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TOBACCO GROWING VERSUS THE HEALTH OF TOBACCO GROWERS

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ABSTRACT: This study aimed to identify the association between tobacco growing and the health of tobacco growers. This was a cross-sectional study, performed in southern Brazil. Data collection occurred in 2012, through individual interviews at home, and administration of two validated instruments (Beck Depression Inventory and Fargerström Scale). For statistical analysis, the use of Poisson regression for associations was applied. Among the 100 tobacco growers included, 67.0% reported signs and symptoms related to green leaf sickness, 66.7% spinal problems, 25.0% heart disease, 25.0% respiratory disease, and 20.0% symptoms of mild/moderate depression. Among the smokers, 64.7% reported low dependence on nicotine. There was a statistically significant association between health problems and years of tobacco growing ($p=0.001$). Tobacco production compromises the health of tobacco growers in different ways; therefore, preventive and educational health measures directed at tobacco growers are necessary.

DESCRIPTORS: Occupational diseases. Tobacco. Rural workers.

CULTURA DO TABACO VERSUS SAÚDE DOS FUMICULTORES

RESUMO: Estudo com objetivo de identificar a associação entre a cultura de tabaco e a saúde de fumicultores. Estudo transversal, realizado em município do sul do Brasil. A coleta ocorreu em 2012 por inquérito domiciliar, por meio de entrevistas individuais e aplicação de dois instrumentos validados (*Beck Depression Inventory* e Escala de Fargerström). Procedeu-se análise estatística, utilizando-se regressão de Poisson para as associações. Participaram 100 fumicultores, 67,0% relataram sinais e sintomas relacionados à doença da folha verde do tabaco, 66,7% alterações na coluna, 25,0% doenças cardíacas, 25,0% respiratórias e 20,0% sintomas de depressão leve/moderada. Entre os fumantes, 64,7% declararam baixa dependência à nicotina. Houve associação estatisticamente significativa entre problemas de saúde e anos de cultura do tabaco ($p=0,001$). A produção do tabaco compromete a saúde dos fumicultores de diferentes formas. Existe a necessidade de medidas preventivas e educativas em saúde direcionadas aos fumicultores.

DESCRIPTORIOS: Doenças ocupacionais. Tabaco. Trabalhadores rurais.

LA CULTURA DEL TABACO VERSUS LA SALUD DE LOS FUMICULTORES

RESUMEN: Estudio para identificar las asociaciones de cultivo de tabaco y la salud de los fumicultores. Estudio transversal, realizado en una ciudad en el sur de Brasil. Los datos fueron recolectados en 2012 a través de encuesta domiciliaria, entrevistas individuales y dos instrumentos validados (*Inventario de Depresión de Beck* y Escala de Fargerström). Después ocurrido el análisis estadístico, utilizando la regresión de Poisson para las asociaciones. Participaron 100 productores, 67,0% reportaron signos y síntomas relacionados con la hoja verde, 66,7% dolor de espalda, 25,0% la enfermedad cardíaca, 25,0% respiratoria y 20,0% síntomas de la depresión leve/moderada. Entre los fumadores, 64,7% reportaron baja dependencia a la nicotina. Se observó asociación estadísticamente significativa entre los problemas de salud y años de cultivo de tabaco ($p=0,001$). La producción de tabaco compromete la salud de los fumicultores de diferentes maneras, por consiguiente, hay necesidad de adoptar medidas preventivas y educativas de salud dirigidas a fumicultores.

DESCRIPTORIOS: Enfermedades ocupacionales. Tabaco. Trabajadores rurales.

INTRODUCTION

Smoking is related to about six million deaths annually in the world. Among these, 130,000 occur in Brazil. This framework suggests an epidemic, considering that smoking constitutes the leading cause of preventable death in the world.¹

Tobacco use is associated with the development of 50 different types of diseases, especially respiratory and cardiovascular comorbidities, and several types of cancer, especially lung cancer.² In addition to diseases related to consumption, tobacco growers have health complications from pesticide handling during cultivation of tobacco, and/or Green Tobacco Sickness (GTS).³

The actions of pesticides are associated with health diseases of tobacco farmers, may cause acute and chronic intoxication, which present clinically as muscle spasms, convulsions, nausea, fainting, vomiting, diarrhea, and breathing difficulties.⁴

The GTS is characterized as an intoxication resulting from absorption of nicotine through the skin during the handling of tobacco leaves. This poisoning is intensified at the time of harvest, in the early morning hours, when the wet leaves and body sweat facilitate dermal absorption, because they are manually collected and loaded close to the body.^{3,5} The diagnosis is made using the harvesting tobacco history and the presence of signs and symptoms, such as nausea, vomiting, weakness, dizziness, headache, abdominal cramps, chills, blood pressure and heart rate fluctuation.³

Studies show an association between smoking and psychiatric disorders.^{1,2} However, the association between tobacco culture, the health of tobacco growers, and depressive symptoms has not been studied in Brazil. Also, the level of nicotine dependence among smokers who are also tobacco growers is unknown.

Due to the need to identify the living conditions of these workers, in addition to knowing the influence of tobacco on their health and disease process, this study was outlined.

Thus, this research aimed to identify the association between tobacco culture and the health of tobacco growers. The purpose of this research is to contribute by providing a better understanding on the subject and provide support for professionals, so that health actions and care can be proposed for this population.

METHOD

This was a cross-sectional study, conducted in 2012, with tobacco growers in the northwest of Rio Grande do Sul State (RS), Brazil.

The sample size determination, the total number of tobacco growing families in the municipality, was identified by means of the registration performed by the Community Health Workers, with a total of 129 families. Considering a confidence level of 95%, proportion of 50% and error of 0.05, it was determined that 97 growers would be required for the study.

All the tobacco growers were sought for the research; however, some of them were not available at the time of the visits. All participants addressed demonstrated satisfaction in participating in the research, without refusals.

The inclusion criteria were: responsible for the production of tobacco in the family, rural workers and tobacco planters, developing all stages of tobacco cultivation, able to respond to the survey instruments, and agreeing to participate. No exclusion criteria were established.

Data collection was performed by the researcher and six research assistants using home interviews. The research assistants were students in the fourth semester of undergraduate nursing school, who were prepared for this activity.

The survey consists of individual interviews with tobacco growers, which lasted about 40 minutes. During the interview, the participant should respond to an instrument developed by researchers, including demographics, socioeconomic and health. The variables studied were: sex, age, education, color, marital status, family income, size of the property, time cultivating tobacco, personal protective equipment (PPE) use, poisoning by pesticides, diseases, signs and symptoms during tobacco cultivation. In addition, two scales validated in Brazil were administered, the Beck Depression Inventory (BDI) and the Fagerström Scale.

The BDI was used to assess the severity of depressive symptoms. This scale contains 21 self-reported items, with scores ranging from 0 to 63. Scores below 10 represent absence of depression; 10-18, mild depression; 19-29, moderate depression; scores over 30 indicate severe depression.⁶

The Fagerström Scale was used only in smoking tobacco growers, and assesses the nicotine dependence. This scale contains six questions with scores ranging from 0 to 10 points, which when

summed allows for the estimation of the degree of nicotine dependence, as follows: 0-2 points = very low dependence; 3-4 points = low dependence; 5 points = medium dependency; 6-7 points = high dependent; and 8-10 points = very high dependence.⁷

The data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 18.0. The categorical variables were described by absolute and relative frequency, and continuous variables as mean and standard deviation or median and interquartile range, based on whether or not the distribution is similar to normal. The Shapiro-Wilk normality test was performed to verify the distribution of variables. The Mann-Whitney test was used for variables with asymmetric distribution. Variables with no tests of significant abnormality were represented by means and standard deviations (SD) and the Student's t-test was used. Categorical

variables were compared by chi-square or Fisher's exact tests. All associations with $p < 0.05$ were considered statistically significant. The variables with $p < 0.20$ in the bivariate analysis were included in the Poisson regression model. The measure of effect used was the prevalence ratio (PR) with a 95% confidence interval.

The project was approved by the Research Ethics Committee of the Integrated Regional University of High Uruguay and Missions, protocol No. CAAE 0055.0.284.000-11. The tobacco growers signed the Terms of Free and Informed Consent.

RESULTS

The study included 100 tobacco growers, all of them male. The mean age was 46.9 ± 10.8 years, mostly white, married and with children. These characteristics and others are shown in Table 1.

Table 1 - Sample characteristics of tobacco growers. Northwest region-RS, 2012

Characteristics (n=100)	n	%	Mean	Standard-deviation	Median
Sex, male	100	100.0			
Age, years			46.9	10.8	
Color, white	72	72.0			
Marital status, married	90	90.0			
Number of children					3.0
Years of education			6.0	2.5	
Monthly income in Reais (R\$)					1500.00
Tobacco farming's contribution to the family income (%)			45.9	22.4	
Family property size *					12.3
Area for tobacco cultivation *					1.5
Time working as tobacco grower, in years					19.5

*in hectares.

Sixty-seven (67.0%) tobacco growers reported any of the signs or symptoms attributed to GTS, which occurred more frequently during the harvest,

43 (64.2%), and in the preparation of the leaves, 15 (22.4%). Twenty-four (24.0%) reported having some disease (Table 2).

Table 2 - Signs and symptoms during tobacco cultivation, and diseases reported by the tobacco growers. Northwest region-RS, 2012

Variables (n=100)	n(%)
Symptoms attributed to green leaf disease* from tobacco	67(67.0)
Headache	51(51.0)
Weakness	38(38.0)
Dizziness	37(37.0)
Nausea	33(33.0)
Vomiting	29(29.0)
Increased salivation	22(22.0)
Abdominal cramps	19(19.0)
Sadness	18(18.0)

Variables (n=100)	n(%)
Chills	15(15.0)
Changes in blood pressure and heart rate	13(13.0)
Others (allergy and throat irritation)	3(3.0)
Disease	
Yes	24(24.0)
No	54(54.0)
Do not know	22(22.0)
Types of diseases*	
Spinal problems	16(66.7)
Heart diseases	6(25.0)
Respiratory diseases	6(25.0)
High cholesterol	3(12.5)
Gastrointestinal disorders	3(12.5)
Cancer	1(4.2)
Others (bursitis, kidney stones, hernia)	4(16.7)

*Multiple response

Regarding the application of the BDI, the presence of signs of mild depression was identified in 18 (18.0%) participants and moderate depression in two (2.0%). The mean intensity of depression was 6.5 ± 5.2 points.

Among the tobacco growers, 17 (17.0%) were smokers, with a mean age for the onset of tobacco consumption equal to 16.9 ± 4.8 years. A statistically significant association between smoking and lower

education ($p=0.010$) was identified. The median of nicotine addiction, by the Fargeström scale, was 4.0 (2-5.5), ranging from zero to eight, indicating low dependency.

Of the total of 100 tobacco growers interviewed, 97 (97.0%) had applied pesticide products. Among them, 20 (20.0%) showed symptoms of intoxication, and 81 (81.0%) reported using PPE (Table 3).

Table 3 - Pesticide application, symptoms of pesticide intoxication, and use of personal protective equipment by tobacco growers. Northwest region-RS, 2012

Variables (n=100)	n(%)
Symptoms of pesticide intoxication *	20(20.0)
Nausea/vomiting	24(38.7)
Dizziness/ malaise / body aches	16(25.8)
Headache	10(16.1)
Fever/chills	4(6.4)
Diarrhea / abdominal cramps	3(4.8)
Epigastric pain / bitter taste in the mouth	2(3.2)
Skin allergies	2(3.2)
Cough	1(1.6)
Use of personal protective equipment *	81(81.0)
Boots	71(87.7)
Overalls	66(81.5)
Safety gloves	66(81.5)
Face shields	65(80.2)
Visors	19(23.5)
Caps	17(21.0)
Pants	12(14.8)
Goggles	11(13.6)
Shirts	8(9.9)
Apron	4(4.9)
Coats	2(2.5)

* Multiple response

To evaluate the association between variables of the health problem category, 22 (22%) tobacco growers who reported not knowing if they had any disease were excluded, in order to increase the power of the statistical analysis. Statistically

significant association was identified between diseases that tobacco growers reported having, and the time working with the tobacco culture, in years ($p=0.001$) (Table 4).

Table 4 - Association between the variables of interest in the study, and the health of tobacco growers. Northwest region-RS, 2012

Variables*	Health problems		p†
	Yes (n=24)	No (n=54)	
Age	50.8±10.0	45.8±11.4	0.065
Marital status			0.204
Married/companion	22(91.7)	47(87.0)	
Separated /divorced	1(4.2)	0(0)	
Single	1(4.2)	7(13.0)	
Years of education	5(5-7)	5(4-8)	0.899
Family monthly income	1.500(958-2.375)	1.500(750-2.500)	0.602
Tobacco contribution to family income	44.8±22.9	46.3±21.6	0.778
Area (in hectares) intended for tobacco cultivation	1.25(1-1.88)	1.5(1-2.63)	0.075
Time (years) dedicated to tobacco cultivation	20(18.5-22)	15(10-20)	0.001
Signs and symptoms related to tobacco growing			0.279
Yes	18(75.0)	32(59.3)	
No	6(25.0)	22(40.7)	
Beck Depression Inventory			0.469
Scores < 10	18(75)	45(83.3)	
Scores 10 - 18	5(20.8)	8(14.8)	
Scores 19 - 29	1(4.2)	1(1.9)	
Fagerström Scale			0.146
Low	1(33.3)	7(70.0)	
Medium	1(33.3)	0(0)	
High	1(33.3)	3(30.0)	
Intoxication symptoms			0.451
Yes	7(29.2)	10(18.5)	
No	17(70.8)	44(81.5)	
Pesticide application			0.223
Yes	22(91.7)	53(98.1)	
No	2(8.3)	1(1.9)	
Use of personal protective equipment			0.534
Yes	18(75.0)	45(83.3)	
No	6(25.0)	9(16.7)	

* Categorical variables expressed as frequency and percentage; Continuous variables expressed as mean±SD or median (25-75 percentile); † The variables, time dedicated to tobacco growing, area for tobacco cultivation, and years of education were analyzed using the Mann-Whitney test; family monthly income and age were analyzed using Student's t-test; the other variables by the chi-square tests or Fisher's exact when less than five individuals.

In multivariate Poisson regression, factors independently associated with health problems were evaluated. In this analysis, only the time (in years) dedicated to tobacco cultivation variable remained associated, after adjustment ($p=0.001$). It means that for each increase by one year of work in tobacco cultivation, there was an increase of 7.0% (PR=1.07; 95% CI: 1.03 to 1.12) in the prevalence of health problems.

DISCUSSION

This investigation aimed to identify the association between tobacco culture and the health of tobacco growers. The results reveal that the tobacco growers were middle-aged adults, white, and that the practice of tobacco growing has been passed from generation to generation. Other research⁸⁻⁹ performed with tobacco growers showed similar findings.

The number of children is similar to another research conducted with tobacco growers in another Brazilian city, which showed a mean of 2.5 children per couple.¹⁰ The mean years of education is similar to research¹⁰ that found that 73.8% of tobacco growers have complete or incomplete elementary education. Low education contributes to increased risks of pesticide intoxication due to the difficulty in reading, and in the subsequent interpretation of the product label and lower awareness of their risks. In addition, it restricts the acting of this unskilled labor force in the labor market, helping to maintain them in their production units.⁸

The income noted among tobacco growers is similar to other studies^{8,10} performed with tobacco growers in southern Brazil, which found incomes between two and six times the minimum monthly wage. The income of those tobacco growers is low, unlike what are proclaimed by the tobacco industry.

Health problems, defined in this study as having a disease, were also found in tobacco growers from another city in RS,⁹ where 19.2% reported having some health problem. The spinal problems ranged from 22.1% to 49.0%, which may be related to the physical strength that activity of tobacco production requires.

In analyzing the working conditions and health impacts associated with tobacco cultivation, it was evident that among the prejudicial effects of tobacco, musculoskeletal injuries, respiratory disorders, GTS, and mental diseases stand out.¹¹ These results reveal the need for further intervention in this population's risk factors, especially among the most disadvantaged, due to the conditions of life and work, to which they have often been subjected.¹²

Among migrants from Latin America and the West Indies, some situations may cause consequences for the physical and emotional well-being of workers, such as intense heat, exposure to chemicals, poor sanitary conditions, boredom, loneliness and poor housing conditions.¹³ In this sense, the intensity of depressive symptoms is a particular concern among tobacco growers, as they may be subject to similar conditions, combined with the fact that at no point have they declared themselves depressed, reported professional monitoring, or used medication for depression.

Research¹⁴ with tobacco growers has shown increased risk of neurobehavioral changes associated with the use of pesticides, which are able to develop into cases of depression and suicide. In tobacco growers who migrated to the United States, depressive symptoms were noted during the four

months of the agricultural season.¹⁵ Furthermore, the pattern of work, inadequate living conditions, and concerns with documentation preceded the depressive symptoms.¹⁵

Suicide rates in 558 micro-regions of Brazil were analyzed over a period of 15 years.¹⁶ The results reinforced the hypothesis that the use of pesticides increased suicide rates, and these rates were highest among people aged 35-64 years.¹⁶ These data reinforce the need for tobacco growers to use PPE, and to receive specific monitoring from the health team in order to prevent and/or treat depression.

Signs and symptoms such as headache, weakness, dizziness and nausea, presented during tobacco growing are compatible with GTS, but it is also confused with characteristics of pesticide intoxication. The major events (nausea, vomiting, diarrhea, dizziness, headache and dermatitis) identified by the health center, occurred from October to January, precisely the period of time that coincides with the tobacco harvest.⁹ Symptoms related to GTS are common and non-specific, and may also be related to pesticide exposure.

Nicotine concentrations in the air in different working environments of tobacco growers suggest that GTS can result from exposure of the respiratory system and the skin to nicotine,¹⁵ which is the reason why nicotine concentrations must be measured, with the intention of preventing GTS. Furthermore, research is recommended to investigate the major route of nicotine absorption and what types of PPE are required for effective protection.⁵ The concentration of nicotine levels found were very high, which has also been confirmed.²¹

In 46 subjects with signs and symptoms of GTS, the level of urinary cotinine was tested to detect the dermal absorption of nicotine, and in 33 cases it was confirmed.²² In another study, the factors associated with the development of GTS in male tobacco growers were: non-smokers or smoking up to nine cigarettes a day, hanging tobacco sticks in the barn, collecting wet tobacco leaves, and participating in physical effort. Among women, the risk factors were: binding tobacco by hand, transporting bales, performing the harvest of wet leaves, maintaining contact with pesticides, and participating in physical effort.¹⁹

One international study²⁰ also confirmed the appearance of GTS in tobacco growers from various locations, such as eastern North Carolina, Florida, Kentucky, Tennessee and Connecticut (USA); Poland; Japan; India; and, Italy. The signs and symptoms most frequently reported were headache,

dizziness, nausea, vomiting, itchiness, and skin rash.

Occupational health risks to which tobacco growers are exposed are worrying, because although they claim to use PPE, many do not follow recommendations. The proper use of PPEs includes all protective clothing that helps in reducing the amount of absorbed nicotine, and thus reduces the risk of the onset of signs and symptoms of GTS, as well as the risk of pesticide intoxication.

The results of this research show that the use of individual protective measures is not occurring, as there is a lack of monitoring and reporting of suspected cases of the disease to the information systems, which could assist in determining the magnitude of the problem. The justification for the non-use of PPE involves the high cost of equipment,⁹ the complaint that it is very hot, or not suitable to the tropical climate, and the discomfort caused by clothes.⁸ The studied tobacco growers presented signs of illness and intoxication, facts that could be reduced with the use of PPE. It should be a reflection on the appropriateness of such equipment for it to be used properly, fully and in its entirety.

The higher the educational level, the greater the chance of an individual using the PPE, and the lower the risk of pesticide exposure.²¹ Furthermore, this variable was significantly associated with tobacco growers who were also smokers, which is consistent with results previously seen,²² that also indicated that individuals with lower educational levels are five times more likely to become smokers.

National and international studies indicate that rural residence and tobacco growing are risk factors for smoking.²²⁻²³ The prevalence of smoking among tobacco growers was higher than the national average for the adult population, which is 12.1%,²⁴ but lower than the rural area, which is equal to 20.4%.²³ It is believed that the fact that tobacco growers have tobacco available, surrounding his home, favors consumption and compromises cessation.

The main challenge for individuals seeking treatment for smoking cessation is nicotine addiction, which hinders success due to the withdrawal syndrome.²⁵ However, the results of this research showed a low median level of nicotine dependence on the Fargeström Scale. In this sense, health professionals must develop actions to promote smoking cessation, focusing on the motivation to stop, the profile of the tobacco grower, and the degree of dependence.

It was found that for each one year increase of work with tobacco cultivation, the prevalence of

health problems increases by 7.0%. This data highlights the seriousness of the problem, as the tobacco growers are exposed to considerable occupational hazards, such as physical exertion, exposure to pesticides, contact with the green leaves, and use of and/or exposure to tobacco. For nurses, it is suggested to intervene with educational and preventive interventions of consumption and worker protection, allowing the reduction of risk behaviors to which they are exposed.

An Iranian study²⁶ showed that tobacco growers are aware of the prejudicial effects of tobacco, and agree with the implementation of governmental measures for its control, however, they expressed concern with the costs of daily living. Therefore, government support is necessary for health care, making the working conditions safer for tobacco growers. The results of this study are in line with the literature, and show that tobacco growers need more support and guidance to be able to adequately care for their health during tobacco cultivation.

CONCLUSIONS

It was found that tobacco growers were young, married, with lower education levels and income, who worked for more than ten years in tobacco farming. The prevalence of smoking was 17.0%, with low nicotine dependence.

Tobacco farming is associated with health problems, such as the presence of signs and symptoms associated with GTS, and exposure to pesticide intoxication. Furthermore, the workers showed spinal problems, which can be related to the physical effort required, particularly during the tobacco harvest. The presence of signs and symptoms of mild depression was observed in 18.0% of tobacco growers. The results also show that the greater the time of exposure to tobacco cultivation, the greater the risk of becoming ill.

Health education actions covering prevention of occupational diseases must be developed by nursing professionals, together with the multidisciplinary team, and supported by the Worker's Health Reference Centers. The correct use of PPE and health control through conducting periodic examinations are important and must be implemented.

One limitation of this study was the fact that the health situation was self-reported by tobacco growers, rather than clinically evaluated by a health professional, which may underestimate or overestimate the results. However, the knowledge produced has relevance to the development of educational

intervention programs in health, and effective public policies in the area of family farming, in order to contribute to the welfare of tobacco growers and therefore improve their level of health.

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