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Research Article

A comparative study to assess Nerve Conduction Velocity (NCV) test among agriculture workers that sprayed pesticide and non-agriculture workers in Wardha District in Central India

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Abstract:
Background: Pesticides are very harmful for human health especially for farmers who are more in contact with them.
Objective: To compare Nerve Conduction Velocity (NCV) Test among agriculture workers those were exposed to pesticide and non-agriculture workers.
Method: A sample size of 83 in each group was selected. A pretested questionnaire was prepared comprising of socio-demographic profile, work practices followed by agricultural pesticide sprayers, detail clinical history & findings of Nerve Conduction Test.

Result: The mean Latency in occasional pesticide sprayer was 3.12 ± 0.95 and in regular pesticide sprayer was 3.88 ± 1.08, on applying student t test the result was observed to be significant. The mean conduction velocity in occasional pesticide sprayer was 52.95 ± 11.28 and regular pesticide sprayer was 43.96 ± 12.34, on applying student t test the result was significant.
Conclusion: In this study it can be concluded that the exposure to pesticides among farmers is a major health threat

Keywords: Pesticide, agriculture workers, Nerve Conduction Velocity (NCV) test, Personal Protective Equipments (PPE).

1. Introduction

The public health issue of pesticide exposure is further complicated by the presence of impurities in so-called, inert-ingredients such as solvents, wetting agents and emulsifiers. These chemicals are suspected of producing adverse health effects based on their structural similarity to proven toxicants. The unregulated and excessive use of pesticides has become a major bottleneck in human fight against insect pests. So the pesticides are very harmful for human health especially for farmers who are more in contact with them. (1)

Exposure to pesticides is one of the most important occupational risks among farmers in developing countries. Occupational exposure to pesticides is of great interest in order to identify the hazards of pesticide use and the establishment of safe methods of pesticide handling. In general knowledge of the main determinants of pesticide exposure in developing countries is often poor and also exposure situations may differ among

countries. [2] Extensive use of domestic utensils and broken equipment for measuring and dispensing pesticides in developing countries often continue unabated because farmers cannot afford equipment that is in good working condition. Fortunately, many farmers have expressed the need for information and training programs on pesticide safety, and therefore are likely to be responsive to such programs. [3]

Agricultural work is one of the predominant jobs, a sustainable mode of development calls for more attention to occupational risks. The experience of many countries shows that prevention of health risk caused by pesticide in technically feasible and economically rewarding for the individuals and, whole community. [4]

India is a vast country with a surface area of about 3.3 million square km. About 72% of the population lives in rural area. India is a developing nation and presents the demographic features similar to the other developing nations of the world. [5] The scenario of Indian agriculture has changed drastically after first green revolution in 1960.

Vast majorities of the population in India is engaged in agriculture and are therefore, exposed to the pesticides used in agriculture. Indian farmer is using wide ranges of chemical pesticides to limit the losses from pests and diseases, in which insecticides account for 73%, herbicides14%, fungicides 11% and others 2 %. [6]

Farming populations exposed to pesticides suffer from several health problems, primarily neurological abnormalities, respiratory ailments, and reproductive, endocrinological, and dermal problems. In spite of the economic and social importance of agriculture the health protection of agricultural workforce has been over looked for too many years, causing a heavy tribute paid in terms of avoidable disease, human sufferance and economic losses, particularly in the developing countries. [7]

Hence the study was done to investigate the adverse effect of pesticide use on nerve conduction velocity.

2. Material and Methods

2.1 Study Design and Setting: A cross sectional study conducted in the field practice area of Rural and Health Training Centre in Deoli in Wardha District., under the Department of Community Medicine Jawaharlal Nehru Medical College (JNMC).

Sample Size: Literature review indicated that the prevalence of respiratory morbidity was found to be 41.5% [8] in agricultural pesticide sprayers and 22.7% [9] in non agricultural workers.

$N= \{p_1 (1- p_1) + p_2 (1- p_2)\} \times [z\alpha + z\beta]^2 \div (p_1 - p_2)$ sample size was calculated as; N= 83 in each group.

2.2 Study Population: Agricultural pesticide sprayers and non agricultural workers who visited to RHTC Deoli, (Department of Community Medicine.) from September 2015 to August 2016 were selected for the study. The participants were interviewed for history of exposure with pesticide and further NCV was conducted in Acharya Vinoba Bhave Rural Hospital (AVBRH) Sawangi with their permission on consent form.

2.3 Study tool: A pretested questionnaire was prepared comprising of socio-demographic profile, work practices followed by agricultural pesticide sprayers, detail clinical history & physical examination & findings of Nerve Conduction Velocity Test. Nerve conduction Velocity test were performed on the EMG-NCS-EP Neuro perfect 2- channel (Medicaid, India) participants were allow to acclimatize in air condition in air conditioned room (24 degree centigrade) for 15 minutes before the procedure.

Recording were obtained at following instrument setting: For motor study: sensitivity 2-5mv/mm, low frequency filter 2-5 Hz, high frequency filter 10 KHz, sweep speed 1-2 ms/mm, For sensory study: sensitivity 10-20 µv/mm, low frequency filter 2-3 KHz, sweep speed 1-2 ms/mm. Stimulation was done by sing standard supra maximal technique using a square wave of 0.1 ms duration. Distance was measured using a metal tape. Motor nerve conduction velocity (MNC) as well as Sensory nerve conduction velocity (SNC) of median nerve of right hand forearm was measured. Latency was measured at time interval between stimulus artifact and onset of electrical response. Nerve conduction velocity was calculated by dividing the latent period by nerve length. MNC were measured by using protocol proposed by **Chouhan S** [10] and SNC were measured by **Salerno DF et al,** [11] Electro diagnostic reference value suggested by both

author were considered as normal value for the MNC & SNC.

2.3.1 Inclusion Criteria: Male agricultural pesticide sprayers, Male non Agriculture workers, Participants with same socio-economic status, Age group of between18-60 years, Agricultural pesticide exposed to exposed to pesticide more than 1 year, Participants who were willing to participate in the study.

2.3.2 Exclusion criteria: Chronic alcoholic patients, Chronic smokers, Diabetes patient, Cardiac Patients, Any Malignancy carrying patients, Chronic Renal Failure Patients, Chronic COPD patients, Participants below 18year and more than 60 year of age, Females, participants who were not willing to participate in the study.

2.3.3 Consent: After explaining the procedure in verbal and in written, the informed consent were obtained and data thus received were kept confidential.

2.3.4 Ethical Committee Approval: The study protocol was approved by Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences (Deemed University). Necessary permission was taken from Physiology Department for nerve conduction test.

Data collection: After building a rapport and ensuring confidentiality regarding the use of data for research purpose only. A pretested questionnaire was used for collection of the data. The data collection was done by a face to face interview and nerve conduction test of the workers were also carried out.

Data Analysis: The data was entered into a computerized Excel (Microsoft Excel 2007) spreadsheet. Subsequently it was analyzed using SPSS (Statistical Package for Social Sciences) Version 16.0 Data were tabulated according to frequency distribution tables. Quantitative variables such as age, duration of working, NCV test readings etc were summarized through mean, Standard Deviation etc.

3 Results:

Figure 1: Distribution of Pesticide Sprayers

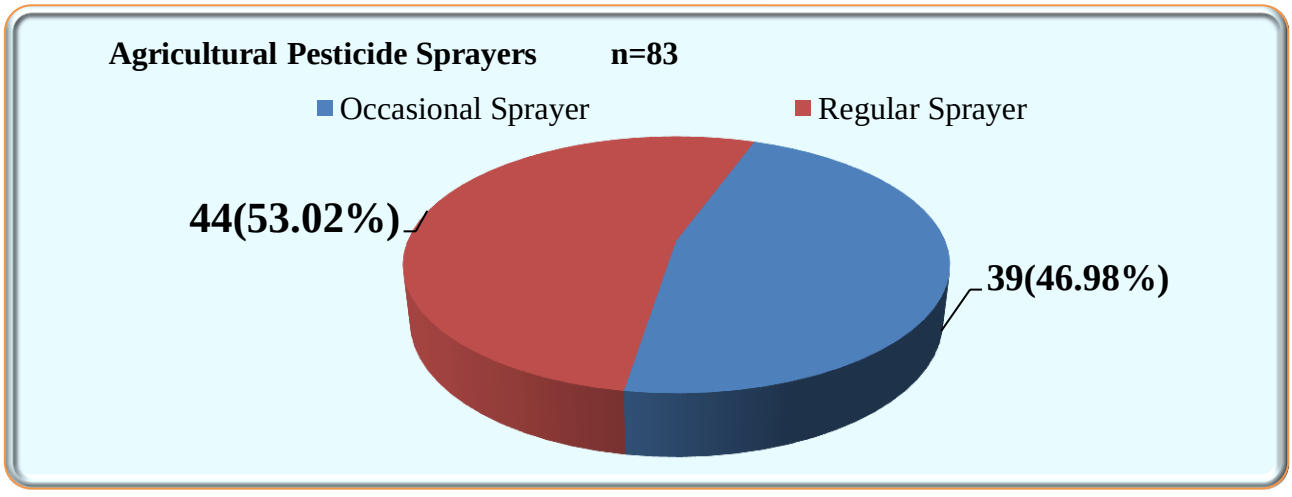

Figure 2: Duration of Exposure to Pesticide

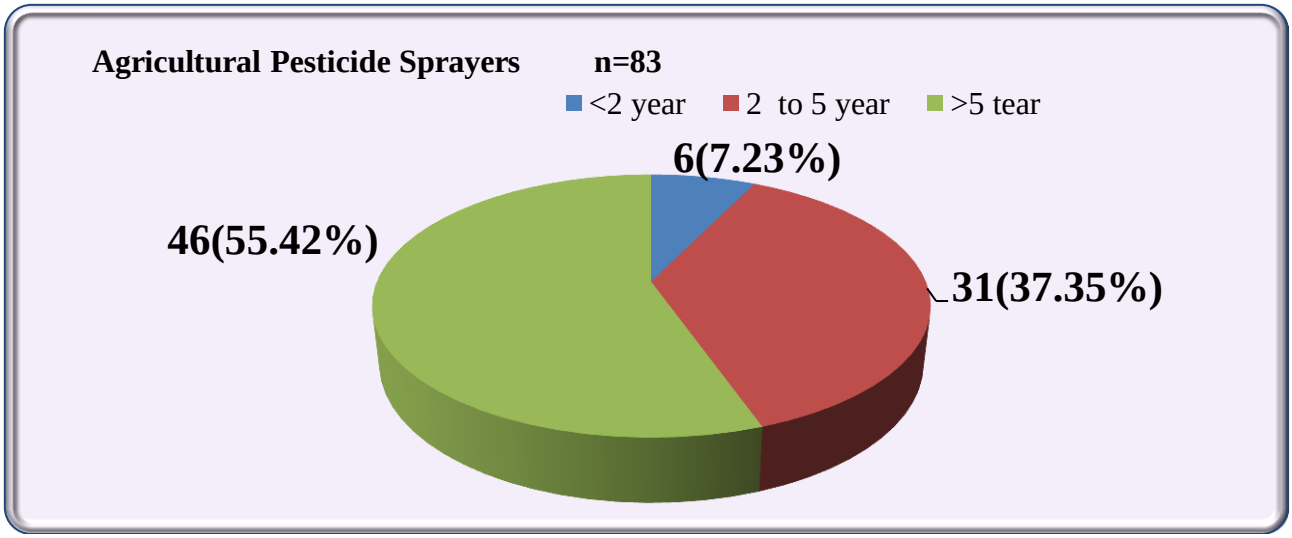

Table 1: Relation between Nerve Conduction Velocity (NCV) Test and study population

Nerve Conduction Velocity in Right Hand median nerve	Nerve Conduction Velocity Test	Agricultural Workers n=83 (%)	Non Agricultural Workers n=83 (%)	t test
Motor Nerve Conduction (MNC) Mean ± SD	Latency (ms)	3.46 ± 0.70	3.26 ± 0.53	t =1.611, p=0.110 Non-Significant
	Amplitude (µv)	14.21 ± 3.48	15.12 ± 2.88	t =-1.424, p=0.157 Non Significant
	Conduction Velocity (m/s)	60.68 ± 8.55	63.95 ± 7.10	t=-2.081, p=0.040 Significant
Sensory Nerve Conduction (SNC) Mean ± SD	Latency (ms)	3.54± 1.08	3.31 ±0.60	t =1.316, p=0.191 Non-Significant
	Amplitude (µv)	21.65± 9.02	21.24 ± 7.94	t=0.241, p=0.810 Non-significant
	Conduction Velocity (m/s)	47.92 ± 12.60	48.84 ± 8.60	t=-0.426, p=0.671 Non-Significant

Table 2: Relation between Nerve Conduction Velocity (NCV) Tests and Type of pesticide sprayers

Nerve Conduction Velocity in Right Hand median nerve	Nerve Conduction Velocity Test	Occasional Pesticide Sprayer (n= 39	Regular Pesticide Sprayer (n=44)	t test
Motor Nerve Conduction (MNC) Mean ± SD	Latency (ms)	3.27 ± 0.67	3.60 ± 0.70	t=-2.187, p= 0.032 Significant
	Amplitude (µv)	14.45 ± 2.84	14.02 ± 3.96	t=0.562, p=0.576 Non-Significant

	Conduction Velocity (m/s)	61.42 ± 9.21	60.11 ± 8.13	t=0.688, p=0.493 **Non-Significant**
Sensory Nerve Conduction (SNC) Mean ± SD	**Latency (ms)**	3.12 ± 0.95	3.88 ± 1.08	t=-3.384, p=0.001 **Significant**
	Amplitude (µv)	20.66 ± 0.95	22.42 ± 9.42	t=-1.161, p=0.249 **Non-Significant**
	Conduction Velocity (m/s)	52.95 ± 11.28	43.96 ± 12.34	t=3.448, p=0.000 **Significant**

Table 3: Relation between Nerve Conduction Velocity (NCV) Test and duration of exposure to pesticide

Nerve Conduction Velocity in Right Hand median nerve	**Nerve Conduction Velocity Test**	**Exposed up to 5 years (n=37)**	**Exposed more than 5 years (n=46)**	**t test**
Motor Nerve Conduction (MNC) Mean ± SD	**Latency (ms)**	2.99 ± 0.50	3.79 ± 0.64	t=-6.225, p=0.000 **Significant**
	Amplitude (µv)	15.2 ± 2.92	13.55 ± 3.75	t=2.194, p=0.031 **Significant**
	Conduction Velocity (m/s)	61.85 ± 9.01	59.84 ± 8.26	t=1.058, p=0.293 **Non-Significant**
Sensory Nerve Conduction (SNC) Mean ± SD	**Latency (ms)**	2.86 ± 0.56	4.04 ± 1.11	t=-5.887, p=0.000 **Significant**
	Amplitude (µv)	18.81 ± 5.29	23.70 ± 10.58	t=-2.563, p=0.012 **Significant**
	Conduction Velocity (m/s)	55.59 ± 9.19	42.36 ± 11.89	t=5.561, p=0.000 **Significant**

Discussion

Figure 1 shows that the agricultural pesticide sprayers were divided into 2 groups according to their working type 39(46.98%) were occasional pesticide sprayer and 44(53.02%) were regular pesticide sprayer.

Figure 2 shows that 6(7.22%) of agricultural pesticide sprayers had the experience of spraying pesticide was less than 2 years, 31(37.34%) of agricultural pesticide sprayers had the experience of spraying pesticide was between 2-5 years.46 (55.42%) of agricultural pesticide sprayers had the experience of spraying pesticide was more than 5 years.

In the present study in the table 1 it was found that the relation of Motor Nerve Conduction Velocity (MNC) Test (Right Hand Median Nerve) between both pesticides exposed agricultural workers and non agricultural in MNC worker was non-significant in Latency and Amplitude, by applying the student t-test and significant in Conduction Velocity. In SNC it was found non-significant in the Latency, Amplitude and Conduction Velocity.

The result in MNC in table 2 of Occasional & Regular pesticide exposure was significant in latency and non-significant in Amplitude and Conduction Velocity. The result in SNC of Occasional & Regular pesticide exposure was significant in Latency and Conduction Velocity, while non-significant in Amplitude by applying student t-test.

The result in MNC in table 3 of relation between Nerve Conduction Velocity (NCV) Test and duration of exposure to pesticide was significant in Latency & Amplitude, while non-significant in Conduction Velocity by applying student t test.

Chauhan S [6] conducted a study on Motor nerve conduction (MNC) in Median nerve in young adult groups to determine the reference value. The study population in this study was male and female students between the age group of 17- 20 years from MBBS course, NSCB medical college, Jabalpur. He found that the paired test "t" test shows no significant difference between right and left for distal latency (p=0.672); Amplitude (p=0.462) and conduction velocity (p=0.512). By comparing Latency, Amplitude, and Conduction Velocity of Right hand median nerve of present study with findings, it was found that the latency value in agricultural pesticide sprayers was **3.46 ± 0.70** & the latency of author was **3.54 ± 0.43** i.e. lower than the author's value. In the non agricultural workers group it was **3.26 ± 0.53** which was lower than author's value i.e. **3.54 ± 0.43.** Amplitude of agricultural pesticide sprayers was **14.21 ± 3.48** Amplitude of author was **11.84±3.41** which was lower than present studied value.

Mean ± SD Amplitude of non agricultural workers was **15.12 ± 2.88** & Mean ± SD Amplitude of author was **11.84±3.41** which was lower than present studied value. Mean ± SD Conduction Velocity of agricultural pesticide sprayers was **60.68 ± 8.55** & Mean ± SD Conduction Velocity of author was **58.85 ± 3.57** which was lower than present studied value. Mean ± SD Conduction Velocity of non agricultural workers was **63.95 ± 7.10** & Mean ± SD Conduction Velocity of author was **58.85 ± 3.57** lower than present studied value.

Salerno DF [7] conducted a cohort study on median and ulnar nerve conduction studies among workers. The purpose of this study was to evaluate nerve conduction data among asymptomatic, healthy workers to assess what is considered as ''normal.'' The current diagnostic method of using fixed thresholds without adjustment for age and sex are not appropriate for a worker population and could result in substantial misclassification. By comparing the SNC values of Mean ± SD Latency, Amplitude, and Conduction Velocity of Right Median Nerve.

Latency of agricultural pesticide sprayers was **2.86 ± 0.56** & the latency of author was 3.2 ± 0.4 which was lower than author's value. Latency of non agricultural workers was **4.04 ± 1.11** & the latency of author was **3.2 ± 0.4** which was lower than author's value**.** Amplitude of agricultural pesticide sprayers was **18.81 ± 5.29** & the Amplitude of author was **35.6 ± 14.8** which was very much lower than author's value. Amplitude of non agricultural workers was 23.70 ± 10.58 & Amplitude of author was **35.6 ± 14.8** which was lower than the author's value**.**

In the present study population was not restricted up to Wardha district only they differ from place nearby Wardha district. It was observed that the working practices were same in maximum number of agricultural pesticide sprayers, maximum participant's sprayed pesticide by using traditional method and still they didn't use preventive measures while spraying and preparing pesticide

Conclusion

In this study it can be concluded that the exposure to pesticides among farmers is a major health threat. This well known fact is one obvious and important rational for safe handling and practices of pesticides. The present study suggests adequate preventive measures by personal protective equipments to those farmers who handle pesticides.

Educational and training interventions on pesticide handling and safety precautions are recommended to change this situation. In addition, governmental interventions and efforts, such as restrictions on hazardous pesticides, monitoring of labels, and enforcement of good agricultural practices are needed to decrease pesticide exposure of farmers and the general population.

Recommendation

Appropriate pesticides handling and its use as per the label are the most important steps for safe use of it. Government agencies need to develop mechanisms for enforcing the regulations for the overall management and use of pesticides and training agricultural workers for its safe use. Personal Protective Equipments (PPE) must be provided at reasonable cost to the pesticide sprayers by the government or pesticide factories.

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