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Hazardous Impacts of Pesticide Usage on Farmer's Health in Cotton Growing Region of District Muzaffargarh, Pakistan

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Pesticides are the chemicals used to control the crop harms by killing the pests causing various diseases in crop plants, thereby playing vital role in yield and crop production. The ingredients of these chemical pesticides are not only lethal to target arthropods but also for human beings. Therefore, the aim of present study was to find out the perception about the impacts of various pesticide usage on the health of cotton growing farmers in rural areas of District Muzaffargarh, Pakistan. Three villages were selected purposively and 130 farmers were approached to perform a questionnaire via face to face interview. Our findings revealed that a major proportion of the respondents (56.9%) were agreed that pesticides cause illness in cotton growing farmers. The results showed the perceptions of respondents that pesticides were responsible to cause various diseases to a great extent in farmers, like increase in headache (48.5%), fatigue (40.0%), insomnia (45.4%), dizziness (37.7%), hand tremors (42.3%), skin disorders (46.9%), birth defects (36.2%), damage of liver (37.7%), damage of kidney (43.8%), respiratory problems (56.9%) and cancer (29.2%). Our results showed non-significant association between age and impacts of pesticide usage on cotton growing farmer's health. It was illustrated that health issues were significantly correlated with education, income, lack of awareness, lack of precautionary measures and lack of facilities or personal protective equipment (PPE).There is need to implement risk reduction strategies and to arrange formal training sessions to address the proper use and storage of pesticides.
Keywords: Pesticides, Health issues, Farmers, personal protective equipment (PPE)

Introduction

At present pesticides are playing an essential role in better yield and profitable crop production [1]. Pesticide is a universal term used for both insecticides as well as different materials like fungicides and herbicides act to prevent pests[2].These pesticide substances are mainly used to repel, kill, or to control harmful living organisms such as herbicides for weeds and unwanted vegetation, insecticides for insects, fungicides for fungus (molds and mildew) and rodenticides for rodents [3].

Approximately about 85% of the overall production of pesticides in the world is used in agriculture sector [3]. However, the enormous usage of pesticides is the major cause of public health problems in the world. The exposure of professional workers to pesticides has been linked with deadly effects on health like fatalities due to birth defects,cancer, leukemia, asthma, disturbance of hormones, antipathy and various allergic reactions [4]. Farmers and workers like pesticide handlers and crop pickers are mainly at high risk because of their direct contact with treated crops, hazardous usage methods, low quality of equipment, unsafe repository and disposal techniques and lack of preventive apparatus [4]–[6]

There are three pivotal routes of entry of pesticide substances in human body such as through skin contamination, gut, and

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lungs. The superficial area of human adult skin is almost 1.73m^2 but it is the major cause of accidental exposure to pesticides. Furthermore, thetype of substances also matters a lot (globular, vapors or particles) as in most of cases inhalation of toxic substances act as the main source for transmission to human bodies. In developing countries, the professional farmers are athigh risk of the exposure of pesticides [7], [8].

The misusage and lack of proper methods and instruments in the use of pesticides are the major reasons for poisoning from pesticides [7]. Some other factors acknowledged by latest research are an absence of protective measures or inappropriate dressing while using pesticides, lack of or poor maintenance of the instruments, false perception of farmers about the harmfulness of pesticides, ecological threat, and carelessness in protective measures while handling of pesticides [9]–[14]. Recent research has revealed the need to increase awareness of farmers through education programs and the importance of communication with the aim to reduce the risks of pesticides[7].

Majority of the farmers in developing countries like Nepal are unaware of different types of pesticides, levels of poisoning, safety precautions and potential hazards on health and environment. Pesticides that are used in cotton today belong to organophosphates and pyrethroids which pose bad effects on human health. The secondary effects pertaining to human health include cancer, birth defects, reproductive problems, tumors, and damage of liver, kidney and neural organs[15].

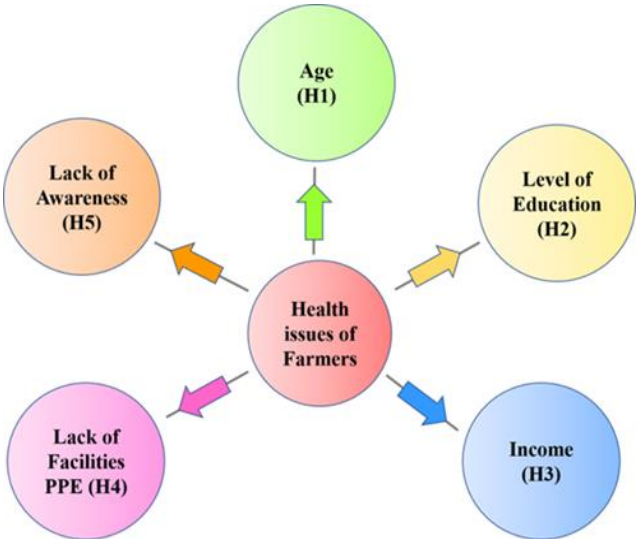
Indian cotton is associated with some of the most dangerous pesticides. India has more cottongrowing farmers than any other country in the world. Indian cotton production is mostly associated with the intensive use of hazardous pesticides. Indian cotton farming is at threatened risk because of the absolute deficiency of safety measures, low-quality equipment, and unavailability of protective clothing or prohibitively expensive. The health of pesticide handlers, growers andCottonpickers are affected in a precarious way in India[16].

Pakistan is the world's fourth-largest producer and the third largest consumer of cotton. Its production is important to Pakistan's agriculture and the overall economy. Nearly 26% of farmers grow cotton, and over 15% of the total cultivated area is devoted to this crop, with production primarily in two provinces: Punjab (80 percent), which has dry conditions, and Sindh (20 percent), which has a more humid climate. Cotton and its by-products (yarn, textiles, and apparel) contribute significantly to the gross domestic product (8 percent), total employment (17 percent), and particularly foreign exchange earnings (54 percent) of the country. However, cotton production in Pakistan faces significant pest damage causing fluctuations in cotton yields and economic losses. Farmer use pesticides to reduce pest attacks on cotton, which affect their health significantly[17].

Figure 1: Theoretical Model (H= Hypothesis)

Pakistan is basically an agricultural country; with its economy largely depending upon a good crop especially cotton yield. Pesticide usage has been undergoing a steady upsurge inPakistan, along with the rest of the world. National and multinational companies are engaged inprofitable business of formulating pesticides in Pakistan. In Pakistan, organophosphate and parathyroid insecticides dominate the markets which are used for cotton cultivators. The climatic condition of Pakistan favors pestreproduction that destroys about 20 percent of the potential cotton crop. The health of the pesticide's handlers, farmers and cotton pickers, in particular, are at high risks due to the irrational use of pesticides. Pesticides cause acute and chronic health effects such as insecticides to inhibit cholinesterase, an enzyme critical for normal functioning of the nervous system [7]. There is lack ofresearch on the awareness level of farmers who are growing cotton and the association of socio-demographic characteristics and health issues of farmers. There should be optimum measures need to be taken in order to safeguard the health issues related to individuals involved in this industry and implement strategic awareness programs in order to avoid hazardous health issues.

This study firstly hypothesized that age of the respondents was associated with health issues (H1), secondly this study hypothesized that the level of education was associated with health issues of the respondents (H2), thirdly income of the respondents was associated with health issues (H3), fourthly lack of facilities (PPE) while using pesticides was associated with health issues (H4) and lastly this study also hypothesized that lack of awareness of the respondents was associated with health issues (H5).



2. Objectives

1) To study the socio-economic characteristics of respondents.

2) To explore the perception of cotton growers about the use of pesticides.
3) Find out the level of knowledge and awareness about the impact of pesticides on health.
4) To suggest some policy measures on the issue.

3. Methodology

The aim of the present study was to find out the perception of the impact of pesticides use on cotton growing farmer's health in rural areas. In this study, a quantitative research methodology was applied and a sample of 130 respondents was selected through random sampling technique. This study was conducted in 3 villages Mouza Yakiwali (Had Bast No-137), Mouza Makwal Hader (Had Bast No- 142) and Mouza Bunday Shah (Had Bast No- 143) of Tehsil Alipur, District Muzaffargarh in Punjab province were selected purposively. To check the accuracy and suitability of research tool, 10 respondents were pretested. After making necessary correction in the research tool, final data was manipulated. Data was collected with the help of a well-designed in-depth interview schedule. Descriptive and inferential statistical techniques were applied for data analysis.

4. Findings

Table 1 indicates a major proportion 40.8% of the respondents had 36-45 years of age, while 35.4% of the respondents had up to 35 years of age and about one-third as 23.8% of them had above 45 years of age. As the educational status of the respondents is concerned, about 33.8% of the respondents were illiterate, while 30.0% of the respondents had primary-middle level education, 22.3% of the respondents had matric and 13.8% were above matric level of education. The results revealed that major proportions of the respondents (80%) belong to the agriculture profession. While the remaining respondents belong to business as 10.8% and 9.2% were employed. According to economic status, about 20.0% of the respondents had up to Rs. 10,000 monthly income from all sources, while a major proportion as 57.7% of the respondents had Rs. 11,000-30,000 monthly income, 13.1% of the respondents had above Rs. 31,000-50,000 and 9.2% had above Rs. 50,000 monthly income respectively.

Table 1: Distribution of different socio-demographic variables (N=130)

Variables	Frequency	Percentage
Respondents age groups (years)		
Less than 35	46	35.4
36-45	53	40.8
Above 45	31	23.8
Level of education		
Illiterate	44	33.8
Primary-Middle	39	30.0
Matric	29	22.3
Above matric	18	13.8
Occupation		
Business	14	10.8
Employee	12	9.2
Agriculture	104	80.0
Average monthly income (PKR)		
Less than 10000	26	20.0
11000-30000	75	57.7
31000-50000	17	13.1
Above 50000	12	9.2

Results of Table 2 show that 56.9% of the respondents had perception that pesticides cause health issues in farmers. And table 3 shows that 53.8% of the respondents had perception that cotton pickers and 51.5%pesticides handlers were most vulnerable to pesticide exposure.

Table 2:Distribution of the respondents according to their perceptions that pesticides in cotton cause ill health of farmers

Pesticides in cotton cause ill health of farmers	Frequency	Percentage
Agree	74	56.9
Neutral	22	16.9
Disagree	34	26.2
Total	130	100.0

Table 3:Distribution of the respondents according to their perceptions that who are most vulnerable to pesticide exposer in field

Vulnerable groups	Great extent		Some extent		Not at all		Total	
	F.	%	F.	%	F.	%	F.	%
Pesticides handlers	67	51.5	27	20.8	36	27.7	130	100.0
Cotton Farmers	55	42.3	35	26.9	40	30.8	130	100.0
Cotton Pickers	70	53.8	28	21.5	32	24.6	130	100.0
Children	40	30.8	44	33.8	46	35.4	130	100.0
Rural Community	44	33.8	44	33.8	42	32.3	130	100.0
Livestock	60	46.2	36	27.7	34	26.2	130	100

The farmers who used pesticides experience increase in headache 48.5% to great extent, 18.5% to some extent and 33.1% have no perception. About 40.0% of the respondents had perception that pesticide users experience fatigue to great extant, 26.2% to some extent and 33.8% had no perception. The respondents had perception that 45.4% of the pesticide's users experienced insomnia to great extant, 27.7% to some extent whereas 26.9% had no perception. According to the perceptions of the respondents, dizziness experience by pesticide users was 37.7% to great extent, 28.5% to some extent and 33.8% had no perceptions.The results also show that 42.3% of the respondents had perceptions that pesticides users experienced hand tremors to great extent, 25.4% of them had to some extant while 32.3% of them had no perception. The respondents had shown the perception that 46.9% of the pesticide's users had experienced skin infections to a great extant, 22.3% had perception to some extent whereas 30.8% had shown no perception.

The respondents had perceptions that 29.2% of the pesticide's users experienced cancer to great extent, 36.2% to some extent and 34.6% of the respondent had no perception. 36.2% of the respondents had perceptions that pesticides users experienced birth defects to great extent, 28.5% to some extent and 35.4% had shown no perceptions. 37.7% of the respondents had perceptions that pesticides users experienced damage of liver to great extent, 34.6% to some extent while 27.7% had no perceptions. The 43.8% of the total respondents had perceptions that pesticide users experienced damage of kidney to great extent, 26.2% had perceptions to some extent and 30% had no perceptions. 56.9% of the respondents had perceptions that pesticide users experienced respiratory problems to great extent, 14.6% experienced to some extent whereas 28.5 percent of the respondents had no perceptions (Table 4).

Table 4: Distribution of the diseases among the respondents according to their perceptions due to usage of agriculture pesticides

Pesticides user's disease	Great extent		Some extent		Not at all		Total	
experiences	F	%	F	%	F	%	F	%
Increase in headaches	63	48.5	24	18.5	43	33.1	130	100.0
Fatigue	52	40.0	34	26.2	44	33.8	130	100.0
Insomnia	59	45.4	36	27.7	35	26.9	130	100.0
Dizziness	49	37.7	37	28.5	44	33.8	130	100.0
Hand tremors	55	42.3	33	25.4	42	32.3	130	100.0
Skin disorders	61	46.9	29	22.3	40	30.8	130	100.0
Cancer	38	29.2	47	36.2	45	34.6	130	100.0
Birth defects	47	36.2	37	28.5	46	35.4	130	100.0
Damage of liver	49	37.7	45	34.6	36	27.7	130	100.0
Damage of kidney	57	43.8	34	26.2	39	30.0	130	100.0
Respiratory problems	74	56.9	19	14.6	37	28.5	130	100.0

Results in table 5 showed that Chi-square value has a non-significant association between age of the respondents and health issues because of the usage of pesticides. Gamma value also showed a negative relationship between the variables which means respondents with more age were facing more health issues as compared to the respondents with less age. The Chi-square value (15.67) showed significant association between level of education and health issues, furthermore Gamma value also showed positive relationship so educated respondents showed more positive perception about the association of pesticides with health issues. The income of the respondents was associated with health issues because Chi-square value (23.79) showed highly significant association. Gamma value alsopresents a positive relationship which denotes that the respondents with high level of income showed more perception that pesticide usage in cotton causes health issues as compared to the respondent with low level of income.

Furthermore, the current study found that the Chi-square value (11.223) showed a significant association between lack of facilities (PPE) while using pesticides and health issues of the respondents and gamma value also demonstrated positive relationship between the variable. This study also found that Chi-square value (13.45) showed a significant association between lack of awareness about precautionary measures while using pesticides and health issues of the respondents (Table 5).

Table 5:Association of different socio-demographic characteristics with causes of health problems

Variables	Chi-square	*d.f.*	P-value	Gamma
Association between age of the respondents and Pesticides in cotton cause health issues	2.131	4	0.712^{Ns}	-0.025

Association between education of the respondents and pesticides in cotton cause health issues	15.67	6	0.016*	0.258
Association between income of the respondents and pesticide in cotton cause their health issues	23.79	4	0.000**	0.465
Association between lack of facilities and Pesticides in cotton cause health issues	11.223	4	0.024*	0.288
Association between lack of awareness of precautionary measures and pesticide in cotton cause health issues	13.45	4	0.009**	-0.252

5. Discussion

Understanding the perception of the cotton growing farmers about the health issues caused by the use of pesticides. In present study, maximum respondents were well aware of the hazardous effects of the pesticide's usage on the farmer's health such as rise in headache, fatigue, insomnia, hand tremors, skin infections, kidney damage and respiratory problems. Previous study [18] found that pesticide handlers experienced physical weakness, skin itching, dizziness, diabetes, psychological disorder, graying hair, alcohol addiction in young generation and the rising chances of cancer in farmers including their families during hot and windy summer seasons. It may be due to majority of illiterate respondents and hence deficiency of knowledge about the proper methodology and safe practices to use pesticides [5], [19] or more crop yield production and high income is their concern rather their own health [20]. Because of the illiteracy and lack of technical knowledge and training, they are unable to read the precautions mentioned on labels [21].

Furthermore, this study found that the income and the lack of facilities of personal protective equipment (PPE) were associated with health issues. The cotton-growing farmers don't have PPE because these are expensive and are not affordable [1]. The probability of poisoning decreases from 44%-80% with the use of personal protective equipment [22]. While there are increased chances of respiratory and dermal exposure to pesticides with the lack of using personal protective equipment PPE [1]. This study found a significant association between the level of awareness and health issues of cotton growing farmers. This suggests that farmers and other people linked with pesticides lack the awareness of protecting themselves and the environment from harmful effects of pesticides [1]. On the other hand, it was also observed [18, 23] that most of the respondents were well aware of the hazardous effects of pesticides but they had not taken any safety measures against this threat. While using pesticides, protective measures were not ensured. The farmers store pesticides at home, where they mix these pesticides and take containers to fields. Frequently the farmers after spraying were used to wash the containers in nearby available water. The empty boxes, packets or cans were thrown in nearby water sources or in the fields and it shows their carelessness and laziness towards harmful effects of pesticides. This study provides the perception of the cotton growing farmers about the health issues caused by the pesticides.

6. Conclusions

Present study concludes that the level of education, income, provision of personal protective equipment and the awareness level of the respondents were significantly associated with the health issues of cotton growing farmers. Government and non-government agencies are required to conduct formal training sessions to address the proper use and storage of pesticides, benefits of using PPE and risk reduction strategies in the use of pesticides.

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Author's contribution

Azam Tariq;Formal analysis, Writing – original draft, Writing – review & editing.
Muhammad waqas; Data collection and data entry.
Tian Behai;Supervision, Writing – review & editing.
Muhammad Iqbal; Proof reading, a part of writing.
Sajjad ali; Data curation and Methodology.
Shahid Ullah Khan; Editing, a part of data analysis.
Nadeem Abbas;Software.
Muhammad Naeem ul Hassan; Data collection.
Qurban Ali; Questionnaire preparation.

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