Journal of Muhammad Medical College

Website: jmmc.mmc.edu.pk

Original Article

Hazard of pesticides on the hearing of farmers.

Syed Farhhan Uddin *[1], Habib Ur Rehman Chohan [2], Naushaba Rizwan[3], Kiran Waheed[4].

1. Assistant professor, Department of Physiology, Mohammad Medical College Mirpur Khas

2. Associate professor, Department of Physiology, Mohammad Medical College Mirpur Khas

3. Associate professor, department of Gynae & Obs, Liaquat University Hospital Hyderabad

4. Post Graduate Trainee. Liaquat University Hospital. Hyderabad. Sindh.

*=corresponding author

Abstract:

Introduction: As the population of world is increasing there is increased use of pesticides to enhance the crop production. Farmers are trying different types of chemicals to kill harmful germs, but they are exposing themselves to different hazards. Throughout the world insecticides are used to kill insects that harm crops. These insecticides are usually neurotoxic. They have a lethal effect on the nervous transmission. Peoples who are exposed to these poisons are also at great risk of neurotoxic effects .

Objective: To study the effects of pesticides on the hearing of the farmers. It was a retrospective and descriptive type of study which was conducted in the department of physiology in association with department of ENT.

Methodology: This retrospective study done between Mar 2019 to Aug 2019 at ENT department of Liaquat University Hospital Hyderabad. 100 subjects (50 study group having exposure to pesticides for at least five years, while 50 subjects as controls having no history of exposure to pesticides during last 5 years) were selected. The selected participants were subjected to a detailed otoscopic examination and if no other cause e.g. conductive deafness was found, the selection was finalized. The finalized participants were undergone through a comprehensive audiometric evaluation.

Results: showed pesticide damages the hearing (P= .003). There was no link between the age of farmers and hearing loss (1.00). It was found that as the duration of exposure increased the intensity of hearing loss increased (.001). It was also detected that that hearing loss was more frequent in nonprofessional than in professionals (.001).

Conclusion: This study revealed that pesticide affects sense of hearing in humans.

Keywords: Pesticide, hearing loss, Farmers.

Introduction:

As the population of the world is increasing, efforts are intensifying to increase the production from the crops. Farmers are trying different types of chemicals to kill harmful germs, but they are exposing themselves to different hazards[1]. Throughout the world insecticides are used to kill insects that harm crops. These insecticides are usually neurotoxic. They have a lethal effect on the nervous transmission. Peoples who are exposed to these poisons are also at great risk of neurotoxic effects [2,3].

Different pesticide includes phenylpyrrole, organophosphate, organochlorine, imidazole and conazole. These pesticides are usually neurotoxic but some may be genotoxic and reprotoxic [4-6]. Acute effect of pesticides is organophosphorus poisoning, pulmonary edema and eye irritation. Chronic effect includes neurotoxic but they are ototoxic also. It damages the auditory nerve and produces sensory neural hearing loss [7-9].

Trauma, noise exposure, infection and genetic history usually lead to hearing loss. As the time is passing chemical expo-

sure particularly the pesticides produces hearing loss due to its neurotoxic effects[1]. Low literacy rate is an important factor. Usually women are less affected then males[2]. Older farmers are most commonly affected peoples because they were exposed to pesticides and noise for longer time period[10].

As the hearing problem is increasing that up to 2030 it will be ten most common disorders. Hearing produces communication but this communication can be hampered by different chemicals and toxins. It is estimated that 15% of work force suffer from hearing problems[4]. About 1.1 billion peoples throughout the world are associated with farming and their hearing is commonly affected by pesticides[5]. According to WHO 23% of deaths throughout the world are because of factors associated with pesticide. Most of the deaths are because farmers do not use protective measures during pesticide spray [11].

Hypothesis:

As there is paucity of data both locally and internationally about the effects of pesticide on the hearing of persons who handle them, a null hypothesis was designed assuming that pesticides have no effects on the hearing.

Study rational:

The use of pesticides is increasing day by day to increase the production of crops to meet the need of increasing population. The rational of present study is to judge the status of hearing of the persons who are exposed to pesticides.

Objective:

To study the effects and relationship between hearing and pesticide.

Methodology:

Study carried out at the ENT OPD of Liaquat University Hospital Hyderabad, from March 2019 to August 2019. For study purpose 100 participants enrolled. This included 50 control cases who were not exposed to pesticides for the last five years and 50 patients in study group who were regularly exposed to pesticides. Ethical permission sought from the ERC of the institute and gate keeper permission was taken from the administration of Liaquat University Hospital Hyderabad. We observed inclusion/exclusion criteria to select the study and control group. In the control group only those patients were selected who were between 15-50 y of age group and were not involved in pesticide spray and handling. They did not have any history of previous otic trauma, chronic suppurative otitis media, cigarette smoking, diabetes mellitus and hypertension. In the study group only the male patients between 15-50 years of age who were involved in pesticide handling and spray for the last five years were selected, however they did not had any history of previous history of otic trauma, chronic suppurative otitis media, cigarette smoking, diabetes mellitus and hypertension. In this study only male patients were selected as exclusive male are involved in pesticides handling. The age group was limited from 15y to 50 to exclude other causes of sensory neural hearing loss. The patients selected were subjected to audiometric evaluation.

Data collected on a specific questionnaire Performa, and analyzed by using SPSS 16. Descriptive analysis was used for calculating the frequency of different variables. Cross tab measured the specific relationship between different variable. Chi square test detected the P value. Value less than 0.05 were considered as significant.

Test procedure:

To invite patients a unique campaign was launched that produced awareness about the hazardous effects of pesticide on hearing if used without protective measures. For this purpose handbills and posters were pasted on different locations. This was supported by face book and messenger. All those farmers who came in the ENT OPD with sensory neural hearing loss were also invited in the study. The selected participants were subjected to a detailed otoscopic examination and if no other cause e.g. conductive deafness was found, the selection was finalized. The finalized participants were undergone through a comprehensive audiometric evaluation.

Results:

For this study 100 participants were divided into two groups. There were 50 control and 50 patients belonged to study group. After audiometric assessment we observed hearing loss in 8% of participants from control group while hearing loss in study group was detected in 34% of the participants. Statistically the difference was highly significant. The chi-square statistic is 10.1869. The p-value is .001414. Significant at $p < .05$.
(p=0.003) as shown in table 1.

Table No 1. Hearing Loss detected after Audiometry

Variables	Hearing loss		Total	P value
	Yes	No		
Control	4 (8%)	46 (92%)	50 (100%)	0.001
Study group	17 (34%)	33 (66%)	50 (100%)	
Total	21 (21%)	79 (79%)	100 (100%)	

Table 2 describe relationship of age with hearing loss.20% participants below age 20 showed hearing loss while 22% participants above 20 experienced hearing loss. The chi-square statistic is 0.0603. The p-value is .806058. Not significant at $p < .05$.
P value was 1.00. This means that there is no significance between age and hearing loss in this study.

Table No 2. Hearing loss and age groups.

Age	Hearing loss		Total	P value
	Yes	No		
< 20y	10	40	50	0.8060
>20 y	11	39	50	
Total	21	79	100	

Table 3 shows hearing loss relationship with duration of exposure. Only 8% participants from control group suffered from hearing loss. The participants who were exposed for less than 5 years 24% suffered from hearing loss. 44% participants from more than 5 years duration exposure suffered from hearing loss. P value was .001 showing significance between hearing loss and duration of exposure to pesticides.

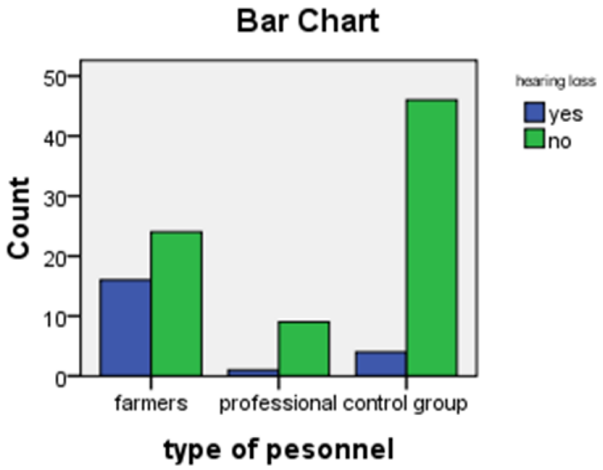
Table No 3. Duration of exposure and hearing loss

Duration of exposure To pesticides	Hearing loss		Total	P value
	Yes	No		
Control group	4	46	50	.001
Less than 5y	6	19	25	
More than 5 y	11	14	25	
Total	21	79	100	

Table 4 shows relationship between type of personnel involved in pesticide handling and hearing loss. There was 40% hearing loss in farmers while 10% hearing loss was seen in professional. Only 4% hearing loss was seen in control group. P value was .001 signifying a close relationship between hearing loss and type of professional involved.

Type of person involved	Hearing loss		Total	P value
	Yes	No		
Farmers	16	24	40	0.001
Professional	1	9	10	
Control	4	46	50	
Total	21	79	100	

Table No 4. Hearing Loss in different professionals.



FigNo.1.

Discussion:

We found high prevalence (34%) of clinical hearing loss (> 25 dB HL threshold) in the study subjects. Published studies have reported hearing loss in agricultural workers with variable frequency.[12,13] Therefore it is appropriate time to develop national policy and active intervention to control this work-related loss of hearing among agricultural workers. Although smoking was not the variable in this study, yet it has been shown that smoking is independent risk factor for loss of hearing and farmers who use to smoke are more vulnerable for high frequency hearing loss.[14,15] We found statistically significant (p value=0.001) difference in hearing loss among workers exposed for less than 5 years and more than 5 years. The use of pesticides is a risk factor for hearing loss and risk depends upon and directly proportional to the duration of exposure to pesticides.[16] We found both low and high frequency band hearing loss among agricultural workers; this finding contrasts with results of Crawford et al.[17] who reported only high frequency hearing loss, but in agreement with finding of Kós et al.[18] who reported for both low and high-frequency band hearing loss and agricultural work. Agriculture machinery also create heavy noise and we cannot clearly conclude whether exposure to pesticides and noise effect hearing in a bilateral or asymmetric manner. However potential synergism between noise and pesticide exposures has been suggested in the literature.[19,20] However hearing loss among professionals involved in pesticides handling; other than farmers, strongly support the major role of pesticides as we found statistically significant (p value 0.001) results.

Conclusion:

The null hypothesis was rejected. This study revealed that pesticide affects the hearing of humans.

Recommendation:

Personal intensive care must always be taken while spraying the pesticide. The companies should also be directed to sale pesticides to professionals only; alternatively should arrange personnel to spray the crop by taking every preventive measure.

References:

1. Crawford JM1, Hoppin JA, Alavanja MC, Blair A, Sandler DP, Kamel F. Hearing Loss among Licensed Pesticide Applicators in the agricultural Health. J Occup Environ Med. 2008;50(7):817-26.
2. Pedro Costa Cavalcanti de Albuquerque, Idê Gomes Dantas Gurgel, Aline do Monte Gurgel, Lia Giraldo da Silva Augusto, Marília Teixeira de Siqueira. Health information systems and pesticide poisoning at Pernambuco. Rev. bras. Epidemiol 2015; 18 (3).
3. Dundar MA, Derin S, Aricigil M, Eryilmaz MA. Sudden bilateral hearing loss after organophosphate inhalation. Turk J Emerg Med. 2016;16(4):171-172.
4. Ghafari M, Cheraghi Z, Doosti-Irani A. Occupational risk factors among Iranian farmworkers: a review of the available evidence. Epidemiol Health. 2017; 39: e2017027.
5. Rafael Haeffner, Leila Maria Mansano Sarquis, Rita Maria Heck, Vanda Maria da Rosa Jardim. Prevalence of hearing problems and associated factors in an agricultural company in southern Brazil. Rev. bras. epidemiol. 2015;18 (3).
6. Elizabeth Freeman Lambar, Gayle Thomas. The Health and Well-being of North Carolina's Farmworkers: The Importance of Inclusion, Accessible Services and Personal Connection. N C Med J. 2019; 80(2): 107-112.
7. Mamane A, Baldi I, Tessier JF, Raherison C, Bouvier G. Occu-

pational exposure to pesticides and respiratory health. Eur Respir Rev. 2015;24(136):306-19.
8. Ashok Murthy V, Visweswara Reddy YJ. Audiological Assessment in Organophosphorus Compound Poisoning. Indian J Otolaryngol Head Neck Surg.2014, 66(1):22–5.
9. N-Thi-Hai-Yen Nguyen, Mélanie Bertin, Julie Bodin, Natacha Fouquet, Nathalie Bonvallot et al. Multiple Exposures and Coexposures to Occupational Hazards Among Agricultural Workers: A Systematic Review of Observational Studies. Saf Health Work. 2018 Sep; 9(3): 239–248.
10. Tereza Raquel R. Sena, Angelo Roberto Antoniolli. Hearing Loss Induced for Pesticides in a Rural Worker: A Case Report. Journal of Otolaryngology Advances.2017; 2(1):12-16.
11. Warwick Williams, Lyn Forby-Atkinson, Suzanne Purdy, Graham Gartshore. Hearing loss and farming community, J Occup Health Safety,2002,18 (2)181-186.
12. Gomez MI, Hwang SA, Sobotova L et al. A comparison of self -reported hearing loss and audiometry in a cohort of New York farmers. 2001; J Speech Lang Hear Res; 44: 1201–8.
13. Kerr MJ, McCullagh M, Savik K et al. Perceived and measured hearing ability in construction laborers and farmers. 2003; Am J Ind Med; 44: 431–7.
14. Chang J, Ryou N, Jun HJ et al. Effect of Cigarette smoking and passive smoking on hearing impairment: data from a population-based study. 2016; PLoS One; 11: e0146608.
15. Pezzoli M, Lofaro D, Oliva A et al. Effects of smoking on eustachian tube and hearing. 2017; Int Tinnitus J; 21: 98–103.
16. Humann MJ, Sanderson WT, Gerr F et al. Effects of common agricultural tasks on measures of hearing loss. 2012; Am J Ind Med; 55: 904–16.
17. Crawford JM, Hoppin JA, Alavanja MC et al.Hearing loss among licensed pesticide applicators in the agricultural health study. 2008; J Occup Environ Med; 50: 817–26.
18. Kós MI, Miranda MF, Guimarães RM et al.Evaluation of the auditory system of farm workers exposed to pesticides. 2014; Revista CEFAC; 16: 941–948.
19. Guida HL, Morini RG, Cardoso AC. Audiological evaluation in workers exposed to noise and pesticide. 2010; Braz J Otorhinolaryngol; 76: 423–7.
20. Wang D, Wang Z, Zhou M et al. The combined effect of cigarette smoking and occupational noise exposure on hearing loss: evidence from the Dongfeng-Tongji Cohort Study. 2017; Sci Rep; 7: 11142.