

Health issues of pesticide applicators and their perception regarding pesticide application activities

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■ **ABSTRACT** : The present study was carried among 30 pesticide applicators from Marathwada region. Incidence of musculoskeletal problems of the pesticide applicators was identified by using Psychophysical techniques developed by Corlett and Bishop (1976). It is concluded that the majority of the pesticide applicants had light pain in neck (46.66), severe pain in shoulder (83.33%) and upper back (70%) while performing the task of pesticide application. Itching (70%), skin rash (86.66%) omitting and headache (53.33%) were the other health issues reported by pesticide applicators.

■ **KEY WORDS**: Health issues, Musculoskeletal problems, Pesticide applicators

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Agricultural development continues to remain the most important objective of Indian planning and policy. In the process of development of agriculture, pesticides have become an important tool as a plant protection agent for boosting food production. The use of pesticides is considered the most attractive method of controlling pests involves less labour and characterizes higher out-put per hector of land. Despite their popularity and extensive use, pesticides have serious concerns about health risk arising from the exposure of farmers when mixing and applying pesticides or working in treated fields and from residues on food and in drinking water. Raised exposure to pesticides poses a continuous health hazard, especially in the agricultural working environment. By their nature most pesticide show a high degree of toxicity because they are designed to kill certain

organism and thus create some risk of harm (Damalas and Eleftherohorinos, 2011).

The health effect of pesticide exposure causes chronic diseases. Pesticide exposure is associated with a broad range of nonspecific symptoms, including headache, dizziness, fatigue, weakness, nausea, chest tightness, difficulty in breathing, insomnia, confusion and difficulty in concentrating.

Agriculture ranks among the most dangerous industries. Farmers are at very high risk for incidents. Chemical products were used to alter life cycle of living pest organisms and improper handling of them is dangerous to involved people (Marzban *et al.*, 2012). Farming populations exposed to pesticides suffer from several health problems, primarily neurological abnormalities, respiratory ailments, and reproductive,

endocrinological and dermal problems (Kesavachandran *et al.*, 2009).

However, exposure to pesticides both occupationally and environmentally causes a range of human health problems. It has been observed that the pesticides exposures are increasingly linked to immune suppression, hormone disruption, diminished intelligence, reproductive abnormalities and cancer. A vast majority of the population in India is engaged in agriculture and is therefore exposed to the pesticides used in agriculture.

Along with other health issues musculoskeletal disorders are frequent during agriculture work due to exposure to heavy, repetitive and forceful work, adoption of awkward and uncomfortable postures and carrying of excessive loads which has been observed to impose a great impc on health of agricultural workers (Vyas, 2014). Pesticide application activities require frequent and repetitive body motions, change in posture, walking and carrying load on back. There is a dearth studies related to these issues in India. Hence the present investigation is undertaken with the objective of studying health issues of pesticide applicators and their perception regarding pesticide application activities

RESEARCH METHODS

Locale of the study :

The present study was carried out in selected six villages namely Nandkheda, Daithna, Katneshwar, Dohra, Hatta, Jawala of Parbhani and Hingoli districts of Marathwada region of Maharashtra State

Selection of the sample:

A purposive random sampling method was followed to select 30 pesticide applicators from the age group of 25 - 45 years who were involved in pesticide application activities since 5 years. The selected pesticide applicators were healthy and without any physical deformities and illness.

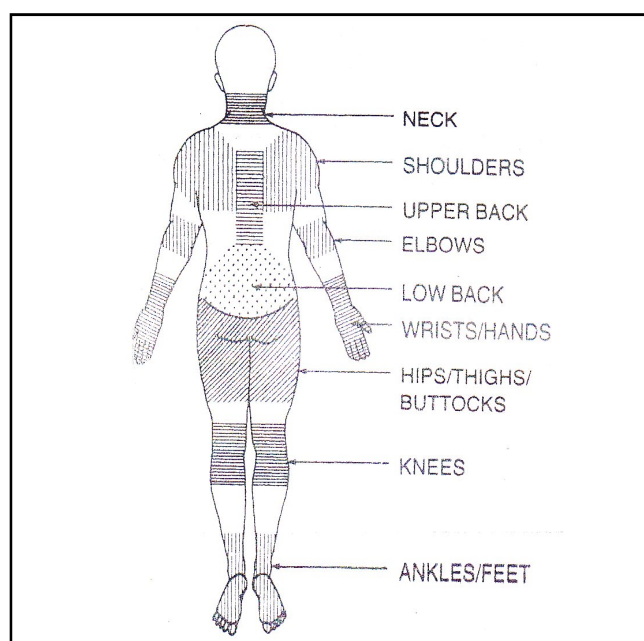
Developing questionnaire and observation schedule:

The questionnaire was developed to collect the information on selected variables related to study . Information was collected through personal interview method. Observation schedule for noting down the selected anthropometric variables *i.e.* height and body weight. The information was recorded through direct

method.

Assessment of work related musculoskeletal problems:

Incidence of musculoskeletal problems of the pesticide applicators were identified by using Psychophysical techniques developed by Corlett and Bishop (1976)‘Body Map’ technique was used to determine musculoskeletal problems and Body Part Discomfort Score (BPDS) and Visual Analogue Discomfort (VAD) scale was used to assess Overall Discomfort Score (ODR) of the respondents while performing different agricultural activities.



Body map used to identify musculoskeletal problems of the pesticide applicators:

The severity of the musculoskeletal problem was assessed with the help of five point scale developed by (Ranjwan, 2000).

Scale	Score
Very Severe	5
Severe	4
Moderate	3
Light	2
Very light	1

Assessment of workload perception and difficulty perception of pesticide application activities:

The following scales were used to know the

workload perception and difficulty perception experienced by pesticide applicators while conducting the pesticide spraying activity.

Rating of workload perception:

Workload perception	Score
Very Heavy	5
Heavy	4
Moderately Heavy	3
Low	2
Very Low	1

Rating of difficulty perception:

Difficulty perception	Score
Very difficult	5
Difficult	4
Moderately difficult	3
Easy	2
Very easy	1

Statistical analysis:

The collected data was analyzed by applying One way analysis of variance test for assessing the differences in perception and difficulty scores of various pesticide application activities by using following formula (Sharma, 2005)

$$F = \frac{MSV}{MSE}$$

where MSV = mean square due to variate effects
MSE = mean square due to error

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

General information of the selected pesticide applicant:

General information of the selected pesticide applicants is given in Table 1. From the table it is observed that the majority of the pesticide applicants (60%) had their monthly family income between Rs.10100-20000/- and 33.33 per cent of pesticide applicants had monthly family income less than Rs. 10000/-.Very few families (6.66%) had monthly income more than Rs. 20,000/-. With reference to the pesticide applicants education, it

was observed that majority of the workers had secondary education (60%) whereas 23.33 per cent of the pesticide applicants had higher secondary education. Only 6.66 per cent pesticide applicants were educated up to primary school. Majority of the pesticide applicants belonged to joint family (63.33%) followed by nuclear family (36%).

Table 1 : General information of the selected pesticide applicants		
Attributes	Frequency	Percentage
Monthly Family Income (Rs.)		
< 10000	10	33.33
10100 to20000	18	60
>20000	2	6.66
Educational Level		
Illiterates	3	10
Primary	2	6.66
Secondary	18	60
Higher Secondary	7	23.33
Type of Family		
Joint	19	63.33
Nuclear	11	36
Size of Family		
Small (1 to 4)	4	13.33
Middle (5 to 10)	23	76.66
Large(> 10)	3	10
Working Status		
Own farm	19	63.33
Paid worker	11	36

The percentage of the pesticide applicants having 5 to 10 members in the family was 23 per cent, whereas 13 per cent of the pesticide applicants belonged to small family consisting 1to 4 members in family. Ten per cent of the pesticide applicants belonged to the large size family consisting more than 10 members in family. Majority of the pesticide applicants were working on own farm (63.33%) and 36 per cent of the pesticide applicants were paid workers.

Health problems faced by pesticide applicants after pesticide application:

The health problems faced by pesticide applicants

Table 2 : Health problems faced by the pesticide applicants after pesticide application			
Problems	Always	Sometimes	Rarely
Diarrhea	Nil	Nil	2(6.66)
Skin rash	1(3.33)	26(86.66)	3(10)
Itching	21(70)	9(30)	Nil
Feeling of omitting	1(3.33)	24(80)	5(16)
Headache	16(53.33)	14(46.66)	Nil

Table 3 : Intensity of musculoskeletal problems experienced by the pesticide applicants

Intensity of pain	Very severe	Severe	Moderate	Light	Very light
Body part					
Neck	-----	3(10)	13(43.33)	14(46.66)	-----
Shoulder	2(6.66)	25(83.33)	3(10)	-----	-----
Upper back	4(13.33)	21(70)	5(16.66)	-----	-----
Wrist	-----	-----	3(10)	6(20)	21(70)
Thighs	-----	2(6.66)	24(80)	4(13.33)	-----
Knees	-----	-----	12(40)	17(56.66)	1(3.33)

are reported in Table 2. It is clear from the table that the 70 per cent of the pesticide applicants always and 30 per cent of the pesticide applicants sometimes suffered from itching, 53.33 per cent of the pesticide applicants always and 46.66 per cent sometimes suffered from headache, followed by 10 per cent of pesticide applicants who suffered always from allergy. The percentage of pesticide applicants suffering from allergy sometimes and rarely were 6.66 and 26.66, respectively. Pesticide applicants sometimes and rarely suffered with feeling of omitting were 80 and 60 per cent, respectively. Meager per cent of pesticide applicants (3.33%) always suffered from feeling of omitting. Skin rash for sometimes was reported by 86.66 per cent of the pesticide applicants. Ten per cent of pesticide applicants suffered with skin rash rarely and 3.33 per cent of pesticide applicants always suffered from skin rash after pesticide application. Only 6.66 per cent pesticide applicants rarely suffered from diarrhea. The incidence of asthma was not reported by any of the pesticide applicants.

Musculoskeletal problems of the pesticide applicants:

Intensity of the musculoskeletal problems experienced by pesticide applicants was assessed while performing the pesticide application activity and presented in Table 3. It is observed that majority of the pesticide applicators felt the light pain in neck while performing the pesticide spraying activity (46.66%), 43.33 per cent of the pesticide applicants felt moderate pain and 10 per cent felt severe pain in neck while performing pesticide application activity. Majority of the pesticide applicators felt severe pain in shoulder while performing pesticide spraying activity (83.33%). The percentage of the pesticide applicants experiencing moderate and severe pain in shoulder while performing

pesticide application activity were 10 and 6.66, respectively. Majority of the pesticide applicants felt severe pain in upper back (70%), 16.66 per cent of pesticide applicants felt moderate and 13.33 per cent felt very severe pain in upper back while applying pesticides.

Majority of the pesticide applicators felt very light pain in wrist while performing pesticide spraying activity (70%), 20 per cent of the pesticide spraying applicators felt light pain in and ten per cent of the applicant felt the moderate pain in wrist while applying the pesticides. Majority felt moderate pain in thighs while performing pesticide application activity (80%), followed by 13.33 per cent of pesticide applicants who felt light pain and 6.66 per cent felt severe pain in thighs while performing pesticide application activity.

Majority of the pesticide applicants felt light pain in knees while performing pesticide application activity (56.66%) and 40 per cent of the pesticide applicants felt very light pain in knees while applying pesticides.

Level of difficulty perception of pesticide applicants while applying pesticides:

Difficulty experienced by the pesticide applicants in various operations of pesticide application is shown in Table 4. It is perceptible from the table that majority of

Table 4 : Intensity score of musculoskeletal pain in various body parts experienced by the pesticide applicants

Body Part	Mean Intensity Score of body pain
Neck	2.7
Shoulder	3.9
Upper back	4.0
Wrist	1.33
Thies	2.96
Knees	2.23

F =86.75** SE= 0.11 CD= 0.29

the pesticide applicants perceived pouring of pesticide as easy (53.33%), loading of pesticide as neutral *i.e.* neither easy nor difficult (76%), spraying of pesticide (66.66%) and complete task of pesticide application (76.66%) as difficult task. More than 40 per cent of the pesticide applicants felt the task of pouring of pesticide as very easy task (43.33%).

Mean scores of difficulty perception of various operations of pesticide application:

Mean scores of difficulty perception of pesticide application activity as expressed by pesticide applicants are presented in Table 5. It is clear from the table that the lowest mean scores for difficulty perception was recorded for pouring of pesticides (1.63 ± 0.66) followed by loading of pesticides (2.93 ± 0.57). The highest mean score for difficulty perception of pesticide application was recorded for complete task of pesticide application (3.96 ± 0.48) followed by spraying of pesticides (3.76 ± 0.61). The results indicated that the difficulty perceived for the complete task of pesticide application was highest and for pouring of pesticide was lowest. Statistically the significant difference between difficulty perception scores was noticed ($F = 95.01^{**}$) for various operations under pesticide application. The difficulty perception of complete task of pesticide application was significantly more over the task of loading the pesticide and pouring the pesticide. Difficulty perception of loading and pouring of pesticide was at par with each other whereas difficulty perception of spraying and complete task of pesticide application was at par with each other.

Workload perception of pesticide application activity

The workload experienced by the pesticide applicants while applying pesticides is presented in the table 6. From the table it is revealed that the majority of the pesticide applicants felt that loading pesticides as exerting task (66.66%) whereas 23.33 per cent of the pesticide applicants felt that loading pesticides was less exerting. Only 6.66 per cent and 3.33 per cent of the pesticides applicants felt that loading pesticides was moderately exerting and highly exerting respectively. Equal percentage of the pesticide applicants expressed that pouring pesticides was less exerting and non exerting task (43.33%). Ten per cent of the pesticide applicants expressed that pouring pesticides as exerting task only 3.33 per cent of the pesticide applicants felt that the pouring of pesticides was highly exerting task. Majority of the pesticide applicants expressed that the spraying of pesticides as moderately exerting (53.33%) whereas 33.33 per cent of the pesticide applicants opined it as highly exerting task and only 13.33 per cent of them were feeling that spraying pesticides was just exerting. Majority of the pesticide applicants felt that the complete task of pesticide application was highly exerting (50%) where as 46.66 per cent of the pesticide applicants expressed the task as moderately exerting.

Mean score of workload experienced while performing pesticide application activity:

Mean scores of workload experienced in pesticide application activity are presented in Table 7. It is clear from the table that the workload experienced of the complete task of pesticide application was highest (4.46) followed by spraying of pesticides (4.2). The lowest

Activity	Very Difficult	Difficult	Neutral	Easy	Very Easy
Pouring of pesticide	Nil	1(3.33)	Nil	16(53.33)	13(43.33)
Loading of pesticide	Nil	3(10)	23(76)	3(10)	1(3.33)
Spraying of pesticide	2(6.66)	20(66.66)	7(23.33)	1(3.33)	Nil
Task of pesticide application	3(10)	23(76.66)	4(13.33)	-----	-----

Activity	Difficulty Perception Score Mean \pm S.D.
Pouring of pesticide	1.63 \pm 0.66
Loading of pesticide	2.93 \pm 0.57
Spraying of pesticide	3.76 \pm 0.61
Complete task of pesticide application	3.96 \pm 0.48

F = 95.01**

SE= 0.13

CD = 0.36

**indicates significance of value at P=0.01 level

Table 7 : Workload experienced by pesticide applicants while performing pesticide application activities

Activity	Highly exerting	Moderately exerting	Exerting	Less exerting	Not exerting
Pouring of pesticide	1(3.33)	Nil	3(10)	13(43.33)	13(43.33)
Loading of pesticide	1(3.33)	2(6.66)	20(66.66)	7(23.33)	---
Spraying of pesticide	10(33.33)	16(53.33)	4(13.33)	Nil	Nil
Complete task of pesticide application	15(50ss)	14(46.66)	1(3.33)	-----	-----

workload score was recorded for pouring of pesticides (1.76). Thus the results indicated that the complete task of pesticide application was more exerting and the activity of pouring of pesticide was less exerting. Statistical results indicated significant difference in workload experienced by the pesticide applicants while performing different operations under pesticide application ($F=93.02^{**}$). The workload experienced while loading and pouring of pesticides was at par with each other and spraying as well as complete task of pesticide application was at par with each other for drudgery experienced. Significantly highest drudgery score was recorded for complete task of pesticide application.

Intensity score of musculoskeletal pain experienced by pesticide applicants:

Intensity score of musculoskeletal pain experienced by pesticide applicants is presented in table no 8. It was observed that the mean intensity score of body pain was noted higher in upper back (4) followed by shoulder (3.9). The mean intensity score of pain in thighs was 2.96 and neck was 2.7. The lowest intensity of pain was noted in wrist (1.33). Statistical analysis with CRD indicated significantly more pain in upper back. Significantly less intensity score of pain was noted in wrist. Intensity score of body pain in shoulder and upper back of pesticide applicants were at par with each other.

Conclusion:

Thus it is concluded that the majority of the pesticide applicants had light pain in neck (46.66). Majority of the pesticide applicants (83.33%) felt severe pain in shoulder while performing the task of pesticide application. Majority of the pesticide spraying applicants had severe pain in upper back and very light pain in wrist (70%). Eighty per cent of the pesticide applicants had moderate pain in thighs and 56.66 per cent of the pesticide applicants had light pain in knees while performing pesticide application activity. Hence from the table it can be

concluded that majority of the pesticide applicants always suffered from itching (70%) and sometimes suffered with skin rash (86.66%) after pesticide application. Eighty per cent of the pesticide applicants sometimes were getting the feeling of omitting after pesticide application. Majority of the pesticide applicants always suffered with headache after pesticide application (53.33).

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