

Characterization of psychotropic medication use among tobacco farmers who handle pesticides: a cross-sectional study

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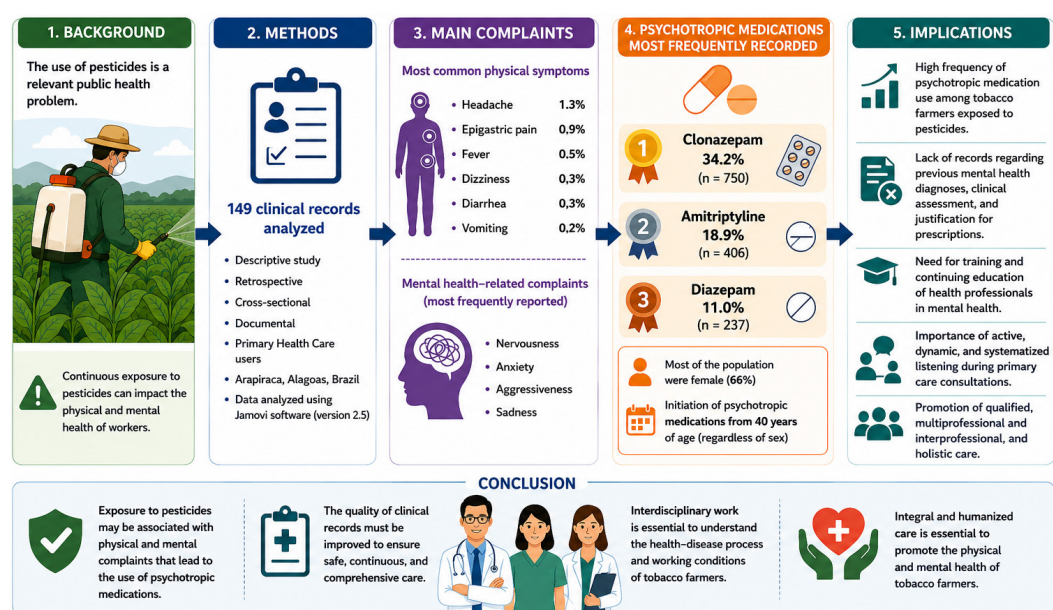
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Graphical Abstract

Highlights

- High frequency of psychotropics among tobacco farmers exposed to pesticides.
- Frequent clinical symptoms included headache and dizziness.
- Mental health complaints involved anxiety, sadness, and aggressiveness.
- Clonazepam, amitriptyline, and diazepam were the most frequently prescribed psychotropics.



Prepared by the authors with the assistance of Google Gemini (illustrative image).

Abstract

The use of pesticides constitutes a relevant public health problem. In this context, the investigation of psychotropic drug use becomes necessary, considering the particularities of the health-disease process and the working conditions that influence the physical and mental health of these workers. The objective of this study was to characterize the psychotropic medications used by tobacco farmers who handle pesticides through a descriptive, retrospective, cross-sectional, and documentary design. Data collection was carried out through clinical records present in 149 medical records of tobacco farmers who were users of Primary Health Care Units in Arapiraca, Alagoas. Analyses were performed using Jamovi software (version 2.5). It was identified that the majority of the population was female (66%) and that, regardless of sex, the onset of psychotropic use began at age 40. The predominant clinical symptomatology was headache (1.3%), epigastric pain (0.9%), fever (0.5%), dizziness (0.3%), diarrhea (0.3%), and vomiting (0.2%). The reported complaints were related to mental health, with higher prevalence of nervousness, aggressiveness, anxiety, and sadness. The psychotropics with the highest frequency of records were Clonazepam (34.2%; n=750), Amitriptyline (18.9%, n=406), and Diazepam (11%; n=237). The results indicated a high frequency of psychotropic use among tobacco farmers who handle and are constantly exposed to pesticides. The absence of records regarding prior diagnoses of mental disorders, clinical assessment, and the presence of psychotropic prescriptions evidenced the need for training of health professionals in the area of mental health and the establishment of an interdisciplinary approach, with dynamic and systematized active listening during consultations at primary health care units, in order to allow qualified and holistic multiprofessional and interprofessional care.

Keywords: Mental Health. Rural Population Health. Pesticides. Psychotropics.

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INTRODUCTION

Tobacco cultivation in Brazil has experienced various challenges over the years. Nevertheless, the country ranks as the second largest producer in the world, occupying the leading position in the tobacco export chain since the 1990s¹. In the health sphere, this position of the Brazilian tobacco industry exposes the vulnerabilities of public policies linked to the production chain, particularly those related to rural producers².

Tobacco cultivation, associated with the direct handling of pesticides, has contributed to the development of poisoning that may be acute, sub-chronic, and/or chronic³. In tobacco farming, the majority of pesticides used belong to the chemical groups of organophosphates, carbamates, and pyrethroids, corresponding to toxicological classes I and II⁴. Some of these groups inhibit enzymes that, consequently, dysregulate the nervous system. The prominent use of pesticides is also associated with greater exposure to these products and, consequently, with deleterious effects on the central nervous system (CNS) and the development of mental disorders⁵.

Exposure to pesticides has left the population even more vulnerable, with a consequent risk of death by suicide, depression, and increased prevalence of common mental disorders (CMDs)⁶. This fact increases the need for therapeutic measures, such as the use of psychotropic drugs. These act on the brain through the modulation of neurotransmitters, altering perception, emotions, and behaviors.

Inappropriate ingestion of these medications can cause serious health damage and lead to physical or psychological dependency. The most commonly used drug classes – given their action on the central nervous system (CNS) for these treatments – are neuroleptics, benzodiazepines, antidepressants, and mood stabilizers⁷.

The use of pesticides in rural settings has been encouraged by government at various levels and positioned as the only alternative for efficient production. Alternatives to these chemicals have been proposed over the years, but with the strengthening of the industry, other pest reduction options have become an approach that is not promoted. For health services, the use of pesticides has become increasingly complex given the illness of rural workers due to the occurrence of poisonings, cancers, and other diseases, which often progress to death⁸. Thus, determining the profile of inappropriate psychotropic use associated with continued handling of chemical products can provide relevant information for public health managers, considering the obstacles faced by health professionals in seeking to resolve this issue.

This work is therefore justified by its focus on the field of collective health and rural workers, seeking to elucidate the frequency of psychotropic drug use among the population engaged in tobacco farming in Arapiraca. Accordingly, the present study aims to identify the psychotropic medications used by tobacco farmers who handle pesticides.

METHODS

Study design

This research was approved by the Research Ethics Committee of the Universidade Federal de Alagoas (UFAL), under opinion number 468.827/2013. This is a documentary, descriptive, retrospective, and cross-sectional study. This study was developed from a subset of the research entitled “Profile of clinical records in medical records of tobacco farmers in Alagoas”, covering the period from 2008 to 2013. The data obtained for this research were derived from the collection of physical medical records of tobacco farming workers registered with and followed up by four Primary Health Care Units of the Unified Health System (SUS) located in the rural area of the municipality of Arapiraca, Alagoas.

Sample, eligibility criteria, and data collection

The sample of this research was non-probabilistic by convenience. Participants’ medical records were selected based on a prior survey of the tobacco-farming population in the covered areas, conducted in partnership with the Community Health Workers Program (PACS) and Primary Health Care Unit teams, which contributed to the location and identification of the medical records of workers eligible for the study.

After identifying tobacco farmers exposed to pesticide handling, records of rural workers aged 18 years or older, users of psychotropic medications, and registered at Primary Health Care Units located in the rural areas studied were included.

Medical records presenting illegible entries, those relating to individuals under 18 years of age, and those related to prenatal follow-up were excluded.

In total, 2,115 entries were tabulated and the extracted data were organized in a Microsoft Excel® spreadsheet to enable descriptive analysis. The researchers involved in the study were previously trained for the appropriate completion of the data collection form. Subsequently, the variables were organized into: identification control number; sex; complaints (PC – primary complaint, SC – secondary complaint, TC – tertiary complaint, and QC – quaternary complaint) and the psychotropics used (P1 – psychotropic 1, P2 – psychotropic 2, P3 –

psychotropic 3, P4 – psychotropic 4).

Statistical analysis

After collection, data were entered and organized in a Microsoft Excel® electronic spreadsheet (Microsoft Corporation, Redmond, WA, USA) and subsequently analyzed using Jamovi® software, version 0.9.5.12. Descriptive statistical analysis was performed, with calculation of absolute and percentage frequencies for categorical variables and measures of central tendency and dispersion for quantitative variables. Results were presented in tables and described in absolute and relative values.

RESULTS

A total of 149 medical records of tobacco farming workers who were psychotropic users were analyzed. A predominance of the female sex was observed, corresponding to 66% of the sample (n=98). The mean age of participants was 63.6 years (SD $\pm$ 17.1), ranging from 41 to 89 years. Regarding age group, a higher frequency of individuals between 40 and 49 years was found (34.9%; n=52), followed by those aged 80 to 89 years (30.9%; n=46). The remaining age groups presented the following frequencies: 50 to 59 years (14.8%; n=22), 70 to 79 years (13.4%; n=20), and 60 to 69 years (6.0%; n=9). Regarding race/ethnicity, records of mixed-race (Brown) individuals predominated (56%; n=79) (Table 1).

Analysis of the primary complaints recorded in the medical records revealed a higher frequency of symptoms suggestive of pesticide poisoning, the most prevalent being: headache (1.3%; n=30), epigastric pain (0.9%; n=20), fever (0.5%; n=10), dizziness (0.3%; n=8), aggressiveness (0.3%; n=7), diarrhea (0.3%; n=6), and vomiting (0.2%; n=5). Regarding manifestations related to mental health, the records of anxiety (0.2%; n=5), sadness (0.1%; n=4), and “nervousness” (0.1%; n=3) stood out (Table 2).

Regarding secondary complaints recorded in the medical records, a higher frequency of symptoms compatible with possible effects of pesticide exposure was observed, among which dizziness (0.1%; n=6), epigastric pain (0.5%; n=5), insomnia (0.1%; n=4), and vomiting (0.1%; n=3) stood out. Among manifestations related to mental health, the most frequent records corresponded to aggressiveness (0.1%; n=2), anxiety (0.1%; n=2), nervousness (0.1%; n=2), tremors (0.1%; n=2), and sadness (n=1) (Table 2).

Regarding tertiary complaints (TC), a higher fre-

quency of symptoms potentially related to pesticide exposure was observed, with headache (0.1%; n=5), epigastric pain (0.1%; n=3), dizziness (0.1%; n=3), and insomnia (0.1%; n=2) standing out. Regarding manifestations related to mental health, the most frequent records corresponded to anxiety (0.1%; n=3), sadness (0.1%; n=2), and fear (0.1%; n=2). Regarding quaternary complaints (QC), the most prevalent manifestations potentially associated with pesticide exposure were headache (0.1%; n=5) and epigastric pain (0.1%; n=2). Among symptoms related to mental health, records of anguish (0.1%; n=2) and sadness (0.1%; n=2) stood out (Table 2).

The classes of psychotropics found in the results of this study were: mood stabilizers, antidepressants, benzodiazepines, and neuroleptics. When analyzing the interrelation among these, the association that occurs in the use of more than one psychotropic per individual was evident. Thus, when analyzing the medications present in all recorded variables P1, P2, and P3, those with the highest percentage of most frequent records were: Amitriptyline (24.9%, n=534) and Clonazepam (47.7%; n=1,038) (Table 3). It should be noted that the absolute values presented correspond to the total number of prescriptions recorded in the medical records during the analyzed period, and a single individual may have had multiple prescription records over the course of follow-up.

In the assessment of psychotropics recorded in the medical records, medications belonging to the classes of benzodiazepines, antidepressants, neuroleptics, and mood stabilizers were identified. For this analysis, the total frequency of prescriptions recorded throughout the workers' follow-up period as described in the medical records was considered.

Among the psychotropics recorded as first choice (P1), a predominance of prescriptions for clonazepam (34.2%; n=750), amitriptyline (18.9%; n=406), and diazepam (11.0%; n=237) was observed. These medications also appeared among the psychotropics recorded as second choice or in

therapeutic combination (P2), although with lower frequencies. Regarding third choice records (P3), a lower frequency of prescriptions was found, with clonazepam (2.1%; n=44), amitriptyline (1.9%; n=40), and chlorpromazine (1.2%; n=29) being the most frequently prescribed medications (Table 3).

Table 1 - Demographic data of tobacco farmers who handle pesticides and use psychotropics, Arapiraca (AL), 2026.

Variable	n (%)
Sex	
Female	98 (66)
Male	51 (34)
Age group	
40-49	52 (34.9)
50-59	22 (14.8)
60-69	9 (6.0)
70-79	20 (13.4)
80-89	46 (30.9)

Table 2 - Distribution of complaints among tobacco farming workers exposed to environments with pesticide handling, Arapiraca (AL), 2026.

Systems	Complaints listed	PC		SC		TC		QC	
		N	%	N	%	N	%	N	%
Nervous system	Aggressiveness	7	0.3	2	0.1	0	0	0	0
	Anxiety	5	0.2	2	0.1	3	0.1	0	0
	Anguish	0	0	0	0	0	0	2	0.1
	Dizziness	2	0	0	0	0	0	0	0
	Difficulty dealing with family conflicts	1	0	0	0	0	0	0	0
	Earache	2	0	1	0	0	0	0	0
	Malaise	2	0	0	0	0	0	0	0
	Drowsiness	4	0.2	4	0.1	2	0.1	0	0
	Fear	0	0	0	0	2	0.1	0	0
	Nervousness	2	0.1	2	0.1	0	0	0	0
	Drowsiness	0	0	1	0	0	0	0	0
	Tremors	1	0	2	0.1	0	0	0	0
	Sadness	4	0.1	1	0	2	0.1	2	0.1
Visual system	Eye pain	3	0.1	1	0	3	0.1	0	0
Cardiovascular system	Palpitations	2	0.1	0	0	0	0	0	0
Respiratory system	Flu	0	0	0	0	0	0	2	0.1
	Sore throat	2	0.0	0	0	0	0	0	0
	Cough	8	0.3	1	0	0	0	1	0
	Rhinorrhea	5	0.2	1	0	0	0	0	0
Digestive system	Heartburn	2	0	0	0	0	0	0	0
	Constipation	8	0	0	0	0	0	0	0
	Diarrhea	6	0.3	0	0	0	0	0	0
	Abdominal pain	11	0.5	1	0	0	0	0	0
	Loss of appetite	1	0	0	0	0	0	1	0
	Nausea	1	0	0	0	0	0	0	0

to be continued...

...continuation - Table 2.

Systems	Complaints listed	PC		SC		TC		QC	
	Motion sickness	1	0	0	0	0	0	0	0
	Obesity	0	0	1	0	0	0	0	0
	Weight loss	1	0	0	0	0	0	0	0
	Vomiting	5	0.1	3	0	0	0	0	0
Musculoskeletal system	Asthenia	3	0.1	0	0	0	0	0	0
	Cramps	0	0	1	0	0	0	0	0
	Numbness in upper limbs	0	0	2	0	0	0	1	0
	Cervical pain	0	0	1	0	0	0	0	0
	Right arm pain	0	0	0	0	1	0	0	0
	Sacral pain	0	0	0	0	1	0	0	0
	Pain in the right big toe	1	0	0	0	0	0	0	0
	Lower limb pain	3	0.1	1	0	0	0	0	0
	Lower back pain	20	0.9	1	0	0	0	0	0
	Cervical pain	0	0	1	0	0	0	0	0
	Right arm pain	0	0	0	0	1	0	0	0
	Sacral pain	0	0	0	0	1	0	0	0
	Spinal pain	7	0.3	0	0	0	0	0	0
	Pain upon wrist flexion	0	0	1	0	0	0	0	0
	Joint pain	12	0.6	0	0	0	0	0	0
	Knee pain	7	0.3	0	0	0	0	0	0
	Shoulder pain	6	0.3	0	0	0	0	0	0
	Neck pain	1	0	0	0	0	0	0	0
	Ankle pain	1	0	0	0	0	0	0	0
	Bone pain	5	0.2	1	0	0	0	0	0
	Neck pain	1	0	0	0	0	0	0	0
	Weakness	4	0.2	0	0	0	0	0	0
	Myalgia	5	0.2	0	0	0	0	0	0
Urinary system	Dysuria	4	0.1	6	0.2	0	0	0	0
	Urinary incontinence	1	0	0	0	0	0	0	0
Circulatory system	Hypertension	1	0	0	0	0	0	0	0
Immunological system	Fever	10	0.5	3	0.1	0	0	0	0
Reproductive system	Vaginal discharge	1	0	0	0	2	0.1	0	0
Skin	Seborrheic eczema	0	0	1	0	0	0	0	0
	Pruritus	7	0.3	1	0	0	0	0	0
	Rhinorrhea	1	0.3	0	0	0	0	0	0
	Hot flashes	1	0	0	0	0	0	0	0
	Skin blemishes	5	0.2	0	0	1	0	0	0
TOTAL		249	100.0	65	100.0	30	100.0	9	100.0

Table 3 - Distribution of psychotropic records found in the medical records of tobacco farming workers exposed to environments involving pesticide handling, Arapiraca (AL), 2026.

Therapeutic Class	Variables	P1		P2		P3	
		N	%	N	%	N	%
Antidepressant	Psychotropics						
	Amitriptyline	406	18.9	88	4.1	40	1.9
	Clomipramine	1	0	5	0.2	0	0
	Venlafaxine hydrochloride	3	0.1	0	0	0	0
	Escitalopram	25	1.2	0	0	0	0
	Fluoxetine	37	1.6	32	1.5	0	0
	Nortriptyline	15	0.7	0	0	0	0
Benzodiazepine	Bromazepam	17	0.8	0	0	0	0
	Clonazepam	750	34.2	244	11.4	44	2.1
	Chlordiazepoxide	26	1.2	0	0	0	0
	Diazepam	237	11.0	35	1.6	0	0
Neuroleptic	Chlorpromazine	41	1.9	35	1.6	29	1.2
	Haloperidol	60	2.7	42	1.9	4	0.2
	Levomepromazine	47	2.2	23	1.1	0	0
	Periciazine	4	0.2	2	0.1	0	0
Antipsychotic	Risperidone	16	0.7	0	0	0	0
Mood Stabilizer	Carbamazepine	123	5.7	68	3.1	0	0
Total		2,040	100	598	100	91	100

Note: An individual may use more than one psychotropic.

DISCUSSION

The higher frequency of psychotropic use observed in this research was among women, which may be related to multiple factors. In the context of tobacco farming, female workers actively participate in different stages of the production process, including activities with potential pesticide exposure⁹. Additionally, the literature demonstrates that women have greater utilization of health services and greater adherence to clinical follow-up, which may contribute to the recognition of mental health demands and, consequently, to a higher frequency of psychotropic prescriptions in this group.

Female participation in tobacco farming occurs at different stages of the production process, encompassing activities ranging from tobacco planting and management to work in tobacco barns, where the stripping of tobacco leaves is performed collectively. In addition to significantly contributing to agricultural production and family income, women frequently accumulate responsibilities related to domestic work and family care. In this context, tobacco farming constitutes an important source of occupation, especially because it requires labor without demanding specific formal qualifications. However, these workers are often subjected to extensive working hours, lower wages than men, and potentially unhealthy working conditions – factors that may negatively impact their physical and men-

tal health¹⁰.

It was observed that a large portion of the complaints recorded in the medical records corresponded to manifestations potentially associated with occupational activities and occupational exposure to pesticides. Additionally, records related to the mental health of tobacco farmers were identified. Although the literature points to possible neuropsychiatric repercussions arising from pesticide exposure, the findings of this study do not allow for inference of a direct association between these variables. Therefore, the development of research with more robust designs is recommended, capable of investigating the magnitude and mechanisms of this relationship, as well as supporting interventions aimed at protecting the physical and mental health of rural workers¹¹. However, evidence from a study conducted with tobacco farmers in southern Brazil demonstrated an association between occupational exposure to pesticides and the occurrence of mental disorders. In this context, the accumulated lifetime duration of exposure to pesticides was identified as one of the main factors related to the onset of these conditions. These findings reinforce the need for further investigations into the possible neuropsychiatric effects of chronic pesticide exposure, especially in populations with intense occupational exposure¹².

In this regard, a cross-sectional study conducted with agricultural workers exposed to pesticides evidenced a frequency of 23% for common mental disorders and 21% for self-reported depression. Additionally, it was found that participants who reported depression had greater occupational exposure to insecticides of the pyrethroid class. Although these findings suggest a possible relationship between pesticide exposure and mental health conditions, additional studies are needed to elucidate the mechanisms involved in this association^{13,14}.

Evidence from a population-based study conducted in South Korea indicates that pesticide exposure may be associated with the occurrence of depressive symptoms. The authors observed a higher frequency of manifestations compatible with depression among individuals subjected to higher levels of pesticide exposure. Additionally, 7.2% (n=61) of participants who reported depression had a history of pesticide exposure. Although such findings suggest a possible relationship between these variables, the complexity of the factors involved in the etiology of depressive disorders requires additional investigations for better understanding of this association¹⁵.

The prevalence of symptoms suggestive of acute poisoning and mental disorders was higher among workers who did not use personal protective equipment (PPE), who had insufficient knowledge about pesticide-related risks, and who had not received training for the safe handling of these products. Among the most frequently reported acute symptoms, headache, mucosal irritation, tachycardia, and manifestations compatible with depressive symptoms stood out. Additionally, workers who performed helper functions presented a greater number of complaints, including headache, dyspnea, wheezing, cough, indigestion, fatigue, and feelings of uselessness. These findings suggest that factors related to working conditions, occupational exposure, and insufficient protective measures may contribute to the worsening of rural workers' physical and mental health¹⁶.

Occupational exposure to pesticides represents an important public health problem, as its effects may impact both the environment and workers' health. Susceptibility to conditions related to these substances is influenced by various factors, among which working conditions, the high toxicity of certain products, limitations in surveillance and inspection activities, and inadequate or insufficient use of personal protective equipment stand out. Thus, the combination of these elements may potentiate the risks of poisoning and illness among

farmers exposed to pesticides¹⁷.

In the present study, a high frequency of psychotropic prescriptions was observed throughout the tobacco farmers' follow-up period, regardless of the presence of complaints recorded in the medical records. This finding may reflect the persistence of conditions related to mental health and the need to maintain pharmacological treatment. Evidence from the literature indicates that common mental disorders among farmers are associated with factors such as occupational pesticide exposure, the occurrence of physical symptoms, and the presence of pre-existing diseases. Additionally, workers with mental disorders present a higher frequency of physical and emotional complaints, suggesting a complex interaction between mental health conditions, somatic symptoms, and factors related to rural work⁶.

These findings corroborate previous discussions that identified a high frequency of physical and emotional symptoms among farmers, including dizziness, dry mouth, headache, eye irritation, nausea, agitation, insomnia, irritability, and difficulty concentrating. Some of these manifestations were also observed in the records analyzed in this study, suggesting that the symptoms reported by tobacco farmers may reflect the interaction among occupational factors, pre-existing clinical conditions, and aspects related to mental health⁶. These findings demonstrate that this is a public health problem for which emergency clinical intervention programs need to be developed¹⁸.

The high frequency of psychotropic prescriptions observed in this study may reflect the complexity of the complaints presented by tobacco farmers, which included symptoms related to both mental health and possible pesticide exposure. However, the documentary nature of the research does not allow for the determination of the origin of these manifestations. Psychotropics occupy a central position in the management of psychological distress and mental disorders. However, the limited production of knowledge regarding access to and use of these medications among rural workers makes it difficult to understand the patterns of use and their determinants. In this regard, characterization of the users' profile becomes essential to guide care strategies and interventions more appropriate to the health demands of this population¹⁹.

In a study conducted with 929 workers in the Bordeaux region of southwestern France between 1997 and 1998, approximately 10% of participants were found to use psychotropics²⁰. Furthermore, 47.5% reported previous use of these medications, while 3.4% of individuals who did not use psycho-

tropics during follow-up reported prior self-initiated consumption. Similarly, a retrospective study assessing psychiatric medication prescriptions among elderly residents in rural and urban areas identified a higher frequency of prescriptions in rural areas, with percentages above 70% for all classes of medications evaluated compared to urban areas²¹. Despite this evidence, studies investigating the profile of psychotropic use in rural populations remain scarce, especially among workers occupationally exposed to pesticides. Therefore, it is necessary to expand investigations directed at this group, in order to understand their illness patterns and support more appropriate care strategies.

In this context, tobacco farmers are subjected to working conditions that may favor the occurrence of health conditions, particularly due to frequent pesticide exposure. Added to this is the possibility of environmental contamination in farming areas, broadening the opportunities for exposure to these substances. Such factors may contribute to the development of physical and psychological manifes-

tations, including symptoms frequently associated with mental disorders.

The limitations of this study are related to the absence and incompleteness of information in the medical records, especially regarding anamnesis, physical examination, clinical diagnoses in mental health, clinical assessment, medication review, and nursing diagnoses. Furthermore, the high frequency of psychotropic prescriptions observed in the records reinforces the importance of continuing education for health professionals and the qualification of care provided to rural workers.

Continuous monitoring of psychotropic use by tobacco farmers becomes essential, as does the adequate recording of diagnoses, prescriptions, and clinical assessments in the medical records. The analysis of the possible relationship between the symptoms presented and occupational exposure must be incorporated into care practice, in order to favor the early identification of conditions and the planning of interventions aimed at protecting rural workers' health.

CONCLUSION

The scarcity of mental health diagnosis records compatible with psychotropic prescriptions, associated with the limited documentation of clinical assessments in the medical records, evidences the need to strengthen the qualification of health professionals for mental health care of this population. In this context, qualified active listening constitutes an essential tool for identifying the health needs of rural

workers and for establishing therapeutic bonds within the scope of Primary Health Care. Furthermore, continuing health education activities play a fundamental role in improving care practices. Thus, it is necessary to implement educational strategies aimed at raising awareness of the risks related to pesticide exposure and handling, contributing to health promotion and the prevention of conditions among tobacco farmers.

CRedit author statement

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All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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