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Socioeconomic characteristics and hearing health profile of rural workers in the northeastern semiarid region of Brazil

Características socioeconômicas e perfil de saúde auditiva de trabalhadores rurais do semiárido nordestino

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ABSTRACT

Purpose: Analyze the socioeconomic characteristics and the hearing health profile of rural workers in the semiarid Northeast. **Methods:** This is a descriptive cross-sectional quantitative study conducted with 88 individuals of both sexes who performed activities in rural areas for at least one year. The first stage of the study corresponded to the application of questionnaires regarding the socioeconomic and health profile, the second stage consisted of the audiological assessment of rural workers. **Results:** A significant difference was observed between individuals with normal results and hearing loss in audiometry according to gender, age group, working hours and hearing impairment. In addition, a positive correlation was observed between the values of the audiometry and the age of the patients, in all frequencies analyzed, but mainly in the higher frequencies. **Conclusion:** The present study established the audiometric and socioeconomic profile of rural workers and demonstrated that the characteristics inherent to working in the field can negatively affect hearing health. It is important to know the reality of this population from the perspective of guaranteeing not only the situational diagnosis, but also measures to promote, protect and prevent hearing health among agricultural workers.

Keywords: Farmers; Audiology; Audiometry; Health promotion; Rural health

RESUMO

Objetivo: Analisar as características socioeconômicas e o perfil de saúde auditiva de trabalhadores rurais do semiárido nordestino. **Métodos:** Trata-se de um estudo quantitativo transversal descritivo, realizado com 88 indivíduos de ambos os gêneros, que executavam atividades em meio rural há, pelo menos, um ano. A primeira etapa do estudo correspondeu à aplicação de questionários a respeito do perfil socioeconômico e de saúde; a segunda etapa consistiu na avaliação audiológica dos trabalhadores rurais. **Resultados:** Observou-se diferença significativa entre os indivíduos com resultado normal e perda auditiva na audiometria, de acordo com o gênero, faixa etária, jornada de trabalho e dificuldade auditiva. Além disso, verificou-se correlação positiva entre os valores das audiometrias e a idade dos pacientes, em todas as frequências analisadas, principalmente nas mais agudas. **Conclusão:** As características inerentes ao trabalho no campo podem afetar negativamente a saúde auditiva. É importante conhecer a realidade da população rural, na perspectiva de garantir não só o diagnóstico situacional, mas também medidas de promoção, proteção e prevenção referentes à saúde auditiva desses trabalhadores.

Palavras-chave: Agricultores; Audiologia; Audiometria; Promoção da saúde; Saúde da população rural

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INTRODUCTION

Brazil has clear economic contrasts and the presence of different stages of agricultural work regarding the use of technology, management, and the organization of productive activities. As for the health of the rural population, in many regions, there are still real 'agricultural ghettos', totally unassisted by public policies towards the welfare of this population[1].

Traditional epidemiological or social indicators are not enough to comprise the situation and the needs of the rural population. Health problems with this worker, revealed in epidemiological data, are not so numerous as those of urban workers, but they possess their specificities, such as intoxication by agrochemicals and injuries caused by more precarious labor conditions[2]. Farmers are exposed to several types of agents harmful to health, including the noise and vibration of agricultural machinery, agrochemicals, and excessive solar radiation. These harmful agents are considered, either alone or together, as the causes of diseases correlated with the health of the rural worker[3,4].

Regarding specifically hearing health, the association of hearing loss by continuous noise exposure is already accepted as synonym of work-related hearing loss[5]. Despite the danger, millions of workers in the whole world are exposed to the most diverse noise levels, which increase the risk of hearing disorders. In countries where law enforcement is more rigid and monitored, there are hearing loss prevention programs associated with reducing the prevalence of these conditions among workers[6]. However, the high rate of noise-induced hearing loss, still detected, casts doubts on their effectiveness nowadays. Given this reality, the rural worker experiences greater exposure, which could be avoided with protection equipment[7].

Besides the noise, several other aspects present risks for the development of hearing loss in these professionals. In the environment of the subsistence agricultural activity, the synergistic effect between noise exposure and toxic agents can potentiate hearing loss[8,9]. Isolated or together, the use of agrochemicals in rural activity is another significant risk factor to the farmer, with great repercussions on the integrality of his health. This population of workers is vulnerable to exposure and intoxication by pesticides due to the degree of toxicity and the improper use of these substances, or even by not using protective equipment and unprepared health services[4].

The indiscriminate use of toxic agents makes rural workers more susceptible to neurological diseases, intoxications, and hearing disorders. Hearing loss may represent an early sign of intoxication by agrochemicals[3]. It is usually presented as an irreversible bilateral symmetrical sensorineural hearing loss, selective at high frequencies (3K to 6K Hz), with injury concentrating on the basal turn of the cochlea, especially in cochlear hair cells[10]. These high frequencies are located at 5 to 10 millimeters from the oval window and present greater vulnerability, which may be associated to the resonance characteristics of the external and middle ear, to the mechanical characteristics of the cochlea, and also to its blood supply, thus configuring a change of the cochlear function[10,11].

This situation aggravates especially in the North and Northeast regions of Brazil, which are historically affected by structural problems related to the sustainability of food production systems, maintenance of landowning structures, counterproductive climatic effects, and deficient systems of technical and educational assistance[12].

In the Northeastern semiarid region, rural communities face difficulties and challenges that involve political, social, environmental, economic, and technological questions[12], from the rural exodus to the lack of production financing, from the precarious and expensive outflow structure of agricultural products to the feasibility of family farming. Water rationing or shortage, associated with precarious basic sanitation facilities, agrochemicals, and the lack of personal protective equipment in agricultural activities are some of the conditions that favor the occurrence of work accidents and illness in this population[13,14].

Given the many associations of risk factors that can impact the quality of life and socioeconomic condition of the rural community, the general aim of this study was to analyze the socioeconomic characteristics and the hearing health profile of rural workers in the semiarid Northeast region of Brazil.

Therefore, we aimed to associate the audiometric profile with the rural context in order to evaluate the hearing health of this community. The scenario is of great complexity and increasingly demands from health professionals the interdisciplinary comprehension of the theme and the proposition of positive, participative, collaborative actions given the need to seek advances and compliance with the hearing health policy in our country.

METHODS

This is a descriptive, cross-sectional, quantitative study performed in a rural community in the municipality of Paulo Afonso/Bahia. The study was subjected and approved by the Ethics and Research Committee of the Federal University of São Francisco Valley, under the protocol number CAAE: 78693917.5.0000.5196.

The target population consisted of farmers from an irrigation project directed towards small and medium rural producers to cultivate fruit, vegetables, and forage. The workers who participated in the study were subjected to social dimensions correlated to those found in several regions of our country, such as the lack of structure and stimulation to sustainable practices in agricultural production, the precariousness of basic sanitation, indiscriminate use of pesticide agents, lack of personal protective equipment, maintenance of monoculture, and little stimulation to the technical development of cultivation practices.

The farmers were invited to participate spontaneously in this study through an in loco visit to the rural community and verbal explanation of the purposes of this research. To those that voluntarily accepted to participate in this study, the Free and Informed Consent Form (TCLE) was presented for their reading and signature.

Individuals from both genders were included in the study, aged 18 to 60, and performed activities in a rural environment for at least a year. Were excluded from this study all those who performed no rural work activity, who had a neoplastic disease in the peripheral auditory system, individuals with alterations in the external and middle ear e/or some ontological complaint, analyzed by audiological evaluation.

All workers served, including those excluded from the study, were instructed on hearing health care and health risks related to the agricultural activity.

The first stage of this study corresponded to applying a questionnaire that allowed generating data on the socioeconomic and health profile of the rural workers, occupational and non-occupational exposure factors to hearing loss. Semi-structured interviews were performed to subsidize the socioeconomic

analysis, and in the same questionnaire, some fields allowed identifying possible hearing loss risks. The interviews were performed with the farmers in their properties to get closer to the reality experienced by them.

The second stage of the study consisted of audiological evaluation, which allowed establishing the audiometric profile of the rural workers in the community. The farmers passed by audiological evaluation through pure tone audiometry, performed in a descending configuration. For the confirmation of the thresholds, the evaluation was performed in an ascending configuration, at the frequencies of 0.25, 0.5, 1, 2, 3, 4, 6, and 8 kHz.

The hearing tests were performed in a quiet environment in a room provided spontaneously at the headquarters of the local farmers association. The tests were invariably performed at the weekends to respect a minimum acoustic rest of 14 hours for the workers. The tests were conducted in a double-walled audiometric booth with dimensions of 1.80 × 0.90 × 0.90 m, meeting the standards recommended for ambient sound pressure levels. An AVS 500 audiometer (Vibrasom, Brazil) was used along with TDH 39 earphones, both calibrated before the audiological evaluations.

The tone audiometry evaluation is considered as a normality criterion, the mean frequency values lower than 25 decibels hearing level (dB HL), according to the standards established by the World Health Organization (OMS)[15]. An audiologist professional performed all audiological tests with no previous access to the data from the questionnaires or patient identification.

The patients with hearing loss in their audiometry results were sent to the otolaryngologist, free of charge.

According to the characteristics of the studied population, the Chi-square test ($\chi 2$) was used with a 5% significance level to compare the results of hearing loss prevalence. According to the audiometry results, the t-Student test was used to verify the existence of differences between the mean age values of the workers. Pearson's correlation test was used for the analysis of the correlations. The value of $P<0.05$ was considered statistically significant.

RESULTS

88 rural workers were interviewed, of which most were male, with age from 30 and 49 years, and incomplete primary education. About 18% of the interviewees were not literate, and none of them had higher education. The monthly family income analysis showed that more than half of the workers (59%) received less than 1 minimum wage and most worked eight or more hours a day (Table 1).

Most interviewees reported no chronic disease, and among those that presented associated comorbidities, systemic arterial hypertension was prevalent. Furthermore, approximately 15% of the farmers reported feeling earache and about 65% presented some hearing impairment (Table 2).

Regarding the use of agrochemicals, more than half of the workers (56.82%) affirmed to use these products in their labor activities. Of these, most informed that they were not instructed regarding the proper handling of chemical products (39.77%) and the proper hygiene procedures after using these products (47.73%). Most workers reported storing the products in an isolated location on the property, called "poison house" (40.91%). However, some of them affirmed to keep these products within

Table 1. Socioeconomic characteristics of the rural workers

Socioeconomic Variables	n Frequencies (%)[1]
Gender	
Male	56 (63.64)
Female	32 (36.36)
Age	
18 to 29 years	34 (38.64)
30 to 49 years	39 (44.32)
50 years or more	15 (17.05)
Education level	
Complete primary education	17 (19.32)
Incomplete primary education	32 (36.36)
Complete secondary education	12 (13.64)
Incomplete secondary education	11 (12.50)
Illiterate	16 (18.18)
Monthly family income	
Lower than 1 minimum wage	52 (59.09)
1 minimum wage	22 (25.00)
From 1 to 2 wages	11 (12.50)
From 2 to 3 wages	2 (2.27)
From 3 to 4 wages	1 (1.14)
Workday	
4 hours	13 (14.77)
5 hours	4 (4.55)
6 hours	7 (7.95)
8 hours	39 (44.32)
10 or more hours	10 (11.36)
Not informed	15 (17.05)
Easy access to health services	
Yes	43 (48.86)
No	45 (51.14)
Total	88 (100.00)

[1]Absolute and relative frequency
Subtitle: n = number of interviewees; (%) = percentage

Table 2. Aspects of the general and hearing health of farmers

Variables related to the health profile	n Frequencies (%)[1]
Associated comorbidities	
Systemic arterial hypertension	19 (21.59)
Systemic arterial hypertension+ diabetes	3 (3.41)
Other	2 (2.27)
None	62 (70.45)
No information	2 (2.27)
Continuous drug use	
No	45 (51.14)
Yes	18 (20.45)
No information	25 (28.41)
Earache	
Yes	14 (15.91)
No	74 (84.09)
Hearing impairment	
Yes	31 (35.23)
No	57 (64.77)
Perception of fluid coming out of the ear	
Yes	10 (11.36)
No	78 (88.64)
Ear surgery	
Yes	1 (1.14)
No	87 (98.86)
Total	88 (100.00)

[1]Relative and absolute frequency
Subtitle: n = number of interviewees; (%) = percentage

their own house (7.95%), in the open air, within the property (6.82%), or in the backyard of the property (1.14%). Most workers reported discarding the agrochemical containers through a specific company for this purpose (37.50%).

Of the study participants, 57 individuals underwent audiometry and remained in the study after filling the inclusion criteria. Of these, 43 (75.44%) presented average audiometry results. On the other hand, 14 participants (24.56%) presented hearing loss in the audiological evaluation: 9 with bilateral (15.79%) and 5 with unilateral hearing loss (8.77%).

When correlated the audiometric results with the general characteristics of health, sociodemographic, and working conditions of the farmers, a significant difference could be seen between the individuals with normal and with hearing loss results, according to the gender, age range, workday, and hearing impairment (P<0.05). Remarkably, there was no statistical difference between the percentages of the audiometry results and the use of agrochemicals (Table 3).

The analysis of the hearing loss prevalence verified was five times higher in men compared to women (P=0.006). Participants with 8 or more work hours presented a hearing loss prevalence of 2.82 times higher than those with less than 8 daily hours of work (P<0.05). Regarding the age range, the age above 35 years was 5 times more associated with hearing loss prevalence (P=0.006), approximately. At last, hearing loss prevalence was 2.66 times higher in workers who reported some hearing impairment (P=0.03).

When evaluating the collective audiometry profile of workers, it was possible to depict the peripheral auditory system of these individuals. Concerning the averages of the researched decibels, a detailed audiometric profile was reached, based on the average of the distribution values of the hearing thresholds (250 to 8000 Hz) in the right and left ears (Figure 1).

In this study, the correlation analysis of the audiometry values based on the age of patients demonstrated, at all analyzed frequencies, and for both ears, a statistical correlation with age, that is, there was a worsening of hearing with the increase of age. This correlation was significantly stronger at the highest frequencies (Figure 2).

Table 3. Association between the audiometry results and clinical, sociodemographic, and work characteristics of the farmers

Variables	n Normal (%)[1]	n Hearing Loss (%)[1]	P-value
Gender			
Male	19 (61.29)	12 (38.71)	0.007*
Female	24 (92.31)	2 (7.69)	
Age range			
18 to 29 years	22 (95.65)	1 (4.35)	0.004*
30 to 49 years	16 (69.57)	7 (30.43)	
50 years or more	5 (45.45)	6 (54.55)	
Workday			
Less than 8 hours	17 (85.00)	3 (15.00)	0.046*
8 or more hours	15 (57.69)	11 (42.31)	
Use of agrochemicals			
Yes	17 (65.38)	9 (34.62)	0.122
No	25(83.33)	5 (16.67)	
Hearing impairment			
No	32 (84.21)	6 (15.79)	0.003*
Yes	11 (57.89)	8 (42.11)	

Student's t-test; *Significant values (P<0.05); [1]Relative and absolute frequency
Subtitle: n = number of interviewees; (%) = percentage

DISCUSSION

Nowadays, hearing loss is the most common sensory impairment and a public health problem in the world. When analyzing the hearing loss prevalence rates in the Brazilian population, not much data is found. Likewise, there is a limitation in the international scientific literature regarding epidemiological studies on hearing disorders for the rural population[16].

Given the analysis of hearing loss prevalence rates from epidemiological inquiries, that is, which did not use audiometric evaluation, it is seen that, in 2010, the Brazilian population presented a hearing loss percentage of 5.1%, being 4.9% for women and 5.3% for men[17].

Greater review research, using prevalence data from 42 studies published from 1973 to 2010, in 29 countries, indicated that the global hearing loss, estimated by audiometry, was of 1.4% for children from 5 to 14 years, 9.8% for women older than 15 years, and 12.2% for men older than 15 years. This same study reported great difficulty finding data on hearing loss prevalence in scientific literature, especially in developing countries[16].

These values found in the literature are below those found in the population of rural workers from the present study, in which 24.56% presented hearing loss. Furthermore, differences were observed between individuals with normal and hearing loss results, according to the gender, age range, workday, and hearing impairment (P<0.05).

By considering the variables of gender and age range (P<0.007 and P<0.004), respectively, this association has already been verified by some authors[18]. It has also been reported that hearing loss was positively related to age, gender, and regions of low and average income[16]. In the present study, hearing loss prevalence was five times higher in man, compared to women. Regarding the age range, the age above 35 years was associated with a higher hearing loss prevalence.

The findings of the present study confirm the data from the literature since it has already been described that hearing loss prevalence is related to age and that men are more affected than women, regardless of the age range[6,19]. A possible explanation for the susceptibility to gender-related hearing problems can be attributed to the protective nature of estrogens. One of the main effects of the estrogens in the central nervous system is the protection against cellular death, either by itself or interacting with neurotrophins or neurotransmitters[19].

The association of hearing loss with gender can also be highlighted as a function of the cultural predominance of the male gender within rural work in Brazil. The man is historically responsible for the management of agricultural products, machinery, and often acts in the keeping and application of agrochemicals, usually through backpack sprayers, which may cause even higher exposure to these several risk factors and, consequently, to greater health vulnerability[4].

It is well described that the aging process is associated with hearing loss (presbycusis), although it is more expected in individuals above 60 years[20]. In this study, the mean age of rural workers with hearing loss was 45.5 years. Therefore, hearing loss can be associated with other possible causes, such as the working activity developed by this community. It was also observed that the correlation between hearing impairment and age increase was stronger at higher frequencies, probably because ototoxic agents compromise high frequencies earlier than low frequencies[11].

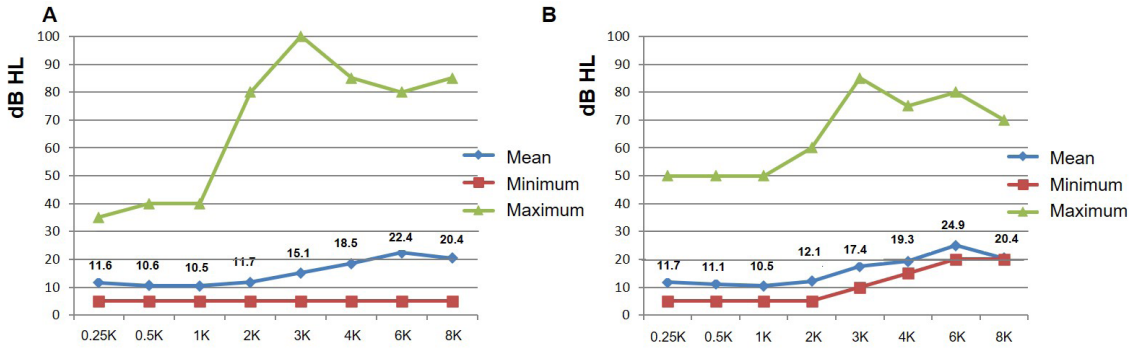

Figure 1. Mean, minimum and maximum values of the audiometry of the right (A) and left (B) ears of rural workers
Subtitle: dB HL = decibel hearing level; K = kilohertz (1000 Hertz)

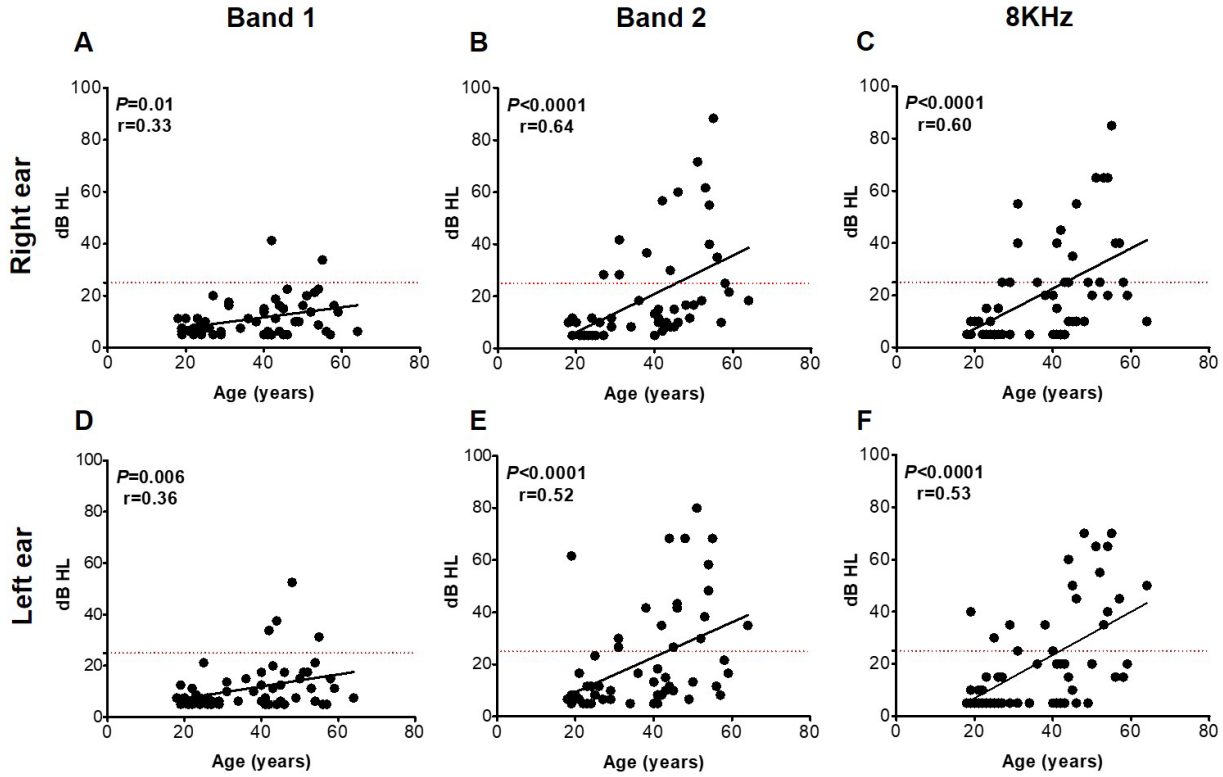

Figure 2. Correlation of the audiometry frequencies of the right (A-C) and left ears (D-F) with the age of rural workers
The "x" axis represents the age of the patients in years and the "y" axis represents the scale in decibels hearing level (dB HL). The low frequency band (Band 1) was calculated as the arithmetic mean of the hearing threshold at 0.25, 0.5, 1 and 2 kHz and the high frequency band (Band 2) was calculated as the arithmetic mean of the hearing threshold at 3, 4 and 6 kHz. The red dashed line indicates the cutoff point for hearing loss (25 dB HL). For statistical analysis, Spearman's correlation test was used

In the present study, all frequency means were lower than 25 dB HL, for both ears, which configures a description of non-hearing impairment to the audiometric profile of the rural community, according to the OMS classification of degrees of hearing impairment[15]. It is worth noting that, in the audiometry evaluations, the maximum values obtained were 100 and 80 dB HL for the right year and 85 and 80 dB HL for the left year, at the frequencies of 3 and 6 kHz, respectively. The decrease in the hearing thresholds at the described frequencies characterizes the existence of an audiometric notch (*v-notched*), which, even when present at a single frequency, can be characterized is an alert signal since it suggests a trend towards hearing loss in the future. Furthermore, it is common for hearing impairment caused by agrochemicals to be characterized by sensorineural hearing loss, with the frequencies from 3 to 6 kHz being the most affected in the audiometry examination[10,21].

Other studies evaluated the hearing health of the rural producer and revealed the presence of noise-induced hearing loss, something very common within this population that handles several types of machinery in their labor environment, being regularly exposed to noise. These studies concluded that, besides the noise itself, the vibration of the machinery used, the carbon monoxide released by the engines, and the use of pesticides are factors that also contribute significantly to the worsening of hearing losses. Consequently, the rural worker is subject to several conditions that are harmful to his health in an integral way, in addition to his hearing health[5].

In a study performed in Sweden, the authors verified an increase in the prevalence of hearing problems the older the population is and noted higher rates of these impairments among men and low-income people. The authors went further when they stated that few studies in the world scientific literature analyze the relationship between hearing problems and socioeconomic status[19]. In another study performed in China, it was evident that the lower economic status, manifested in the type of work and education level, was associated with a higher risk of hearing loss, both in urban and rural areas[22].

In this study, it was observed that about 80% of interviewees declared to live with up to one minimum wage. Furthermore, most were illiterate or had only incomplete primary education. Although not evidencing the association of hearing problems with the socioeconomic status, the analysis of the economic and social profiles provided important reflections regarding the lifestyle of these workers, given the description, in the literature, of the relationship between the degree of information, education, and awareness about occupational risks[4,23]. Therefore, as referred to in the present study, a low education level can impact the obtainment of information on the exposure risks to agrochemicals and contribute to a possible intoxication of this population.

These data reveal the low socioeconomic level of rural workers and expose the daily reality lived by so many rural communities in the Northeast and Brazil, resulting from the lack of adequate public policies and labor and health assistance[12]. Thus, the scenario observed shows the gradual deterioration of social welfare along with the damage to hearing health, which may result in the aggravation of the overall health of the farmer[24].

In view of this reality, it is verified that the population of rural workers is subjected to several health impairments, which are summed to the difficulties related to work. It has already been described that hearing problems are often associated with various forms of comorbidities, such as psychiatric diseases, diabetes, and cardiovascular diseases[2]. In this study, variables such as chronic diseases and continuous drug use presented no statistical relationship with hearing problems.

When analyzing the workday, it was seen that workers with eight or more daily hours of work presented a 2.82 times higher prevalence of hearing loss than workers with shorter working hours. This association can be interpreted as a positive correlation, that is, the longer the daily exposure time to work-related risk factors (pesticides, chemical products, noises, and vibrations), the higher the probability of the appearance of hearing problems.

Data are scarce in the literature regarding the workday association with hearing loss, such as related in the present study. Most studies relate hearing loss with the exposure time to certain risk factors, that is, the time accumulated in years[25].

In the context of the small producer, it has been demonstrated, for example, that the amount of time driving tractors in the field was significantly associated with hearing loss, or even that the noise level during the use of a simple manual weeder can exceed 100 dBA[26]. Thus, in isolation, the noise already represents a risk to health when the sound level is above 85 dBA[27], depending on the duration and the systematic exposure to it. This risk is increased when exposed along with chemical agents, such as agrochemicals[9,10]. Considering all these aspects, this study highlighted the importance of taking into account the workday as a factor related to the impact on the hearing quality of rural workers.

Another variable associated with the audiological evaluation was hearing impairment, mentioned by the farmers in the questionnaires. Of the 14 workers who mentioned hearing loss, 42.11% complained of hearing difficulties. After audiometry, it was observed that the prevalence of hearing loss was 2.66 times higher among workers who reported hearing difficulties in the interviews. This association confirms what Lacerda et al.[5] found in the assessment of the audiometric profile of forest workers exposed to noise, in which they significantly linked the altered audiological assessments with hearing impairment complaints.

Regarding the use of agrochemicals, despite the numerous studies in the literature that relate hearing problems to the use of pesticides[6,9,10], there was no difference between the audiometry results in this study (P=0.12). However, it was verified that, even with the high use frequency of these products, many farmers still felt reluctant to talk openly about the use of pesticides, perhaps for fear or even ignorance about the products, which may have underestimated the data regarding their use. This phenomenon is related to the personal estimation of the consequences of a specific harmful event and the feeling of control (or being in control) and can be defined as risk perception. Thus, there is no way to conceive a risk assessment disconnected from the beliefs, interpretations, and reactions of the subjects involved[28].

Other studies have reported the same impression and difficulty in collecting data on the use of agrochemicals since there is a gap between the details of the products actually used and the denial of their use by farmers. This difficulty encountered was attributed to extensionist actions – said to be educational – from the past, which attributed names (such as plant poison) to pesticides, which last until the present day[3,9].

Still regarding the use of these products, out of the workers who performed audiometry and reported using pesticides, 34.62% had hearing loss. On the other hand, among the workers who said they did not use pesticides, only 16.67% had hearing loss. It is believed that, although no significant association was observed, the use of these chemical agents has a strong potential to cause damage to the health of these workers. Furthermore, in this research, it was verified that many farmers did not have the habit or the instruction for the proper storage of these harmful products, a fact that can further aggravate the harmful consequences of their indiscriminate use.

Considering the vastness of the types of pesticides used in agriculture and, sometimes, the use of mixtures of various chemical groups, it is complex to infer which of them can cause hearing damage to the farmer. However, it is well described that most of these chemical agents are neurotoxic, reaching both the central and peripheral nervous systems[29]. Different approaches regarding the ototoxic and neurotoxic effects of pesticides on the auditory system have been described. Although the structural damage induced by such agents in the

cochlea is well documented, the specific mechanisms of action remain unclear. It is believed that pesticides can induce hearing loss due to damage to the cochlea by free radicals or even by interrupting the cochlear function by altering the regulation of cellular metabolism[10,21,30]. Also, there is evidence that hearing loss can be present as an early manifestation of intoxication[29,30].

It is worth emphasizing the need for future research, such as, for example, longitudinal studies in order to better characterize the association between the various risk factors inherent to working in the field and hearing impairment. More complete audiological assessments are also relevant since the initial damage caused by neurotoxicity attributed to pesticides can be identified in high frequency audiometry or the assessment of otoacoustic emissions. This finding can be interpreted as usual in conventional audiometry[3].

It is also important to highlight other limitations of this study, among them, the lack of information about the working time in agriculture, or the use of personal protective equipment by the interviewees, as well as information about possible exposures to aggressive agents, such as noise, vibration of agricultural machinery, or high temperatures. Besides, the study did not describe the type or mixtures of the pesticides used, making it impossible to determine adverse auditory effects referring to specific chemical components.

Finally, it is clear that work in rural areas exposes the farmer to various situations that are harmful to health, whether due to low remuneration, ostracism of public policies, limited development of productive techniques, or by harmful factors intrinsic to work in the field. The various factors mentioned, once added and multiplied for years, result in the deterioration of social and mental well-being, here understood by health, which begins with the loss of hearing health and culminates in the worsening of the global well-being of this worker[28].

Thus, knowing the reality experienced by the rural community helps to understand social and labor determinants as factors that aggravate and hinder the benefit of the overall health of rural workers.

CONCLUSION

The characteristics inherent to working in the field can negatively affect hearing health. Therefore, there is a clear need to improve the perspective of guaranteeing not only the situational diagnosis, but the promotion, protection, and preventive measures related to the hearing health of rural workers.

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