had some symptom of acute or subacute intoxication. Lima (2015)³⁵ found a prevalence of poisoning similar to that of the present study in research in the city of Atibaia. Reinforcing findings of this study, Bedor et al. (2009)¹⁸ found in their research reports of symptoms such as headache, weakness, nausea and vomiting. Being not aware of signs of acute intoxication, in addition to exposure to situations of high morbidity and mortality, can lead to the chronicity of the condition and disabling situations for work and poorest quality of life.

It is noteworthy that the recognition and mention of chronic symptoms were very low (22.8% among exposed, and 38.8% among unexposed). Marques et al. (2010)³³ found an index of seeking medical services after symptoms of 62.3% among participants, while, in the present study, 92.1% did not.

Possible explanations for the non-recognition of signs and symptoms can be the lack of information, the similarity with several other clinical conditions, the diversity and intensification of the clinical manifestations themselves, and the lack of technical guidance when purchasing products, although this do not exclude the pressing need for public policies aimed at this population.

According to Levigard and Rozemberg (2004)³⁶, health professionals have little knowledge about the subject. Almost all participants reported that health professionals, when contacted, did not relate their presented signs and symptoms to possible pesticide poisoning. The same authors also warn that many health professionals are unable to make the connection between the health-disease/work process and the signs and symptoms presented by workers, which, in addition to not helping to improve their health conditions, can also generate an increase in sub-notifications. In the present study, 96.8% of the participants reported that the professionals who attended them did not relate the symptoms presented to the pesticide poisoning, even less to the work activity. If the health professional does not recognize the relationship, the diagnosis and the possibility of reducing the damage caused by exposure, both acute and chronic, are even more difficult.

The exposed group showed greater evidence of signs of depression and common psychiatric disorders, indicated by the use of the BDI and GHQ scales. Considering the BDI scale, most workers presented results above 10 points among those exposed; among those not exposed, only 22% had results above this level. In a study carried out with tobacco growing workers, Cargnin et al. (2016)³⁷ found that 20% of the participants had symptoms compatible with mild and moderate depression. Conti et al. (2017, 2018)^{38,39} alert to the possible neuronal impairments that the use of pesticides can cause, increasing the chances of neurological problems and common mental disorders. The authors also state that the use of pesticides and their relationship with neurological and psychiatric diseases needs to be better elucidated in order to ensure greater quality of health for those exposed to it.

In the assessment of CMD, more than half of the participants showed signs of impairment, contrasting with the group of unexposed, where the majority did not show such signs. The study by Faker (2009)⁴⁰ found about 12% of the individuals with CMD. However, in this one, another investigation tool was used. Despite the difference between the tools used, it is difficult to argue that the distinctions are only due to a greater sensitivity of the tool used in this study. The percentage found here is quite different from that of the general Brazilian population and reveals a higher prevalence among rural workers⁴¹. This assumption is a sufficient indicator that more studies should be carried out in the direction of clarifying the possible relationship between exposure and the prevalence of CMD.

The present study had limitations such as the cross-sectional design of the study, the gender differences between the groups of participants (predominantly male among the exposed, and female among the unexposed), and a small sample size, though representative when calculated. However, demonstrating the lack of knowledge regarding pesticide poisoning - both acute and chronic, associated with other factors that alert to greater vulnerability and risk among those exposed workers, make the findings of this study current and relevant. Being vulnerable in itself is a risk; but not knowing when that risk becomes real makes the situation even worse.

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ETHICS COMMITTEE

Research Ethics Committee of the Federal University of Viçosa. Authorization under number: 2,259,914 of 09/05/2017.

AUTHORS' CONTRIBUTION

Silva LS participated in the analysis, interpretation of results, writing and revision of the manuscript. Dias AC participated in the study design, data collection, analysis of the scales used and writing of the manuscript. Cardoso SA participated in writing and revising the manuscript. Pinheiro TMM participated in writing and revising the manuscript. The authors approved the final wording of the article and are responsible for its accuracy and integrity; they also declare that they have no conflicts of interest involved in the research.

CONCLUSION

The results found in this study, such as recognition that pesticides are poison and dangerous to human health, the difficulties in acquiring them with proper guidance on use, the higher prevalence of mental health morbidities (all very important and consistent with the literature available), low education, and especially the difficulty in recognizing the signs and symptoms of acute and chronic poisoning, reinforce the social and occupational vulnerability of workers in the exposed group.

The continuation of this study through a longitudinal design, as well as similar studies in other populations of rural workers, is necessary to better elucidate the findings.

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