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## Impacts on farmers health due to pesticides exposure in agriculture sector of Gujrat, Punjab, Pakistan

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**Abstract**

Pesticides are used in excessive amounts in agricultural fields to kill pests and increase crop production. This study is mostly carried out in developing countries like Pakistan. Although these chemicals lessen pests and other microorganisms but at the same time, they have severe bad effects too on health of workers and rest of community which get exposed to pesticides through any mean. This study was done in the city of Gujrat and its surrounding areas with 300 field farmers as participants. This study purpose was to evaluate health problems to workers due to pesticide exposure. Most of the farmers were used to breathe in ambient air with pesticides mostly without the use of any mask or any other personal protective equipment. Results showed that most ad frequent health issues were cough, flue and skin irritations, 75.3% of workers were reporting these problems with 51.3% of workers along confirmed medical reports. Among the respondents, about 41% workers were having cough problem and 60% with flu. Besides this, 15% people from them were experiencing the severe skin allergies and rashes. This study reveals that extreme application of pesticides and lack of use of PPEs have headed to the acute problems in workers which may grow to chronic one and this practice stays continue without any pause. For reducing the pesticide exposure to farmers and minimizing health related problems, a proper guide is require for the use of protective masks and making the workers aware about hazardous effects of pesticides.

**Keywords:** Pesticides, agriculture, pests, PPEs

**1. Introduction**

Globally, pesticides are used extensively in the agriculture sector. These chemicals are used to control the weeds, pests and many other microorganisms in agriculture sector. Pesticides can be uptake by plants or can be synthetic <sup>[1]</sup>. Pesticides play the significant role to maintain the productivity of the crops in agriculture field. They may include herbicides, fungicides, insecticides, plant growth regulators etc. <sup>[2]</sup>.

Many insecticides i.e. organochlorine (OC), efficiently controlled many diseases like typhus and malaria but were banned in advanced countries onward, then time by time other pesticides were developed. They were initially thought to be lethal for the pests but not for the rest of lives like humans. However, the chemicals showed characteristics to produce undesirable impacts on human health and environment. There are about 1 million people per year who tastes death and chronic diseases due to pesticides world-wide <sup>[3]</sup>.

Rachel Carson published 'silent spring' in which the harmful effects of DDT were described in 1962 and Environmental Protection Agency (EPA) banned the pesticides use in agricultural sector. <sup>[4]</sup>. Many workers in Third world countries are using heavy amount of pesticides in agricultural activities, which also includes such types of pesticides which are strictly restricted in industrialized nations <sup>[5]</sup>. Pesticides have ability to harm the animals, plants, humans and even the environment, if they are used incorrectly and when their exposure is high in humans <sup>[6]</sup>. The four routes for the exposure of pesticides are skin (Dermal), lungs (inhalation), mouth (Oral), and eyes. Pesticides persist into the vegetation cover and enter into the food chain, then these pesticides enter into the blood and organ system <sup>[7]</sup>.

The effects from pesticides might be either chronic or acute. Acute health effects refer to the single exposure of human or animal to the chemical and lasts for short time. Chemicals can get into the receiver's body through mouth, skin, lungs and eyes. While chronic effects refer to exposure for quite long time which leads to long-lasting problems. It includes nervous disorder, reproduction alterations, genetic effects, tumors and many more. Due to pesticides almost 54% women exposed to this during pregnancy. Children and fetus are more vulnerable through the pesticides because of weak immune system and cannot detoxify the pesticides <sup>[8]</sup>.

The problems have raised in exposure to occupational workers, especially in field works <sup>[9]</sup>. Due to pesticides serious health threats have been posted to the farmers, when they mix and apply the pesticides in fields and those workers who are involved in the making process of pesticides. General public also get exposed when these pesticides get mixed with water and food <sup>[10]</sup>.

## 2. Literature review

Pesticides are extensively used in agricultural sectors by the farmers in the global level, such as Pakistan in which most of the economy depends on agricultural sector. These are used to increase the production level of agriculture output by controlling and preventing the diseases, pests, weeds etc. Using pesticides can enhance the quality of production proving beneficial for crops, nutritional value of the crop production can be improved along with its safety. In this concern, pesticides are considered an efficient mean for pest control thus economically profitable too <sup>[9]</sup>.

There are about more than 80,000 chemicals that are available in the agricultural industry and almost 4.6 million types of pesticides are used to apply in environment and they are accounting the large portion of total crop productivity in the world. According to a study, pesticides are designed in the way which damage the brain of insect, so it cause neurotoxicity which also cause damaging effects on human and other exposed community. Insects are those organisms which are frequently present in environment. About more than 10,000 insect species have damaged fiber and food crops, with 13.6% annual loss globally <sup>[4]</sup>.

Although the pesticides were manufactured under a strict process to give maximum output and to not affect the environment and human health in any way, but still after all this, many health problems were reported regarding the exposure of pesticides, especially in the workers of this occupation <sup>[15]</sup>. General public can get exposure to pesticides by eating contaminated food and drinking contaminated water with pesticides residues <sup>[16]</sup>. The problems can arise by the use of old containers for pesticides, improper way of use and inappropriate storage conditions. Pesticides prove harmful because these are developed to kill specific organisms so, can have adverse impacts on humans as well <sup>[17]</sup>.

According to WHO, there are many cases of suicides which are related to pesticides. As pesticides are easily and commonly available in the most Latin American and Asian countries, so they are available for such crucial purposes. The very first report regarding the suicides from pesticides was given in the start of the 1990s. Now governments and organizations have shown concern about these cases and there are many researchers who are working on the methods for solving this social issue. To apply the pesticides their registration is an important step which provides the authorities the information about their potential on environment and health of humans. Exposure to pesticides can also happen when attention is not paid on the instructions and ignore the use of Personal Protective Equipment (PPEs) <sup>[18]</sup>.

The effects on humans of pesticides in developing nations have been provoking considerable amount of attention because most of issues are happen in global level. A tremendously high risk associated with the exposure of the pesticides which caused 66,000 cases every year in Nicaragua. In these cases, most are primarily in agricultural workers in rural areas. These pesticides or chemicals are mostly associated with expressively damaged or nervous system disorder among people who perform the practice of

pesticides in the different fields like cotton fields especially in Egypt. The studies of Africa show that pesticides modify to acetyl cholinesterase reserve and enhance very adverse impacts on the agricultural workers especially in Kenya State. In South Africa, recent studies stated that exposure in children due to pesticides is increasing day by day which is most serious problem in that state. The information about on human health cases due to exposure of the pesticides is critical to frame suitable policies and proper legislation for decreasing work-related risks due to pesticide among those people who belong to agriculture sector. Therefore, the main objectives of that study are to recognize impacts on the human health from pesticides in agricultural sector <sup>[19]</sup>.

## 3. Materials and Methods

Research design for this study is Empirical design. The knowledge, which is gain from direct and indirect observation, it can be qualitative or quantitative. In the empirical research design, the questions are asked from the people through a designed questionnaire. In this study, both primary and secondary sources are used. Primary data is gathered from a walk through survey and observation. The secondary form of data which is obtained from the different material i.e. many different books, journals, magazines, newspaper, published articles etc. General observation of the particular area i.e. under pesticide use, is also carried out which will add up in the information about their effects. For the collection of data, we took the quantitative approach with survey through questionnaires.

According to the survey of 1988 the total population of Gujrat was 30,1595 and target population is 300 workers dealing with the pesticides spray in the fields of Gujrat and surrounding areas. Sampling technique which is used in this research is Simple Random Sampling (SRS). Sample size for this research is 300, from which data is collected through Simple Random Sampling. A designed questionnaire is used for collecting data in this research as this was the most suitable and proper way. Our data collection tool is questioner and survey. Our questionnaire contained 23 questions about the demography, working conditions and health effects on workers related to pesticides. Data processing is done through SPSS software which is used for review and analysis of data. We use string for data quantification for calculating the percentages and frequencies. We review data many times to control the quality of data and to remove all the mistakes that could be present in the collection and analysis of the data. It refers to the arrangement of data in groups or classes and the data is further analyzed by the use of SPSS software, based on the general characteristics. The data which is collected, is represented in the form of tables, maps, diagrams. These tables are then interpreted by the members of the group and that information is used whenever it is needed. After this, the conclusion and recommendation is given.

## 4. Theoretical framework

It is a type of structure which contains the information about the research work. It can be obtained by consulting with the existing theories or those concepts which are related to the research statement. This helps in understanding about the concept and problem of the research study <sup>[20]</sup>. The extensive use of pesticides for increasing crop growth, has compromised the health status of number of workers and local community. Pesticides, after spraying, get mixed into air, water, dust and food and when humans breathe in this ambient air, eat the contaminated food, drink residue

containing water, the pesticide residues get into the human body. These can be transferred in host's body through inhalation, dermal (During washing of pesticide containers without using personal protective equipment) and through ingestion.

Wide range of diseases are observed in humans, especially field workers. In skin, pesticides can cause different types of allergies, blisters, open sores, irritations. In blood, precancerous disorder, Alzheimer's disease and Leukemia (Cancer of blood cells). Breathing problems due to pesticides exposure are the most frequent one.

It can lead to asthma, chest pain, throat irritation and also lung cancer which includes the disorders in bronchitis. When pesticides get into the body, they also add up in urinary tract, causing Urological disorders (Bladder control infections, kidney stones), total kidney failure, urinary retention (Inability for empty bladder). These types of problems are not only limited to humans but also to the plants, animals and marine lives. The chemicals which are used as pesticides in fields, remain persistent in the natural environment and also in the food web or food chain and transfers in the living organisms [21].

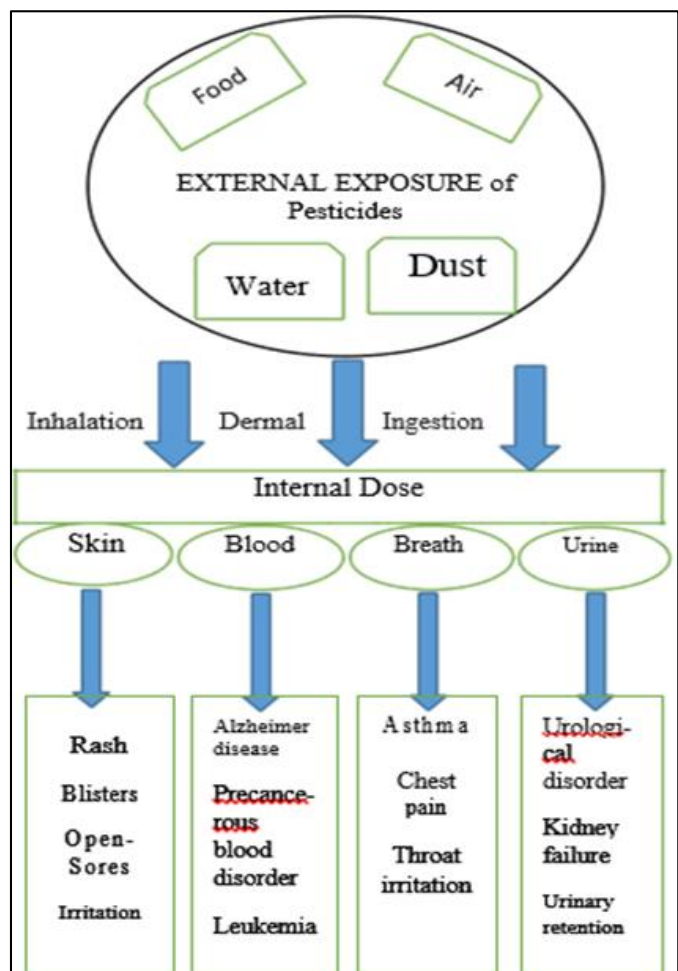


Fig 1: Richard Baldwin, Analytica Chimica Acta, September 2015)

5. Results

Gender

Among the farmers, which were the study participants, there was only one female worker i.e. 0.3% and the male workers were 299 i.e. 99.7%. Though the number of male workers in the agricultural area of Gujrat is notable on Female workers as shown in following graph and table:

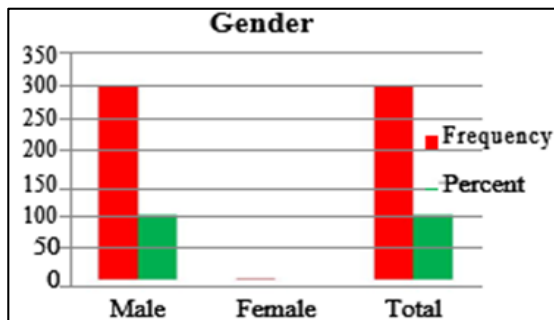


Fig 2: Gender

Data	Frequency	Percent
Male	299	99.7
Female	1	.3
Total	300	100.0

Exposure time with Ambient Air

Following graph predicts that total 82 workers (27.3%) were exposed of ambient air for 8 hours or less at daily bases, 104 workers (34.7%) for 10 hours daily and 114 workers (38%) stay and breathe in the contaminated air for 12 or more hours.

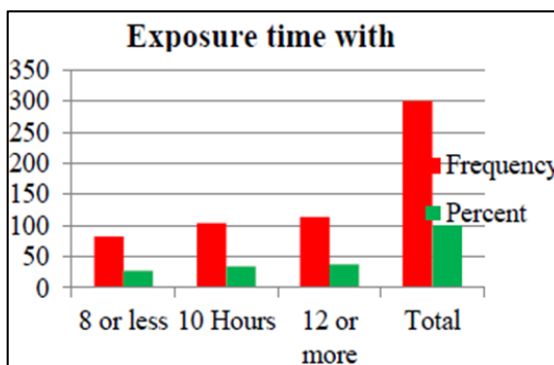


Fig 3: Exposure time with Ambient Air

Data	Frequency	Percent
8 or less	82	27.3
10 Hours	104	34.7
12 or more	114	38.0
Total	300	100.0

Use of protective mask

The following graph predicts that out of 300 respondents, only 135 workers (45%) were using protective masks while spraying pesticides in the fields and 165 workers (55%) do not use any type of protective mask.

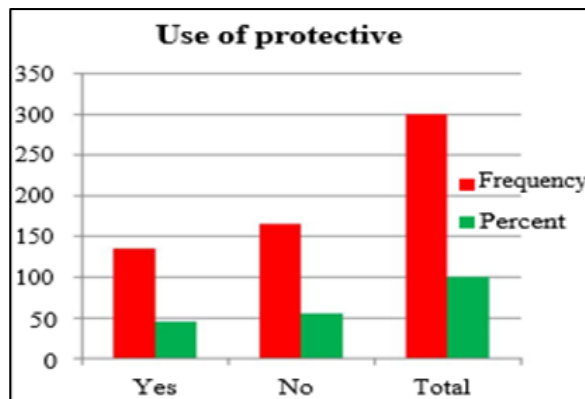


Fig 4: Use of Protective Masks

Data	Frequency	Percent
Yes	135	45.0
No	165	55.0
Total	300	100.0

**Bronchial difficulty with other diseases**

This graph shows that the respondents who says that they have bronchial difficulty with other disease are 114 (38%) and the respondents who says that they do not have bronchial difficulty with other disease are 186 (62%) respectively.

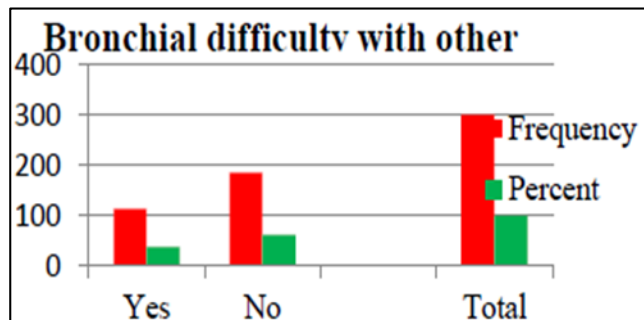


Fig 5: Bronchial difficulty with other diseases

Data	Frequency	Percent
Yes	114	38
No	186	62
Total	300	100.0

**Occurrence of multiple health problems**

This graph shows that the respondents facing cough are 123(41%) and the respondents who are facing flue are 60(20%) the respondents facing eye problem are 71(23.7%) and respondents facing skin problems are 46(15.3%) respectively.

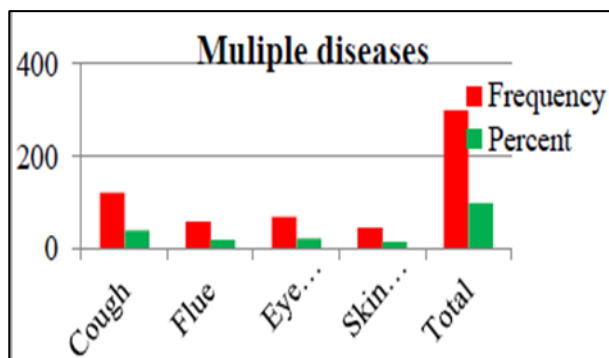


Fig 6: Multiple diseases

Data	Frequency	Percent
Cough	123	41.0
Flue	60	20.0
Eye problems	71	23.7
Skin problems	46	15.3
Total	300	100.0

**Time period for any health issue**

This graph shows that the respondents who does not face such problem are 72(24%) and the problem faced by the respondents during few days ago are 223(74.3%) 1 to 3 months are 62(20.7%) 4 to 6 months are 13(4.3%) 7 to 9 months are 2(0.7%).

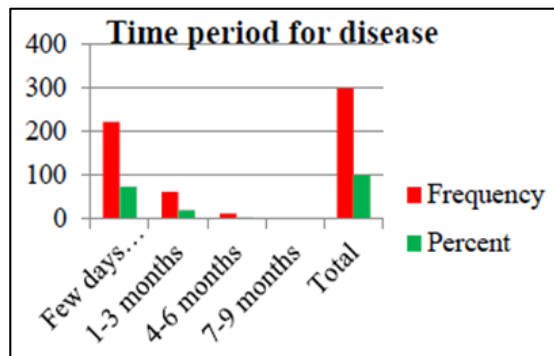


Fig 7: Time period for disease

Data	Frequency	Percent
Few days ago	223	74.3
1-3 months	62	20.7
4-6 months	13	4.3
7-9 months	2	.7
Total	300	100.0

**Visit to physician**

This graph shows that 3(1%) respondents visited to Hakeem, 1(0.3%) respondent visited to the homeopathic doctor and 296(98.7%) visited MBBS doctors respectively.

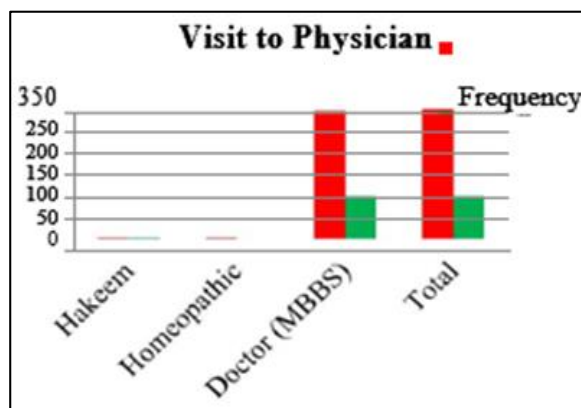


Fig 8: Visit to Physician

Data	Frequency	Percent
Hakeem	3	1.0
Homeopathic	1	.3
Doctor	296	98.7
Total	300	100.0

**6. Discussion**

The harmful effects of pesticides are known to the world as they have high level of toxicity. The exposure to pesticides does not only because health effects in humans but is also a reason of a great range of diseases and illness in humans. There are many ways for exposure to pesticides, human can expose to pesticides when they are working in agricultural fields while treating plants, grain stores and crops. We can also get exposed with pesticides in the process of manufacturing of pesticides, packaging, storing, transporting and spraying. Toxicity from pesticides could be acute or chronic i.e. short term or long term. When the harmful effect can be seen through a single ingestion, skin contact or inhalation this is called acute toxicity and its symbols can be scene within 48 hours.

For example: vomiting, headache, or throat, cough etc. when the effects are seen over a long period is called chronic toxicity. For example depression, cancer, asthma etc. According to our results 27.3% people exposed to ambient air quality in 8 hour and 34.7% people exposed in 10 hours, 38% people exposed to air quality in 12 or more than 12 hours. The people who exposed to ambient air only 45% of those people use protective mask and other personal protective equipment. According to the result 51.3% people medical reports confirm presence of those diseases and 48% people medical report not confirm the presence of those diseases. The most common diseases due to pesticides exposure are cough, flue, skin problem and T.B which effect 75.3% respondents. The 38% respondents have severe kind of bronchitis diseases while 62% does not have bronchitis diseases. Due to ambient air quality and air contamination 41% respondents have cough problem and 60% people have flue problem and 15.3% respondents face skin problems.

## 7. Conclusion

This study concludes that in many countries still pesticides are in use and Pakistan is one of them. As Pakistan is an agricultural country, so the application of pesticides in its all cities is common and regular. The study which was conducted in the city of Gujrat and its surrounding local areas and it was clear that the usage of pesticides on the continuous bases effected the farmer's health. The Farmers who are working in the agricultural fields. The most common issue was cough, almost 123 farmers out 300 were suffering from cough along with other diseases like flue, eye problems and skin irritations. Majority of the farmers were not using any kind of safety measures while handling pesticides. It was known after the study that huge portion of the respondents reported their health problems to the doctor i.e. 296 respondents out of 300 had confirmed medical reports for their problems. There is a need to create awareness among those workers who are involved in spraying pesticides in Gujrat. Special training has to be given in order to reduce the exposure with workers.

## 8. Recommendations

As this is a serious problem to farmers associated with pesticide exposure, different protection measures have to be taken by workers.

- Pesticides way of use in agricultural fields should be taught to the farmers.
- Training session for farmers should be arranged for creating awareness about hazardous effects of pesticides.
- Washing of hands and taking bath after applying pesticides should be focused before eating or entering home.
- Knowledge should be delivered to workers about Personal Protective Equipment (PEPs) and their use while working.
- The instructions given on the pesticide pack should be followed by all the workers before pesticides use.

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