The survey aims to assess the knowledge, perception and health hazards associated with the use of and exposure to pesticides and to determine self-reported health symptoms from the exposure to pesticides among 270 oil plantation workers in PAPAR, SABAH. The hazards from pesticides have become a global concern. The increase in harm to field workers from pesticide intoxication is mainly because of lack of knowledge of pesticide exposure, pesticide handling techniques and protective equipment's.

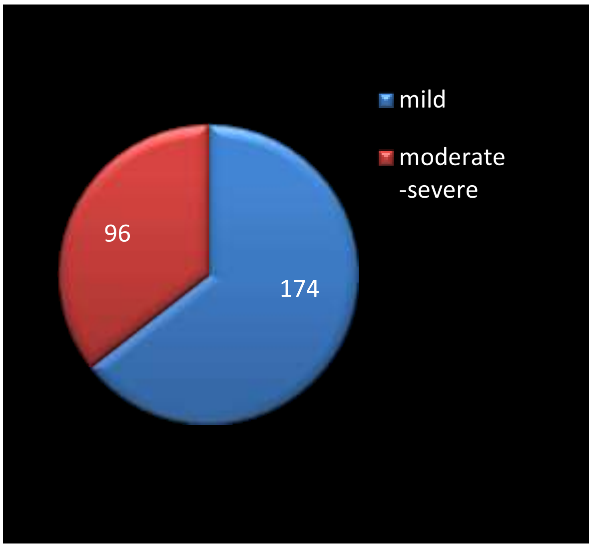
A cross section of oil plantation workers in the Paper District were asked to fill questionnaire which included various questions related to their demographic characteristics like age, gender, education level, income level, etc , usage of and exposure to pesticides and health symptoms.

From the questionnaire symptoms could be classified into 2 categories i.e., mild symptoms (dizziness, headache, skin irritation, eye irritation) and moderate-severe symptoms (convulsion, fever, vomiting, diarrhoea).

SymtomsCategory

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mild	174	64.4	64.4	64.4
	Moderate-Severe	96	35.6	35.6	100.0
	Total	270	100.0	100.0	

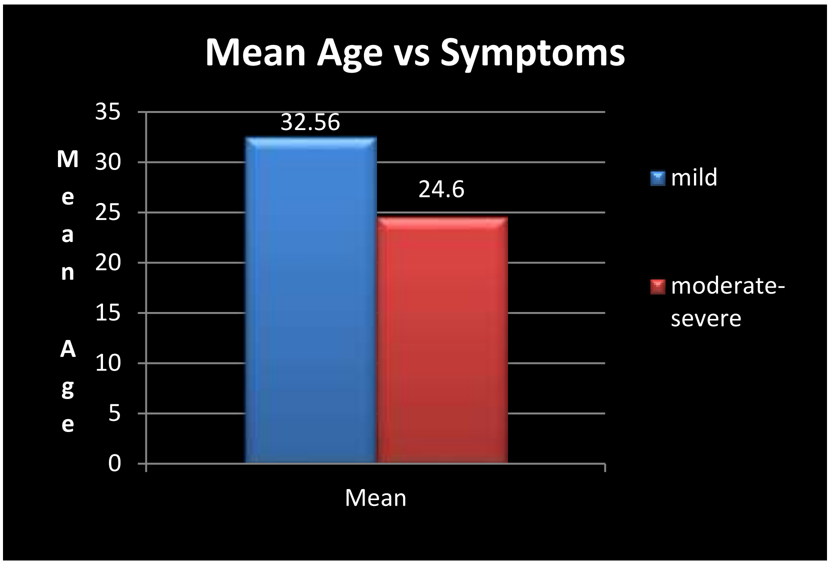
It is clear from the above table that there are 174 workers who show mild symptoms whereas 96 workers show moderate-severe symptoms. A pie chart can be prepared for the same.



The total number of workers was 270 and the following is a detailed analysis of demographic characteristics, perceptions related to health and use of protective gears when exposed to pesticides:

1. MEAN AGE VS SYMPTOMS

In this, we are interested in comparing the mean age of participants who show mild symptoms to the mean age of participants who show moderate-severe symptoms. From the obtained data the following bar graph can be made:



For comparison of two independent means, we run independent sample t test. The null hypothesis may be set as:

Ho: $\mu_{mild} - \mu_{mod} = 0$, i.e., the difference in the mean age of participants with mild symptoms to the mean age of participants with moderate-severe symptoms is zero.

H1: $\mu_{mild} - \mu_{mod} \neq 0$, i.e., the difference in the mean age of participants with mild symptoms to the mean age of participants with moderate-severe symptoms is not equal to zero.

Following outputs are obtained:

Group Statistics

	SymtomsCategory	N	Mean	Std. Deviation	Std. Error Mean
Age in years	Mild	174	32.56	9.036	.685
	Moderate-Severe	96	24.60	3.567	.364

From the group statistics table we can observe that there are 174 participants who show mild symptoms with mean age 32.56 years whereas 96 participants show moderate-severe symptoms with mean age 24.60 years.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Age in years	Equal variances assumed	74.257	.000	8.276	268	.000	7.959	.962	6.066	9.853
	Equal variances not assumed			10.259	248.439	.000	7.959	.776	6.431	9.487

From the independent sample test table we extract the actual results of the independent sample test. Here we can observe that the results of t-test are reported twice. This is because Levene's test checks the assumption that population variance are equal. Since the significant value in equal variances assumed row is 0.0001 < 0.05 i.e., p-value is very very low at 5% level of significance, thus we say that the population variances are not same, so we proceed from the equal variance not assumed row to the t- test for equality of means column.

The mean difference column gives the difference in the mean age of participants showing mild symptoms to mean age of participants showing moderate-severe symptoms which is 7.959 in our case. Also, this difference is positive so we can say that the mean age of first group is significantly higher that the mean age of second group. Now let us look at the t and df column. The computed test statistic at 248.439 degrees of freedom is $t_{248.439} = 10.259$. Also, the significant 2 tailed value which is the p-value to the test statistic and degrees of freedom is 0.000 at 5% level of significance. Lastly, we have the column for confidence interval, which complements the test significance results. Here the confidence interval is (6.431, 9.487).

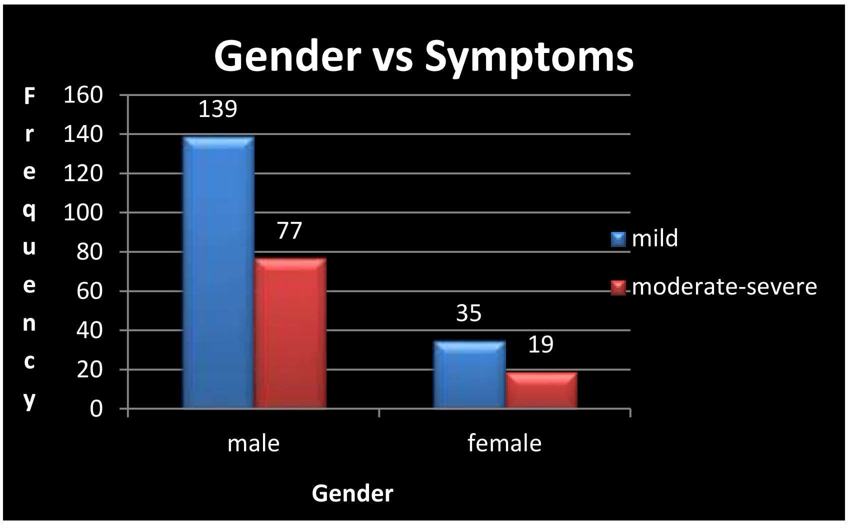
From the above observations we may conclude as:

i) Since, the p value for the given test statistic and degrees of freedom 0.000 < 0.05 so can say that the null hypothesis may not be accepted at 5% level of significance, which means that the mean age of participants with mild symptoms differs significantly from the mean age of participants with moderate-severe symptoms.

ii) Also, from the confidence interval we see that 0 is not included in the interval (6.431, 9.487), so the null hypothesis may not be accepted.

2. GENDER VS SYMPTOMS

In this we are interested in knowing whether the participant's gender is associated with the symptoms or not. Out of 270 participants, we observed that 216 are males and out of 174 participants who show mild symptoms 139 are males. Bar graph for the obtained data is as:



To know the participant's gender is associated with the symptoms or not we use χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: Participant's gender and Symptoms are independent of each other.
H1: Participant's gender and Symptoms are not independent i.e., the symptoms shown by participants are dependent on participants gender.

Following outputs are obtained:

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
Gender	male	Count	139	77	216
		% within Gender	64.4%	35.6%	100.0%
	female	Count	35	19	54
		% within Gender	64.8%	35.2%	100.0%
Total		Count	174	96	270
		% within Gender	64.4%	35.6%	100.0%

It is quite evident that majority of the oil plantation workers i.e., 80% are males. Also, from the above crosstabs table we can see that among 174 participants with mild symptoms 139 are males and 35 are females and among 96 participants with moderate-severe symptoms 77 are males and 19 are females. This table allows us to understand that both males and females, who show moderate-severe symptoms are comparatively less to those participants who show mild symptoms.

Based on the above crosstabs, we can easily obtain the table of expected frequency. Below is a table for the same:

	EXPECTED FREQUENCY TABLE		
	Symptoms		
Gender	**mild**	**moderate-severe**	**Total**
Male	139.2	76.8	**216**
Female	34.8	19.2	**54**
Total	**174**	**96**	**270**

Here we can observe that among 174 participants showing mild symptoms, approximately 139 are males and approximately 35 are females and among 96 participants showing moderate-severe symptoms, approximately 77 are males and approximately 19 are females which is same as the data acquired from crosstabs table.

The next table obtained is the table of chi square tests.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.004[b]	1	.949		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.004	1	.949		
Fisher's Exact Test				1.000	.542
Linear-by-Linear Association	.004	1	.949		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.20.

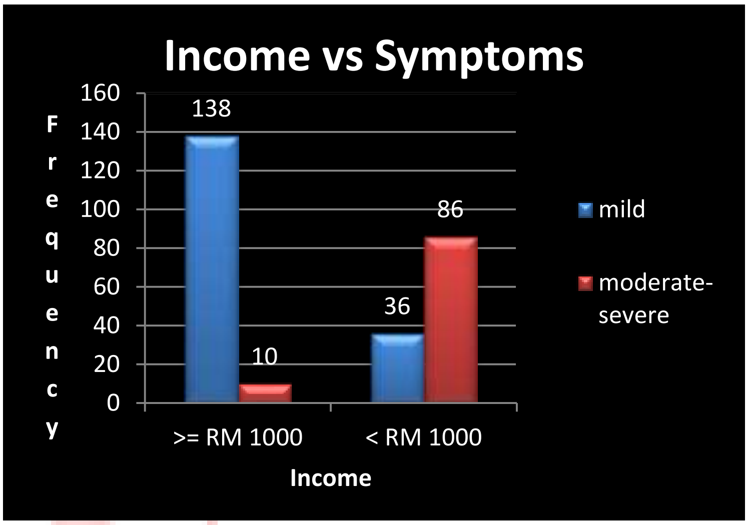
In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 0.004 whereas the tabulated $\chi^2_{0.05}(1)$ is 3.841. Hence, we can clearly see that calculated χ^2 is much less than the tabulated χ^2 i.e., $0.04 < 3.841$. Also, the p value for the given test statistic and degrees of freedom is 0.949, which is greater than 0.05.

To make a decision i.e., to accept the null hypothesis or not, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Hence, we can say that at 5% level of significance, we may accept the null hypothesis and conclude that there is no statistically significant association between the genders of the participants and the symptoms i.e., participants showing mild or moderate-severe symptoms is irrespective of the attribute of he or she being a male or a female.

3. INCOME VS SYMPTOMS:

In this we are interested in knowing whether the household's monthly income is associated with the symptoms or not. Out of 270 participants, we observed that 148 households have monthly income greater than or equal to RM 1000and out of 174 participants who show mild symptoms 36 households have monthly income less than RM 1000. Bar graph for the obtained data is as:



To know the household's monthly income is associated with the symptoms or not we use χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: Household's monthly income and Symptoms are not associated i.e., independent of each other.
H1: Household's monthly income and Symptoms are associated i.e., the symptoms shown by workers depend upon households income.

Following outputs are obtained:

Income1000 * SymtomsCategory Crosstabulation

			SymtomsCategory		
			Mild	Moderate-Severe	Total
Income1000	>= RM1000	Count	138	10	148
		% within Income1000	93.2%	6.8%	100.0%
	<RM1000	Count	36	86	122
		% within Income1000	29.5%	70.5%	100.0%
Total		Count	174	96	270
		% within Income1000	64.4%	35.6%	100.0%

From the above crosstabs table we can see that among 174 participants with mild symptoms 138 household's have monthly income >= RM 1000 36 household's have monthly income <RM 1000 and among 96 participants with moderate-severe symptoms 10 household's have

monthly income >= RM 1000 and 86 household's have monthly income <RM 1000. From the above crosstabs, we can easily obtain the table of expected frequency. Below is a table for the same:

	EXPECTED FREQUENCY TABLE		
	Symptoms		
Income	**mild**	**moderate-severe**	**total**
>=RM 1000	95.4	52.6	**148**
<RM 1000	78.6	43.4	**122**
total	**174**	**96**	**270**

Here we can observe that among 174 participants showing mild symptoms, approximately 95 household's have monthly income >= RM 1000 and approximately 79 household's have monthly income <RM 1000 and among 96 participants showing moderate-severe symptoms, approximately 53 household's have monthly income >= RM 1000 and approximately 43 household's have monthly income <RM 1000.

The next table obtained is the table of chi square tests.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	118.555[b]	1	.000		
Continuity Correction[a]	115.790	1	.000		
Likelihood Ratio	130.221	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	118.116	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

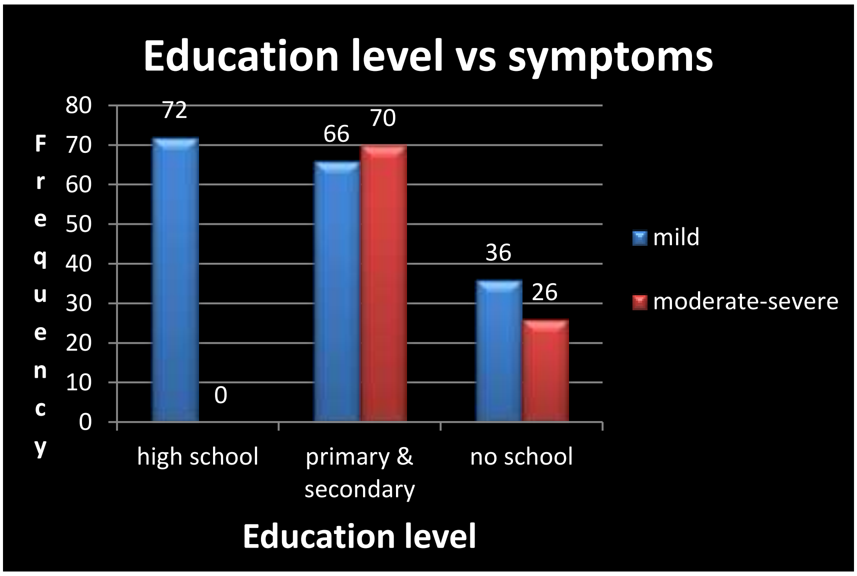
b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 43. 38.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 118.555 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841.
To make a decision we follow the same criterion as we followed in part (2. Gender vs symptoms).

Here, we can clearly see that calculated χ^2 very very high from tabulated χ^2 i.e., 118.555 >>> 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000, we can say that at 5% level of significance, we may not accept the null hypothesis and conclude that there is an association between the symptoms and households monthly income.

4. EDUCATION LEVEL VS SYMPTOMS

Here, we are interested in studying, if the education level or literacy has an association with the symptoms. From the obtained data, following bar graph is prepared.



We can observe that 72 workers have completed high school, 136 workers have completed primary and secondary school and 62 workers no formal education.

With the education level of a participant, one can understand if he has the intellect to understand the usage of different components of pesticides. If the worker is illiterate, there are greater chances for the worker to face difficulty in performing critical tasks. For this, we again use χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: Education level and Symptoms are not associated i.e., independent of each other.
H1: Education level and Symptoms are associated i.e., Symptoms are dependent upon education level.
Following outputs are obtained:

edecation category * SymtomsCategory Crosstabulation

			SymtomsCategory		
			Mild	Moderate-Severe	Total
edecation category	high school	Count	72	0	72
		% within edecation category	100.0%	.0%	100.0%
	primary & secondary school	Count	66	70	136
		% within edecation category	48.5%	51.5%	100.0%
	no school	Count	36	26	62
		% within edecation category	58.1%	41.9%	100.0%
Total		Count	174	96	270
		% within edecation category	64.4%	35.6%	100.0%

From the above table of crosstabs we can observe that workers who have high school education show mild symptoms only i.e., all 72 workers show mild symptoms only, out of 136 workers with primary and secondary school 66 show mild symptoms and 70 show moderate-severe symptoms and out of 62 workers with no schooling 36 show mild symptoms and 26 show moderate-severe symptoms. Based on the above observed table following expected frequency table is made:

	EXPECTED FREQUENCY TABLE		
	Symptoms		
Education level	**Mild**	**moderate-severe**	**Total**
high school	46.4	25.6	**72**
primary & secondary	87.6	48.4	**136**
no school	40.0	22.0	**62**
Total	**174**	**96**	**270**

Here we observe that theoretical frequency of workers who have high school education show mild symptoms (46) as well as moderate-severe symptoms (26). Unlike crosstabs, maximum number of workers constitute the cell with primary and secondary level showing mild symptoms and the number of workers with no schooling showing mild symptoms (40) are approximately double to that of workers with no schooling showing moderate-severe symptoms(22).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	55.859[a]	2	.000
Likelihood Ratio	78.693	2	.000
Linear-by-Linear Association	28.423	1	.000
N of Valid Cases	270		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.04.

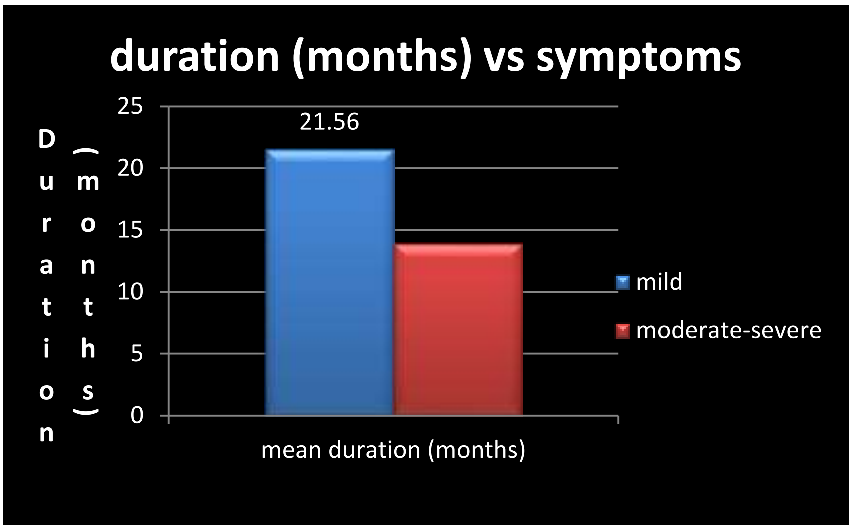
In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 55.859 whereas the tabulated $\chi^2_{0.05}$ (2) is 5.991. Also, the significant value is 0.000.

Now, to make a decision we follow the same criterion as we followed in part (2. Gender vs symptoms).

Here, we can clearly see that calculated χ^2 very very high from tabulated χ^2 i.e., 55.859 >> 5.991. Also, the p value for the given test statistic and degrees of freedom is 0.000, we can say that at 5% level of significance, we may not accept the null hypothesis and conclude that there is an association between the symptoms and the education level of a worker.

5. MEAN PESTICIDE APPLICATION DURATION VS SYMPTOMS

In this we want to know if the symptoms shown by the oil plantation workers are due to long duration of months since they have been using pesticides. From the obtained data the following bar graph can be made:



For comparison of two independent means, we run independent sample t test. The null hypothesis may be set as:

Ho: $\mu_{mild} - \mu_{mod} = 0$, i.e., the difference in the mean duration of pesticide application by workers (in mths) with mild symptoms to the mean duration of pesticide application by workers (in mths) with moderate-severe symptoms is zero.

H1: $\mu_{mild} - \mu_{mod} \neq 0$, i.e., the difference in the mean duration of pesticide application by workers (in mths) with mild symptoms to the mean duration of pesticide application by workers (in mths) with moderate-severe symptoms is not equal to zero.

Following outputs are obtained:

Group Statistics

	SymtomsCategory	N	Mean	Std. Deviation	Std. Error Mean
duration in month	Mild	174	21.5690	9.87806	.74885
	Moderate-Severe	96	13.9792	7.04568	.71910

From the group statistics table we can observe that there are 174 workers who show mild symptoms with mean duration of pesticide application of approximately 21.5 months whereas 96 workers who show moderate-severe symptoms with mean duration of pesticide application of approximately 13.9 months.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
duration in month	Equal variances assumed	38.240	.000	6.650	268	.000	7.58980	1.14129	5.34276	9.83684
	Equal variances not assumed			7.310	250.803	.000	7.58980	1.03821	5.54507	9.63452

From the independent sample test table we extract the actual results of the independent sample test. Here we can observe that the results of t-test are reported twice. This is because Levene's test checks the assumption that population variance are equal. Since the significant value in equal variances assumed row is 0.000 < 0.05 i.e., p-value is very very low at 5% level of significance, thus we say that the population variances are not same, so we proceed from the equal variance not assumed row to the t- test for equality of means column.

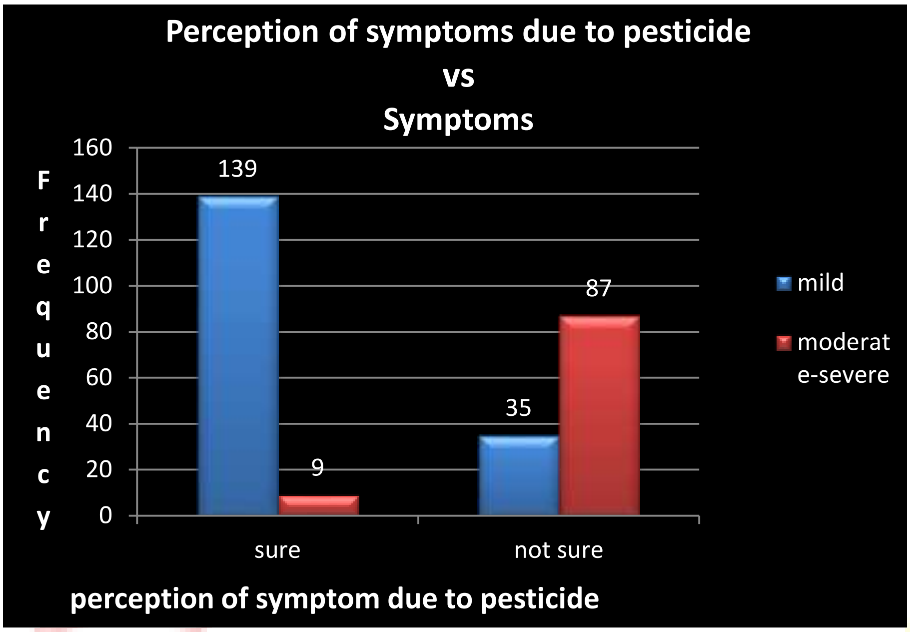
Now let us look at the t and df column. The computed test statistic at 250.803 degrees of freedom is $t_{250.803} = 7.310$. Also, the significant 2 tailed value which is the p-value to the test statistic and degrees of freedom is 0.000 at 5% level of significance. Lastly, we have the column for confidence interval, which complements the test significance results. Here the confidence interval is (5.545, 9.634).

Since, the p value for the given test statistic and degrees of freedom 0.000 < 0.05 so we may infer that the null hypothesis may not be accepted at 5% level of significance, which means that mean duration of pesticide application by workers (in mths) with mild symptoms differs significantly from the mean duration of pesticide application by workers (in mths) with moderate-severe symptoms.

Also, from the confidence interval we see that 0 is not included in the interval (5.545, 9.634, so the null hypothesis may not be accepted.

6. PERCEPTIONS OF SYMPTOMS DUE TO PESTICIDES VS SYMPTOMS

In this we want to study if the workers perception of knowing that the symptoms shown by him are due to pesticides holds. From the obtained data following bar graph is prepared:



Here, we use χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: Symptoms and workers perception of symptoms due to pesticides are independent of each other.
H1: Symptoms and workers perception of symptoms due to pesticides are dependent.

Following outputs are obtained:

SurePesticideCausingSymptoms * SymtomsCategory Crosstabulation

			SymtomsCategory		
			Mild	Moderate-Severe	Total
SurePesticide CausingSymptoms	sure	Count	139	9	148
		% within SurePesticide CausingSymptoms	93.9%	6.1%	100.0%
	Not sure	Count	35	87	122
		% within SurePesticide CausingSymptoms	28.7%	71.3%	100.0%
Total		Count	174	96	270
		% within SurePesticide CausingSymptoms	64.4%	35.6%	100.0%

From the above crosstabs table we can see that among 148 workers, 139 and 9 workers are sure of having mild symptoms and moderate-severe symptoms respectively due to pesticides whereas among 122 workers, 35 and 87 workers are not sure of having mild symptoms and moderate-severe symptoms respectively due to pesticides. From the above crosstabs, we can easily obtain the table of expected frequency. Below is a table for the same:

	EXPECTED FREQUENCY TABLE		
	Symptoms		
Perception	**mild**	**moderate-severe**	**total**
Sure	95.4	52.6	**148**
not sure	78.6	43.4	**122**
Total	**174**	**96**	**270**

These are the theoretical frequencies obtained corresponding to the crosstabs. We observe that it was expected that among 174 workers showing mild symptoms, approximately 94 workers were to be sure and 79 workers were to be unsure that the symptoms were due to pesticides and among 96 participants showing moderate-severe symptoms, approximately 53 workers were to be sure and 43 workers were to be unsure that the symptoms were due to pesticides.

The next table obtained is the table of chi square tests.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	124.184[b]	1	.000		
Continuity Correction[a]	121.353	1	.000		
Likelihood Ratio	137.362	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	123.724	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 43. 38.

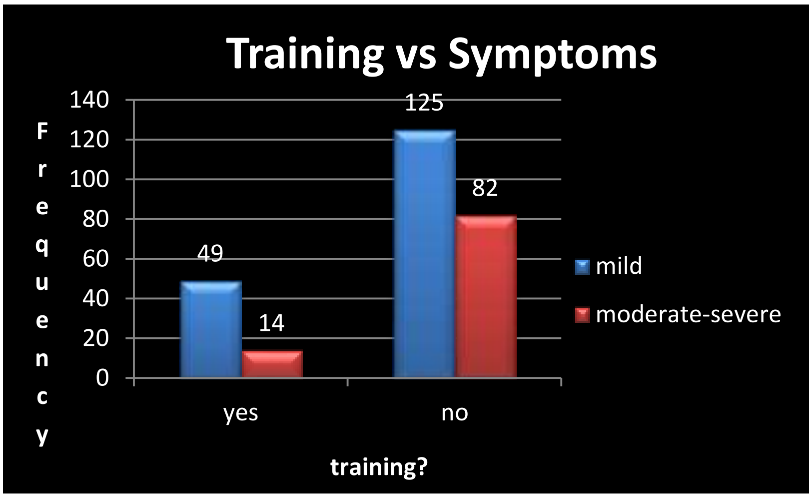
In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 124.184 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000

To make a decision we follow the same criterion as we followed in part (2. Gender vs symptoms).

Here, we can clearly see that calculated χ^2 is very very high from tabulated χ^2 i.e., 124.184 >>> 3.841 and p value is very small i.e., 0.000 < 0.05, hence, we can say that at 5% level of significance, we may not accept the null hypothesis.

7. TRAINING VS SYMPTOMS

Regular training given to workers ensures the safe usage of pesticides while preventing environment pollution and health hazards. We want to study the effect of training on symptoms shown by the oil plantation workers. That is we want to see if there is an association between the training and symptoms. For the data collected, following bar graph is prepared:



To know whether training is associated with the symptoms or not we use χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent of the training given to workers i.e., they are not associated.
H1: The symptoms shown by a worker are dependent of the training given to workers i.e., they are associated.

Following outputs are obtained:

have you recieved any training on handling pesticide * SymtomsCategory Crosstabulation

			SymtomsCategory		
			Mild	Moderate-Severe	Total
have you recieved any training on handling pesticide	yes	Count	49	14	63
		% within have you recieved any training on handling pesticide	77.8%	22.2%	100.0%
	no	Count	125	82	207
		% within have you recieved any training on handling pesticide	60.4%	39.6%	100.0%
Total		Count	174	96	270
		% within have you recieved any training on handling pesticide	64.4%	35.6%	100.0%

From the above crosstabs table we can see that among 174 participants with mild symptoms 49 workers have received training and 125 have not whereas among 96 workers with moderate-severe symptoms 14 have received training and 82 have not. From the above crosstabs an expected frequency table can be formed:

	EXPECTED FREQUENCY TABLE		
	Symptoms		
Training	**mild**	**moderate-severe**	**Total**
Yes	40.6	22.4	**63.0**
No	133.4	73.6	**207.0**
total	**174.0**	**96.0**	**270.0**

Among the expected 174 workers showing mild symptoms, approximately 41 workers were expected to have received training and 133 have not received training whereas among the expected 96 workers showing moderate-severe symptoms approximately 22 workers were expected to have received training and 77 to have not.

The next table obtained is the table of chi square tests.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.376[b]	1	.012		
Continuity Correction[a]	5.639	1	.018		
Likelihood Ratio	6.734	1	.009		
Fisher's Exact Test				.016	.008
Linear-by-Linear Association	6.352	1	.012		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.
40.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 6.376 whereas the tabulated $\chi^2_{0.05}(1)$ is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.012.

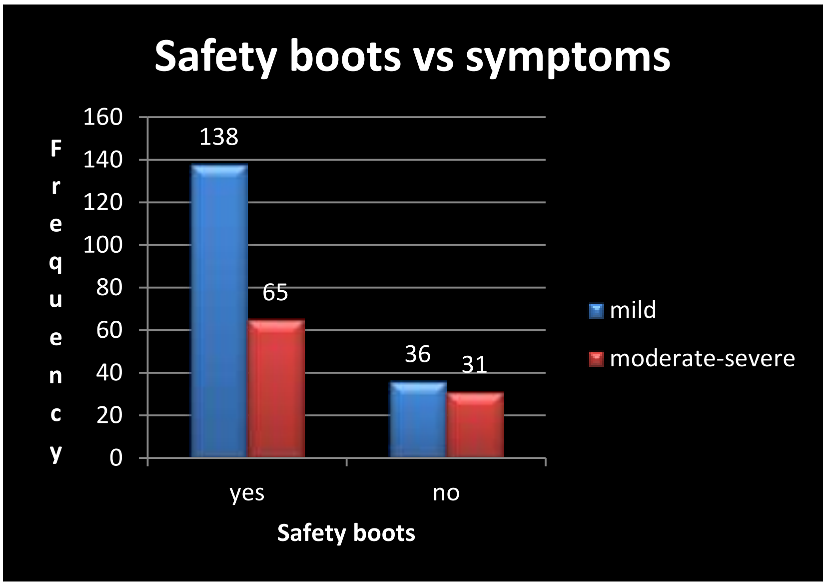
To make a decision i.e., to accept the null hypothesis or not, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.012 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the symptoms and the training received by the workers.

Moving to the next section where we are interested in assessing use of protective equipments like special boots, protective clothes, gloves, etc by the oil plantation workers.

8. SAFETY BOOTS VS SYMPTOMS

Out of 270 workers, 203 (approximately 75%) of the them wore safety boots and 67 of them did not wear protective boots.



Now we are interested in knowing whether the use safety boots actually protects the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the use of safety boots.
H1: The symptoms shown by a worker are dependent on the use of safety boots.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
safety measure usage of protective boots	yes	Count	138	65	203
		% within safety measure usage of protective boots	68.0%	32.0%	100.0%
	no	Count	36	31	67
		% within safety measure usage of protective boots	53.7%	46.3%	100.0%
Total		Count	174	96	270
		% within safety measure usage of protective boots	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 203 workers who use safety boots, 138 workers show mild symptoms and 65 workers show moderate-severe symptoms, i.e., 32% of the workers who use safety shoes show excessive symptoms whereas out of 67 workers who do not wear safety boots, 36 workers show mild and 31 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.464[b]	1	.035		
Continuity Correction[a]	3.863	1	.049		
Likelihood Ratio	4.364	1	.037		
Fisher's Exact Test				.040	.026
Linear-by-Linear Association	4.447	1	.035		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23. 82.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 4.464 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.035.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.035 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the use of safety boots and the symptoms shown by the workers.

Risk Estimate

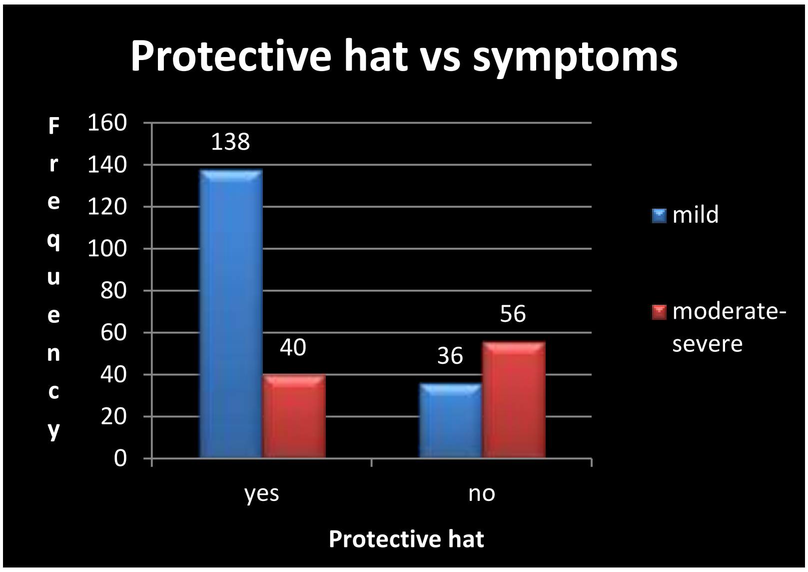
	Value	95% Confidence Interval Lower	95% Confidence Interval Upper
Odds Ratio for safety measure usage of protective boots (yes / no)	1.828	1.041	3.212
For cohort SymtomsCategory = Mild	1.265	.994	1.611
For cohort SymtomsCategory = Moderate-Severe	.692	.499	.959
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio for safety measure usage of protective boots = 1.828. So we can say that workers who do not use safety boots show mild symptoms 1.828 times more likely to workers who show mild symptoms and use safety boots.

9. ~ NA ~

10. PROTECTIVE HAT VS SYMPTOMS

Out of 270 workers, 178 (approximately 66%) of the them wore protective hat and 92 of them did not wear protective hat.



Now we are interested in knowing whether the use protective hat actually protects the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the use of protective hat.
H1: The symptoms shown by a worker are dependent on the use of protective hat.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
safety measure usage of protective hat	yes	Count	138	40	178
		% within safety measure usage of protective hat	77.5%	22.5%	100.0%
	no	Count	36	56	92
		% within safety measure usage of protective hat	39.1%	60.9%	100.0%
Total		Count	174	96	270
		% within safety measure usage of protective hat	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 178 workers who use protective hat, 138 workers show mild symptoms and 40 workers show moderate-severe symptoms whereas out of 92 workers who do not wear protective hat, 36 workers show mild and 56 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	39.027[b]	1	.000		
Continuity Correction[a]	37.369	1	.000		
Likelihood Ratio	38.603	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	38.882	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 32. 71.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 39.027 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the symptoms and the use of protective hat shown by the workers.

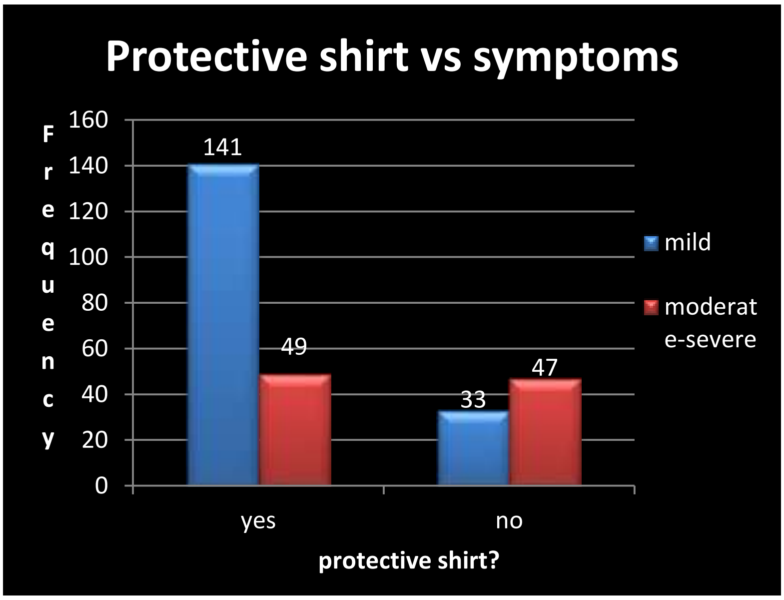
Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for safety measure usage of protective hat (yes / no)	5.367	3.106	9.274
For cohort SymtomsCategory = Mild	1.981	1.517	2.587
For cohort SymtomsCategory = Moderate-Severe	.369	.269	.508
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio for safety measure usage of protective hats = 5.367. So we can say that workers who do not use protective hats show mild symptoms 5.367 times more likely to workers who show mild symptoms and use protective hat.

11. PROTECTIVE SHIRT VS SYMPTOMS

Out of 270 workers, 190 (approximately 70%) of them wore protective shirt and 80 of them did not wear protective shirt.



Now we are interested in knowing whether the use protective shirt actually protects the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the use of protective shirt.
H1: The symptoms shown by a worker are dependent on the use of protective shirt.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
safety measure usage of protective shirt	yes	Count	141	49	190
		% within safety measure usage of protective shirt	74.2%	25.8%	100.0%
	no	Count	33	47	80
		% within safety measure usage of protective shirt	41.3%	58.8%	100.0%
Total		Count	174	96	270
		% within safety measure usage of protective shirt	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 190 workers who use protective shirt, 141 workers show mild symptoms and 49 workers show moderate-severe symptoms whereas out of 80 workers who do not wear protective shirt, 33 workers show mild and 47 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	26.692[b]	1	.000		
Continuity Correction[a]	25.273	1	.000		
Likelihood Ratio	26.080	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	26.593	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28. 44.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 26.692 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the symptoms and the use of protective shirt shown by the workers.

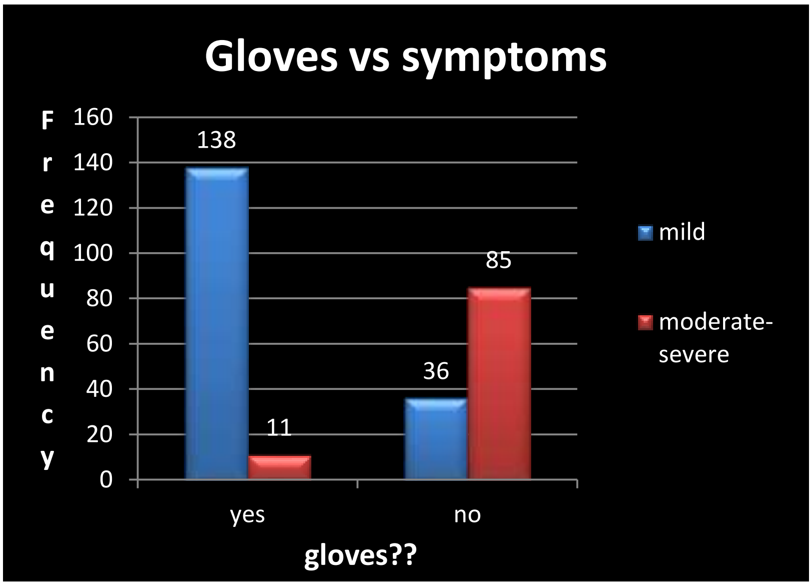
Risk Estimate

	Value	95% Confidence Interval Lower	95% Confidence Interval Upper
Odds Ratio for safety measure usage of protective shirt (yes / no)	4.098	2.362	7.112
For cohort SymtomsCategory = Mild	1.799	1.367	2.368
For cohort SymtomsCategory = Moderate-Severe	.439	.324	.594
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio for safety measure usage of protective shirt = 4.098. So we can say that workers who do not use protective shirt show mild symptoms 4.098 times more likely to workers who show mild symptoms and use protective shirt.

12. GLOVES VS SYMPTOMS

Out of 270 workers, 149 (approximately 55%) of the them wore gloves and 121 of them did not wear gloves



Now we are interested in knowing whether the use gloves actually protect the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the use of gloves.
H1: The symptoms shown by a worker are dependent on the use of gloves.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
safety measure usage of protective gloves	yes	Count	138	11	149
		% within safety measure usage of protective gloves	92.6%	7.4%	100.0%
	no	Count	36	85	121
		% within safety measure usage of protective gloves	29.8%	70.2%	100.0%
Total		Count	174	96	270
		% within safety measure usage of protective gloves	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 149 workers who use gloves, 138 workers show mild symptoms and 11 workers show moderate-severe symptoms whereas out of 121 workers who do not wear protective shirt, 36 workers show mild and 85 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	115.170[b]	1	.000		
Continuity Correction[a]	112.442	1	.000		
Likelihood Ratio	125.624	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	114.743	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 43.02.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 115.170 whereas the tabulated $\chi^2_{0.05}(1)$ is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the symptoms and the use of gloves shown by the workers.

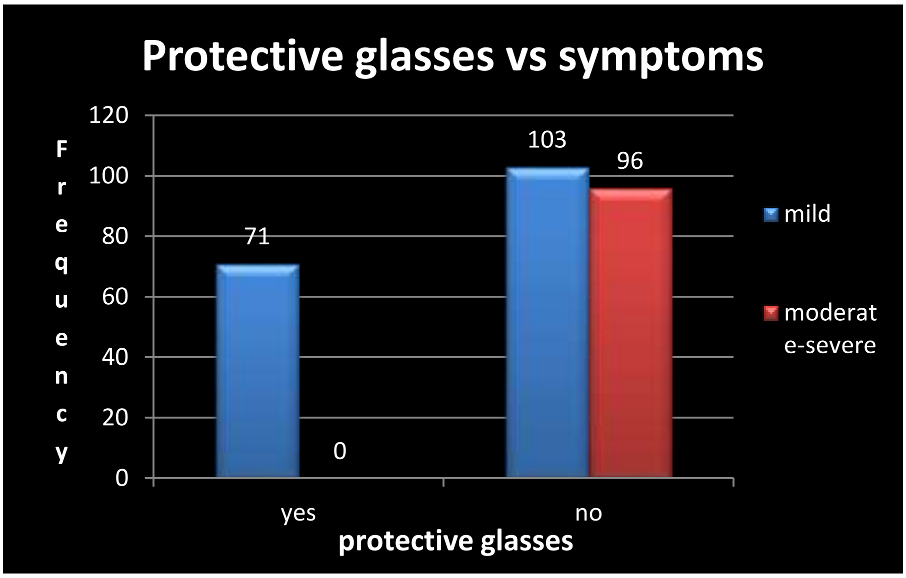
Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for safety measure usage of protective gloves (yes / no)	29.621	14.313	61.300
For cohort SymtomsCategory = Mild	3.113	2.359	4.109
For cohort SymtomsCategory = Moderate-Severe	.105	.059	.188
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio and relative risk. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio for safety measure usage of gloves = 29.621. So we can say that workers who do not use protective shirt show mild symptoms 29.621 times more likely to workers who show mild symptoms and use gloves.

13. PROTECTIVE GLASSES VS SYMPTOMS

Out of 270 workers, 199 (approximately 74%) of them do not wear protective eye glasses and only 71 wear protective eye glasses.



Now we are interested in knowing whether the use protective glasses actually protect the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the use of protective shirt.
H1: The symptoms shown by a worker are dependent on the use of protective shirt.

Crosstab

			SymtomsCategory: Mild	SymtomsCategory: Moderate-Severe	Total
safety measure usage of protective eye glasses	yes	Count	71	0	71
		% within safety measure usage of protective eye glasses	100.0%	.0%	100.0%
	no	Count	103	96	199
		% within safety measure usage of protective eye glasses	51.8%	48.2%	100.0%
Total		Count	174	96	270
		% within safety measure usage of protective eye glasses	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 71 workers who use protective eye glasses, all 71 workers show mild symptoms whereas out of 199 workers who do not wear protective shirt, 103 workers show mild and 96 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	53.149[b]	1	.000		
Continuity Correction[a]	51.064	1	.000		
Likelihood Ratio	75.815	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	52.952	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.24.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 53.149 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the use of protective eye glasses and the symptoms shown by the workers.

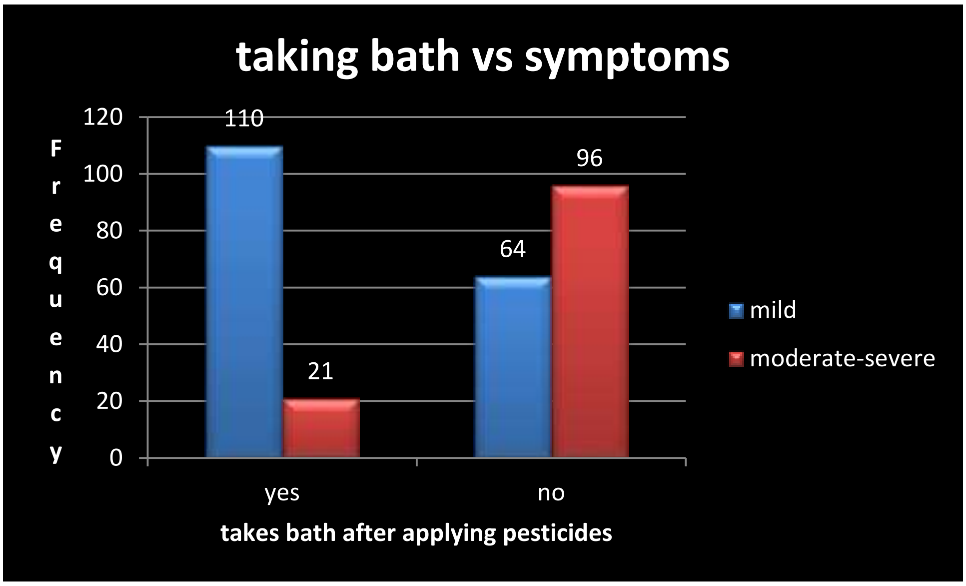
Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
For cohort SymtomsCategory = Mild	1.932	1.690	2.209
N of Valid Cases	270		

Relative risk is defined as the ratio of incidence rate among exposed to the incidence rate among the unexposed. SPSS denotes RR by "For cohort symptoms category= Mild". Here, RR=1.932, thus, we can say that workers who do not wear protective eye glasses are 1.932 times as more likely to have mild symptoms than those who weaar protective eye glasses.

14. TAKING BATH AFTER APPLYING PESTICIDES

Out of 270 workers, 131 (approximately 49) workers take bath right after applying pesticides and 139 workers do not.



Now we are interested in knowing whether bathing right after applying pesticides actually protect the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from workers bathing right after applying pesticides.

H1: The symptoms shown by a worker are dependent on workers bathing right after applying pesticides.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
do you take bath right after applying pesticide	yes	Count	110	21	131
		% within do you take bath right after applying pesticide	84.0%	16.0%	100.0%
	no	Count	64	75	139
		% within do you take bath right after applying pesticide	46.0%	54.0%	100.0%
Total		Count	174	96	270
		% within do you take bath right after applying pesticide	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 131 workers who take bath right after applying pesticides, 110 show mild symptoms and 21 show moderate-severe symptoms whereas out of 131 workers who do not take bath after applying pesticides, 64 workers show mild and 75 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	42.336[b]	1	.000		
Continuity Correction[a]	40.697	1	.000		
Likelihood Ratio	44.292	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	42.179	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 46. 58.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 42.336 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the bathing of workers right after applying pesticides and symptoms.

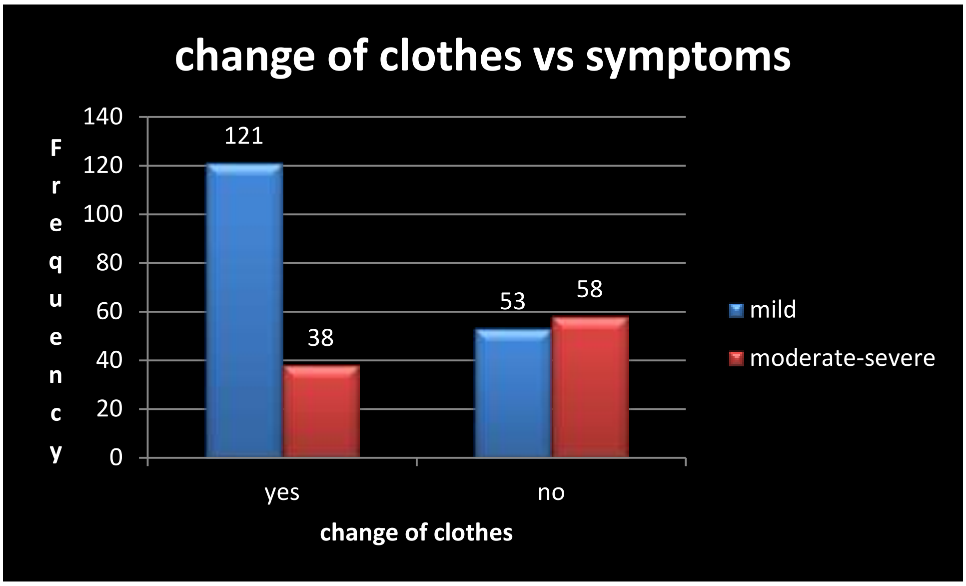
Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for do you take bath right after applying pesticide (yes / no)	6.138	3.459	10.894
For cohort SymtomsCategory = Mild	1.824	1.501	2.216
For cohort SymtomsCategory = Moderate-Severe	.297	.195	.453
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio = 6.138. So we can say that workers who do not use do not take bath right after applying pesticides show mild symptoms 6.138 times more likely to workers who take bath right after applying pesticides.

15. CHANGE CLOTHES AFTER APPLYING PESTICIDES VS SYMPTOMS

Out of 270 workers, 159 workers (approx 59%) change clothes right after applying pesticides and 111 workers do not.



Now we are interested in knowing whether changing of clothes right after applying pesticides actually protect the workers from exposure to pesticides or not. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from workers changing of clothes right after applying pesticides.

H1: The symptoms shown by a worker are dependent on changing of clothes of workers right after applying pesticides.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
do you change clothes right after spraying pesticide	yes	Count	121	38	159
		% within do you change clothes right after spraying pesticide	76.1%	23.9%	100.0%
	no	Count	53	58	111
		% within do you change clothes right after spraying pesticide	47.7%	52.3%	100.0%
Total		Count	174	96	270
		% within do you change clothes right after spraying pesticide	64.4%	35.6%	100.0%

From the above crosstab table, we can see, out of 159 workers who change clothes right after applying pesticides, 121 show mild symptoms and 38 show moderate-severe symptoms whereas out of 111 workers who do not change clothes right after applying pesticides, 53 workers show mild and 58 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	22.933[b]	1	.000		
Continuity Correction[a]	21.712	1	.000		
Likelihood Ratio	22.915	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	22.848	1	.000		
N of Valid Cases	270				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 39. 47.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 22.933 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the symptoms and the change of clothes of workers right after applying pesticides.

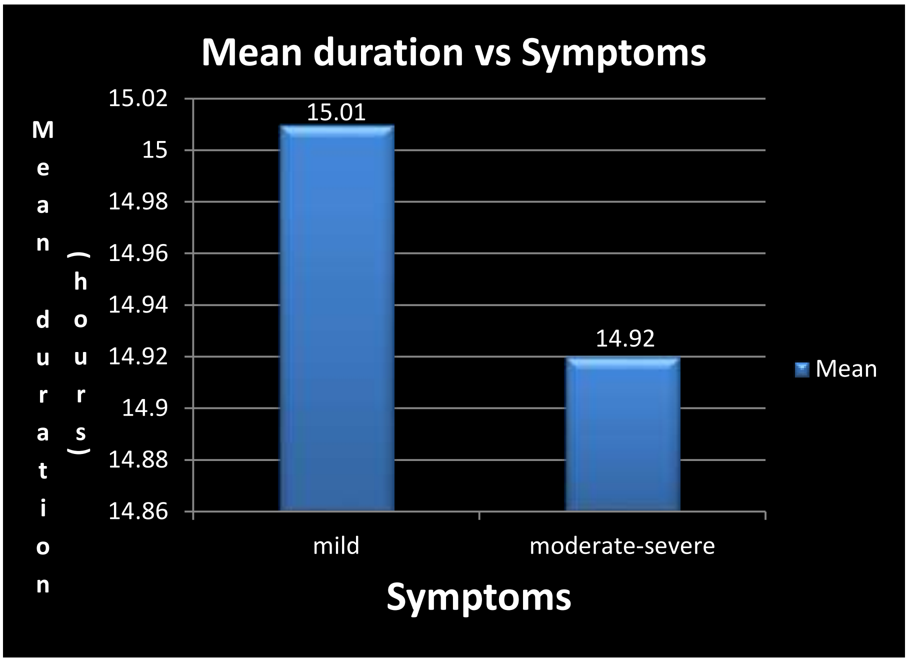
Risk Estimate

	Value	95% Confidence Interval Lower	95% Confidence Interval Upper
Odds Ratio for do you change clothes right after spraying pesticide (yes / no)	3.485	2.069	5.868
For cohort SymtomsCategory = Mild	1.594	1.288	1.973
For cohort SymtomsCategory = Moderate-Severe	.457	.329	.636
N of Valid Cases	270		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio = 3.485. So we can say that workers who do not use do not change clothes right after applying pesticides show mild symptoms 3.485 times more likely to workers who change clothes right after applying pesticides.

16. MEAN DURATION (IN HOURS) AFTER APPLYING PESTICIDE RE ENTER THE FIELD VS SYMPTOMS

In this, we are interested in knowing if there is a difference in mean duration of time for re entering the field after application of pesticides due to which workers show mild or moderate-severe symptoms. From the obtained data the following bar graph can be made:



For comparison of two independent means, we run independent sample t test. The null hypothesis may be set as:

Ho: $\mu_{mild} - \mu_{mod} = 0$, i.e., the difference in the mean duration of time after application of pesticides that workers re enter the field with mild symptoms to the mean duration of time after application of pesticides that workers re enter the field with moderate-severe symptoms is zero.

H1: $\mu_{mild} - \mu_{mod} \neq 0$, i.e., the difference in the mean duration of time after application of pesticides that workers re enter the field with mild symptoms to the mean duration of time after application of pesticides that workers re enter the field with moderate-severe symptoms is not zero. Following outputs are obtained:

Group Statistics

	SymtomsCategory	N	Mean	Std. Deviation	Std. Error Mean
how long is it thaht after application of pesticide that you reenter the field?(hours)	Mild	174	15.01	1.249	.095
	Moderate-Severe	96	14.42	1.228	.125

From the group statistics table we can observe that there are 174 workers who show mild symptoms when the mean duration of time after application of pesticides that workers re enter the field is 15.01 hours whereas 96 workers show moderate-severe symptoms when the mean duration of time after application of pesticides that workers re enter the field 14.42

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
how long is it thaht after application of pesticide that you reenter the field?(hours)	Equal variances assumed	3.766	.053	3.767	268	.000	.595	.158	.284	.906
	Equal variances not assumed			3.786	198.810	.000	.595	.157	.285	.905

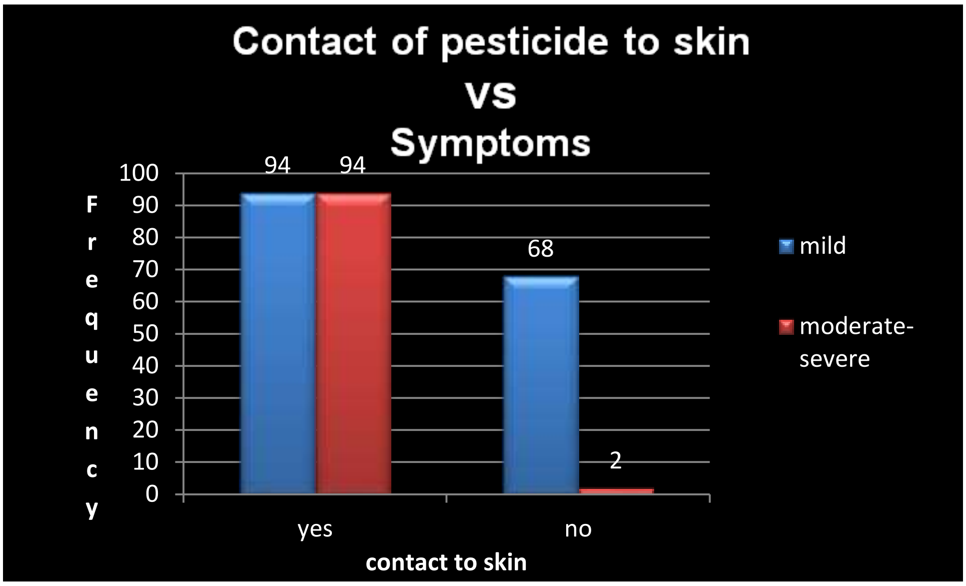
From the independent sample test table we extract the actual results of the independent sample test. Here we can observe that the results of t-test are reported twice. This is because Levene's test checks the assumption that population variance are equal. Since the significant value in equal variances assumed row is 0.053 > 0.05 at 5% level of significance, thus we say that the population variances are equal and we ignore the equal variance not assumed row.

Now let us look at the t and df column. The computed test statistic at 268 degrees of freedom is t_{268} = 3.767. Also, the significant 2 tailed value which is the p-value to the test statistic and degrees of freedom is 0.000 at 5% level of significance. Lastly, we have the column for confidence interval, which complements the test significance results. Here the confidence interval is (0.284, 0.906).

Since, the p value for the given test statistic and degrees of freedom 0.000 < 0.05 so can say that the null hypothesis may not be accepted at 5% level of significance, which means the mean duration of hours for re entering after applying pesticides differs significantly in both the groups. Also, from the confidence interval we see that 0 is not included in the interval (0.284, 0.906), so the null hypothesis may not be accepted.

17. MAKING SKIN CONTACT VS SYMPTOMS

We may notice that here we have 258 participants instead of 270. Out of 258 workers, pesticide touches the skin of 188 workers whereas only 70 workers do not have their skin contact with pesticides.



Now we are interested in knowing whether the contact of pesticides to skin actually does harm to the workers. We run χ^2 test for independence of attributes. So, we set the null hypothesis as:

Ho: The symptoms shown by a worker are independent from the contact of pesticides to the skin.
H1: The symptoms shown by a worker are dependent on the contact of pesticides to the skin.

Crosstab

			SymtomsCategory		
			Mild	Moderate-Severe	Total
when you mix pestcide , does the liquid come in contact with any part of your body?	no	Count	68	2	70
		% within when you mix pestcide , does the liquid come in contact with any part of your body?	97.1%	2.9%	100.0%
	yes	Count	94	94	188
		% within when you mix pestcide , does the liquid come in contact with any part of your body?	50.0%	50.0%	100.0%
Total		Count	162	96	258
		% within when you mix pestcide , does the liquid come in contact with any part of your body?	62.8%	37.2%	100.0%

From the above crosstab table, we can see, out of 70 workers whose skin does not come in contact with the pesticides 68 show mild symptoms and 2 show moderate-severe symptoms whereas out of 188 workers whose skin comes in contact with the pesticides, 94 workers show mild and 94 workers show moderate-severe symptoms.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	48.520[b]	1	.000		
Continuity Correction[a]	46.523	1	.000		
Likelihood Ratio	61.804	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	48.332	1	.000		
N of Valid Cases	258				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.05.

In the above table, we are interested in the Pearson's Chi-Square row only. The calculated χ^2 value is 48.520 whereas the tabulated $\chi^2_{0.05}$ (1) is 3.841. Also, the p value for the given test statistic and degrees of freedom is 0.000.

To make a decision i.e., to accept the null hypothesis or not at given level of significance, we check if calculated χ^2 value is less than the tabulated χ^2 value or the p value is greater than 0.05 (5% los). If yes, then we accept the null hypothesis, otherwise we may not accept the null hypothesis at 5% level of significance.

Since, χ^2(cal) > χ^2(tab) or p value 0.000 < 0.05 at 5% level of significance, we may not accept the null hypothesis and conclude that there is statistically significant association between the contact of pesticides to the skin and symptoms shown by them.

Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for when you mix pestcide , does the liquid come in contact with any part of your body? (no / yes)	34.000	8.097	142.774
For cohort SymtomsCategory = Mild	1.943	1.675	2.254
For cohort SymtomsCategory = Moderate-Severe	.057	.014	.226
N of Valid Cases	258		

Above, is a table of risk estimates. Here, we are interested in understanding the odds ratio and relative risk. We may define odds ratio a measure of association between an exposure and an outcome i.e., the odd that an outcome will occur given a particular exposure to the odds of the outcome in absence of that exposure. Here, Odds Ratio = 3.485. So we can say that workers who do not use do not change clothes right after applying pesticides show mild symptoms 3.485 times more likely to workers who change clothes right after applying pesticides.

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