**Occupational Health: Farmers Knowledge on Pesticide usage and it’s Harmful Effects on Human Health in Rural Areas of South India**

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**Abstract**

An estimated 1.3 billion workers are engaged in agricultural production worldwide. This represents half of the total world labor force. Almost 60% of them are in developing countries. Pesticides can enter the human body by three common ways: Through the skin (contact), the mouth (ingestion) and the lungs (inhalation). The state of the chemical, i.e. solid, liquid or gas, affects the chances of pesticide penetration into the body. During the usage of pesticides farmers reported problems such as eye irritation, headache, dizziness, breathing difficulty, skin rashes and all of these symptoms at least once during their exposure to pesticides. A field based cross sectional study was conducted in the rural areas of Karnataka state, Gadag district, to assess the farmer’s knowledge, attitudes and practices about pesticide usage and its harmful effects on human health. A pre-tested semi-structured questionnaire was used to obtain the data from January to February 2020. Data was collected at the rural settings by visiting their house and agriculture fields. Totally 265 farmers were interviewed, out of that more than half of them have good knowledge about pesticide usage but only few of them have knowledge about the harmful effects of pesticide on their health. In our study findings majority of the farmers are not aware about the health hazards due to usage of pesticides, they showed good attitude and poor practices about pesticide usage.

**Keywords:** Attitude and Practices, Farmers Knowledge, Health Awareness, Occupational Health, Occupational Hazard

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**1. Introduction**

A great majority of agricultural workers are found in Asia, which is the most densely populated region of the world, with more than 40% of the world’s agricultural population concentrated in China and more than 20% in India. In India inadequate safety precautions by workers using or manufacturing pesticides, health checks for employees or workers, labeling of chemical products and chemical contamination of food, unsafe storage of chemicals in the home, environmental pollution from industry often due to uncontrolled disposal of waste are the major causes for occupational hazards. Mixing and spraying are the tasks associated with the greatest intensity of pesticide exposure, given that during this phase farmers are exposed to the concentrated product and, therefore, often face high exposure events. Studies on pesticide dermal contamination highlight that the spray deposition the sprayers bodies is crucial as these results indicated that all the farmers were at risk from the pesticides they used. The working environment frequently contains a wide variety of chemical, physical, biological and psychosocial health hazards. The early detection and assessment of occupational hazards fall under the discipline of occupational hygiene. In this study we wanted to assess the rural area farmer’s knowledge about the pesticide usage and its harmful effects on human health.

**2. Materials and Methods**

**2.1 Study Design**

A field based cross sectional study was conducted in rural areas of Gadag district on farmers. Purposive sampling technique was used to recruit the study participants. Socio-demographic details, knowledge, attitudes and practices about the pesticide
usage and its harmful effects on farmers health related data was obtained using pre-tested semi-structured questionnaire.

2.2 Study Setting
A field based cross sectional study was conducted in the rural areas of Gadag district on farmers. Data was obtained from January to February 2020 using a pre-tested semi-structured interview questionnaire.

2.3 Participants
Those who were involved in the agriculture activity and have experience of previously used the pesticides and those who have at least once sprayed the pesticide and among them those who given oral consent to participate in the study were included.

2.4 Variables
Independent variables: Gender, age, education and income status.
Dependent variables: knowledge was assessed using semi-structured questionnaire.

2.5 Data Sources
Primary data was obtained introducing the questionnaire to farmers. Visited the farmer’s agriculture fields and questionnaire was administered related to pesticide usage and its harmful effects on their health.

2.6 Study Size
KSRDPR University was located in the Gadag district headquarters. Purposive sampling technique method was used to recruit the study participants. Totally 265 farmers data was collected from the 5 villages.

2.7 Statistical Methods
Data was entered into excel sheet, analyzed using SPSS v20 and expressed in frequency and percentages.

3. Results
In the current study majority of the participants belongs to 41-50 age group, half of them are completed primary education and all most all are married (Table 1).

In the north Karnataka majority of the farmers grown commercial crops and in Nagavi majority of farmers grown vegetables (Table 2).

In our study almost all the farmers have knowledge about definition of pesticide, its name, how many times it should be sprayed, storage and its safe usage. Majority of the farmers were aware about necessity of reading the label on pesticide prior to its usage and nearly half of them know the names of banned pesticides (Table 3).

In the present study majority (36.6%) of the study participants responded that pesticide residue will exist in air, soil, surface water and fruits, seeds, leaves of crop. For the question disposal of pesticide containing majority (26.8%) of the responded, they will burn the containers (Table 4).

In this study all farmers replied that they were aware about the adverse health effects of pesticides and if they get exposed then they will visit the hospital. If they saw the pesticide poisoned person they will take them into the hospital, nearly half of the farmers responded that they will wash pesticide contacted skin with soap and water. None of them aware about the poison information centre and its toll free number (1800-4250297) (Table 5).

Table 1. Socio-demographic details of study participants

| Characteristics          | Frequency (%) |
|--------------------------|---------------|
| Gender                   |               |
| Male                     | 232 (87.5)    |
| Female                   | 33 (12.5)     |
| Age Group                |               |
| 20-30                    | 17 (06.4)     |
| 31-40                    | 82 (30.9)     |
| 41-50                    | 89 (33.6)     |
| 51-60                    | 56 (21.1)     |
| 61 and above             | 21 (07.9)     |
| Education level          |               |
| Illiterate               | 57 (21.5)     |
| Primary                  | 113 (42.6)    |
| Secondary                | 74 (27.9)     |
| Undergraduate            | 13 (04.9)     |
| Graduate                 | 08 (03.0)     |
| Marital status           |               |
| Single                   | 10 (03.8)     |
| Married                  | 255 (96.2)    |

Table 2. Frequency distribution of types of crops harvesting in 5 villages

| Villages   | Vegetables | Types of crops harvest |
|------------|------------|------------------------|
|            | Food grains| Commercial crops | Fruits | All |
| Binkadakatti | 24 | 11 | 2 | 0 | 0 |
| Hulkioti    | 4 | 17 | 20 | 7 | 11 |
| Kalasapur   | 3 | 4 | 35 | 14 | 0 |
| Kurthkoti   | 21 | 7 | 30 | 1 | 3 |
| Nagavi      | 34 | 4 | 13 | 0 | 0 |
| Total       | 86 | 43 | 100 | 22 | 14 |

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In our findings majority of the farmers opined that pesticide can enter all routes (Nose, mouth, skin and eyes) and skin irritation and irregular heartbeat are the symptoms and signs (Table 6).

4. Discussion

4.1 Socio-demographic Characteristics

Majority of the farmers are males, belongs in the age group 41-50 years completed their primary education and married.

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**Table 3.** Knowledge about pesticide and its usage

| Variables                                      | Responses given by Farmers (n - 265) |
|------------------------------------------------|-------------------------------------|
|                                                | Yes                | No               |
| Do you know what is Pesticide                  | 257 (97.0)         | 08 (03.0)        |
| Do you know the name of the pesticide which you used | 236 (89.1)         | 29 (10.9)        |
| Are you aware about how many times you can sprayed the pesticide | 256 (96.6)         | 09 (03.4)        |
| Do you know that pesticides need to be stored separately and handled safely | 251 (94.7)         | 14 (05.3)        |
| Is it Necessary to read and understand the label or leaflet of pesticide container prior to its use | 207 (78.1)         | 58 (21.9)        |
| Do you know the names of the banned pesticides | 133 (50.2)         | 132 (49.8)       |

**Table 4.** Knowledge about other aspects of pesticide usage

| Variables                                      | Farmers responses (n - 265) |
|------------------------------------------------|----------------------------|
|                                                | Frequency | Percentage |
| In which of the following pesticide residues may exist |          |            |
| Air                                            | 33        | 12.5       |
| Soil                                           | 87        | 32.8       |
| Surface water and ground water                 | 04        | 01.5       |
| Fruits, Seeds and Leaves of crop               | 28        | 10.6       |
| All of the above                               | 97        | 36.6       |
| None of the above                              | 04        | 01.5       |
| Do not know                                    | 12        | 04.5       |
| Which of the following ways of disposal of pesticide containers or bottles was safe |          |            |
| Throw the container in garbage                 | 85        | 32.1       |
| Throw the container in barren land or any water source | 04        | 01.5       |
| Burn the container                             | 71        | 26.8       |
| Clean the container and use them for the daily routine | 65        | 24.5       |
| All of the above                               | 29        | 10.9       |
| None of the above                              | 05        | 01.9       |
| Do not know                                    | 06        | 02.3       |

**Table 5.** Farmer’s responses about the harmful effects of pesticide usage

| Variables                                      | Correct response given by farmers (n - 265) |
|------------------------------------------------|---------------------------------------------|
| 1. Do you aware that exposure to the pesticides have adverse health effects | Yes                  | No           |
|                                                | 256 (96.6)         | 09 (03.4)    |
| 2. Do you know that if you are exposed to pesticides, you should visit the hospital | Yes                  | No           |
|                                                | 241 (90.9)         | 24 (09.1)    |
| 3. What would you do when you see a person poisoned with pesticide | Frequency | Percentage |
| Find out which way the person was poisoned    | 05                | 01.9         |
| Render the first-aid                          | 26                | 09.8         |
| Take the person to the hospital               | 194               | 73.2         |
| All of the above                              | 36                | 13.6         |
| None of the above                             | 04                | 01.5         |
| 4. What would you do if your skin come in contact with pesticide | Yes                  | No           |
| Wipe it off the exposed area with clothes     | 08                | 03.0         |
| Wash the exposed area with soap and water     | 147               | 55.5         |
| Make a call to the poison information centre  | 00                | 00           |
| Go to the nearest hospital                    | 108               | 40.0         |
| Do not do anything                            | 02                | 00.8         |
| 5. What would you do in case of accidental spillage of pesticides into your eyes | Yes                  | No           |
| Wash the eyes with water                      | 123               | 46.4         |
| Make a call to the poison information centre  | 00                | 00           |
| Take the person to the nearest hospital       | 140               | 52.8         |
| Do not do anything                            | 02                | 00.8         |
Table 6. Farmer’s responses about toxic symptoms and signs

| Variables                                      | Frequency | Percentage |
|------------------------------------------------|-----------|------------|
| In which route pesticides can entry into human body |           |            |
| Nose                                           | 50        | 18.9       |
| Skin                                           | 16        | 6.0        |
| Mouth                                          | 36        | 13.6       |
| Eyes                                           | 9         | 3.4        |
| All routes                                     | 121       | 45.7       |
| Don’t know                                     | 33        | 12.4       |
| Which of the following are toxic symptoms of pesticide |       |            |
| Headache                                       | 67        | 25.3       |
| Watery/sore eyes                               | 23        | 08.7       |
| Nausea                                         | 19        | 07.2       |
| Excessive Sweating                             | 01        | 00.4       |
| Cough and cold                                 | 10        | 03.8       |
| Skin irritation                                | 49        | 18.5       |
| Abdominal pain                                 | 05        | 01.9       |
| Body pain                                      | 01        | 00.4       |
| All of the above                               | 47        | 17.8       |
| None of the above                              | 05        | 01.9       |
| Don’t know                                     | 38        | 14.3       |
| When you are using pesticides have you experienced the following signs |       |            |
| Dizziness                                      | 26        | 09.8       |
| Blurred vision                                 | 15        | 05.7       |
| Excessive salivation                           | 20        | 07.5       |
| Hand tremor                                    | 13        | 04.9       |
| Convulsion staggering                          | 17        | 06.4       |
| Narrow pupils                                  | 11        | 04.2       |
| Vomiting                                       | 25        | 09.4       |
| Insomnia                                       | 21        | 07.9       |
| Breathlessness                                 | 26        | 09.8       |
| Skin rashes                                    | 30        | 11.3       |
| Irregular heartbeat                            | 34        | 12.8       |
| Diarrhea                                       | 27        | 10.2       |

The similar socio-demographic characteristics found in study conducted at Puducherry7.

4.2 Types of Crops Grown

In this area majority of the farmers grown commercial crops followed by vegetables. Similar findings found in study conducted at Karnataka8, Bangladesh9 and Palestine10.

4.3 Knowledge Pesticide Usage

In our study majority of the farmers knows about where to store the pesticide containers or bottles, a study conducted at Chikkabalapur district South Karnataka found the similar findings11, Ethiopia12 and Pakistan13.

1/3rd of the farmers responded that the necessity of the reading the label on pesticide container, the similar opinion found in study conducted at Bangladesh9 and Brazil14.

In the current study almost all (96.6%) farmers are knows that how many times they have sprayed the pesticide. A study conducted at Nigeria15 and Indonesia16 found the similar opinion.

4.4 Knowledge on Pesticide and Containers Disposal

We came out in the interesting findings that pesticide residue will exists in the air, soil, surface and ground water and in crops. Similar findings found in Kuwait17, Spain18 and Sweden19.

In our study majority (32.1%) of the farmers replied that they will throw the pesticide containers in garbage followed by burned the container. A study conducted at Tanzania20 found the similar results.

4.5 Knowledge on Harmful Effects of Pesticides on Health

In our study majority of the farmers responded that they were aware about the adverse health effects of pesticide usage. The interesting findings found in rural village of Chikabalapur district South Karnataka11, United State of America4 and in Northern Iran21.

Farmers opined that when they saw the pesticide poisoned person they will render the first-aid and take him to the hospital, the similar advice found in World health Organization report2.

Nearly half of the farmers replied that they will wash their eyes with water when they met an accidental spillage of pesticide into eyes. The review study conducted by department of agriculture development along with Democritus University of Thrace at Greece found the similar findings22.

4.6 Knowledge on Symptoms and Signs Toxic Effect of Pesticide

In the current study nearly half (45.7%) of the farmers replied that pesticide will enter into the body through nose, skin, mouth and eyes. The similar study conducted in Sweden showed that pesticide will enter into body through skin19. Similar results found in studies conducted at Palestine10 and in Uganda23.

Among the 265 farmers majority of them replied as skin irritation and irregular heartbeat are symptoms and signs of the pesticide harmful effects on health. The similar findings found in Kuwait17.

In our findings 25.3% of the farmers opined that headache was a common symptom of pesticide usage. Similar results found in Uganda23 and in Indonesia study24.
5. Conclusion

In our study majority of the farmers aware about the pesticide usage but only few of them are aware about harmful effects of the pesticide usage on health. Henceforth continuous education provision on proper mixing or spraying would increase their knowledge and helps to avoid the harmful consequence on health.

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