

## **A Statistical Analysis of Major Risk Factors for Diabetic Patients in Pakistan**

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### **Abstract**

The topic of this study was chosen with consultation of physicians. The general purpose of this work was to evaluate some major risk influences behind growth of diabetes and the aim was to examine the link between factory areas and risk variables for diabetic patients. This work also tells the major gender-based risk influences. In general evaluation some significant risk factors i.e., lifestyle, no exercise, no physical activity, kidney issues, long sitting, and areas of residence (industrial) are observed.

### **Keywords**

Risk factors, Diabetes, Chi-square test, Kolmogorov-Smirnov test.

### **1. Introduction**

Diabetes mellitus is an arising disease. More than 400 million people are diabetic patients in the world and this number may increase. Diabetes is a major reason of death in young age, also causes heart attack and stroke. According to a report published by World Health Organization (WHO) (2022), diabetes remained the 4<sup>th</sup> biggest reason of death in the world, during the year 2016.

In year 2000, WHO listed Pakistan at 6<sup>th</sup> rank among nations, having largest number of diabetic patients. It was stated that 5.2 million Pakistanis were diabetic patients and among them, 90% were of Type 2 Diabetes Mellitus. Globally in 2000, approximately 171 million people were diabetic patients, and it was 2.8 % of the total number of world's population and 366 million people further expected from third world countries. Recent research illustrated that "environmental chemicals" is a considerable reason because it is playing a major role to enhance diabetes proportion. Obesity is long term health problem and also a biggest reason of diabetes.

It is observed that mostly diabetes arises in people of age between 40 to 60, however in developing countries mostly in the age above 60 (Riaz, 2009). Many studies showed that higher intensities of environmental variables bring increasing rate of Type 2 diabetes. Research has shown that diabetes has been directly related to environmental variables (dioxin), particularly in Vietnam and Korea (Riaz, 2022).

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Primarily, environmental factors are by-products of the factories however can be produced due to the natural processes too, like volcanic explosions and jungle on fire. Environmental factors such as dioxin are undesirable consequential productions against a big level of productions, like pesticides, smelting, herbicides and bleaching of paper pulp by chlorine. Partial burning of medical waste and solid waste mostly release exhaust gasses to the environment at big level. With time technology is available now to reduce the emissions of this solid waste burning (Riaz, 2010).

The environmental variables are produced locally but they affect the worldwide environment. Highest concentrations of similar compounds found in soils, deposits and meals, especially dairy goods, mutton and fish. A very small number of particles number of particles are exposed to water and air harvests.

## 2. Context

The initial inspiration was outcome of the work of Riaz (2009), Riaz and Butt (2010), Riaz *et al.* (2010), Riaz and Rana (2014), Riaz (2014), Riaz (2022) and numerous additional studies by these authors. They worked on environmental factors that are causing different diseases. During the work, they introduced and discussed twenty-nine studies. Among them seven were on arsenic, three on cadmium, two on mercury, eleven on constant organic pollutants, three on phthalates and four on bisphenol A. The authors discussed that environmental factors play an important role in different diseases, however, it is not enough to conclude that these factors are the only reason behind diabetes (Riaz, 2012).

Another inspiration for our study was the research work of Fernández *et al.* (2016). They studied the excess of iron and risk of diabetes in a potential group. They focused on gender. They collected data from females and males between the age of 55 to 80 years from three countries. A conditional regression model used for food, socio demographic, anthropometrical, and the variables for inflammation. They concluded that in this age range, cardiac risk was at very high level due to iron storage in bodies. It was also observed that the increasing level of iron in bodies was the biggest risk of diabetes. The relationship between environmental factors and type 2 diabetes mellitus (T2DM) is not clear, and there is controversy surrounding the relationship between iron status and serum levels (Riaz, 2014).

It is worth mentioning that working of Alam *et al.* (2009-2013) was the next-level motivation for us to work on this topic. They carried out the research work on the existence of Dioxins in the world environment. They discussed in their paper about the main course of dioxins to humans is through ingestion. They used extraction methods as a detection tool. Further, they discussed the Dioxin concentrations, and environmental factors from main factory areas in the world. They mentioned the challenges to take the data from middle east region, especially after recent wars in Iraq, Iran, and Syria. However, they summarized the main sources of environmental pollution in the world. Further they discussed the exhaust gases of factory regions.

## 3. Methodology

The methodology involves following steps.

### **3.1 Selection of patients**

About hundred diabetic patients of Type 2 were selected for this study. The patients having other disease with diabetes not included.

### **3.2 Ethical approval of study**

A protocol and synopsis review committee at Jinnah Hospital, Lahore approved this study ethically.

### **3.3 Objective people**

The 100 individuals for this study were targeted, all were diabetic patients from Jinnah Hospital Lahore.

### **3.4 Survey technique**

The purpose of a survey is always to gather the appropriate data in true spirit. It can be happened only with the help of a perfect survey technique. Here, for this research a questionnaire is used to collect the data along with some personal answer and question sessions.

### **3.5 Data Collection**

Data was collected in one month with the help of questionnaire and personal interviews. The interviews were conducted due to the difficulties for old and uneducated patients to understand the nature and wording of questions. Some forms filled by the surveyors as per answers of patients against their questions.

### **3.6 Field Experience**

On field difficulties were there. Though mostly patients behaved gently but some refused to respond. However, we explained the objective of the survey, which become fruitful to convince them to co-operate. Some individuals admired our working and study on this common issue. Some were more positive to know the results of this study and they shared their contact numbers for this purpose. Overall, it had been a good experience on field.

### **3.7 Questionnaire**

Total questions were fifty-four. First, seven were about introduction and personal details of the respondents and rest of the questions were related to the risk variables, effecting the diabetic individuals.

### **3.8 Statistical tools**

In order to obtain the results, descriptive and inferential statistics were used. We analysed the gathered data using various tests called association tests, Kolmogorov-Smirnov goodness-of-fit tests, Pearson's chi-squared test and Mann-Whitney U test.

#### **4. Statistical analysis**

The study carried out on 100 diabetic male and female patients. About twenty-two risk variables like age, sex, marital status, job, exercise, lifestyle, diet, usage of junk food, processed meat, half-baked items, hoteling, smoking, drinking, soft drinks usage, availability of gluco-meter, knowledge of sugar levels, medications, living areas, satisfied sanitation system, usage of sugar tablets (e.g., sucral) were noted. Some variables considered as quantitative, like age and the rest are taken as qualitative. Among them, mostly were asked in the form of Yes or no. This research is divided into two sections, descriptive and analytical to present the complete analysis.

The percentages and frequency of many environmental variables of diabetes for 100 patients is examined in this part of research and results were based on percentages and their frequencies. As shown in Tables, all major risk factors are associated with the people working in a factory. There is considerable association in industry's type, issue of kidney, test ranges can be seen, and their resident area did not matter, whether from factory area or not. Just age, job and happy with the sanitary system are linked up with marital status and rest of the risk factors did not have any connection with their status as married or not.

We conclude the impact of gender on main risk factors, applying Mann-Whitney U test. These factors include living status, physical activities, daily routine, food, other problems, blood sugar intensive care, usage of medicines, and environmental factors. It is observed that gender did not affect physical activity, daily routine, food, blood sugar monitoring and proper usage of medicines. However, individuals of rural side had a poor environmental exposure. They were not taking care of their medication. In some areas availability of medication is also a common issue. While urban diabetic patients had good environmental exposure, and they were good in medications.

#### **5. Summary**

It was the purpose of this study to determine environmental factors that affect diabetic patients. In this regard, data gathered from 100 patients of a Lahore based government hospital. The respondents were confirmed as diabetic patient from their medical reports. The data collected through a survey form and answer question sessions of uneducated patients. After that a suitable sampling technique used for statistical analysis

The research topic "Major Risk Influences on Diabetic Patients" was selected with the consultation of doctors. This study was designed to determine the effects of some main risk influences on growth of diabetes and to measure the relationships of gender with the risk factors of this disease. This research tells us the biggest considerable risk factor in male and female patients. After finalization of topic of the study, relevant basic and important information and authentic literature were gathered. Journals, articles books and digital studies were reviewed. The questions in the survey form were started from personal information of the patients and then in next section questions were asked related to the other risk factors.

Statistical analysis is then performed on the collected information based on predetermined criteria. An IBM compatible computer was used with a statistical software named "Statistical Package for Social Sciences (SPSS)" version 23.0 for descriptive analysis. In the descriptive calculations, percentages, distributions of frequency and cross-tabulations

were considered to confirm the relationship between the different informative characteristics. When performing assessments, the chi-square test is used to confirm the importance of different factors by relating these numbers to p-values. In addition, a normality test was performed to confirm the numbers with "yes" and "no". At the same time, the Mann-Whitney U test was performed to confirm the influence of various risk factors on the variables.

## 6. Findings and discussion

It was observed that the kidney issues, tests range and industry's type are mainly linked regardless of living area of patients. It was also noted that patients from industrial area have specific problems like kidney issues. We observed that industrial exhaust gasses are increasing air pollution and their drains are the biggest reason behind water pollution. Drinking water of these areas are also not healthy. It is causing kidney issues, diarrhoea, nausea etc. Due to which, people got tested of blood sugar on a big level. The intense of these effects can vary in different industries. The other variables like weight reduce, weight increase, eyesight, numbness in feet, dental issues etc are not associated with industrial area. It was observed that proper medication gave considerably good results even in industrial area. Age, job, and sanitary system satisfaction is considerably linked with the marital status. Most female respondents were married and housewives. However, some were working and unmarried. Only twelve among hundred patients were satisfied with the sanitary system. Diabetic patients have gender related effects on other complications; however, usage of medicines and environmental influencers were linked with their living area. There were seven variables in the factor of other complications.

The results of our study told that in male, other complications like weight reduced, weight increased, vision, issues of kidney, dental problems, numbness, and wound healing were different. Males faced less problems as compared to female and the reason behind is, mostly males were working and more efficient. However, females were housewives and less active. Therefore, they were suffering more.

The risk factor on usage of medicines was affected by the living area of diabetic individuals. The individuals from rural area have not good effect of medication due to lack of knowledge about usage of medicine and due to non-availability of proper medicine in their area. Even, unavailability of proper pharmacies in their far areas is a big hurdle of due medication. On the other end, in city areas, medical facilities, pharmacies, labs and good knowledge of medicine is the biggest reason behind good results of medication. The living areas also have effects on different variables, such as industrial areas, sanitation systems, drinking water, processed meat and the use of food additives. The settlement area (urban/rural) has an influence on these variables.

## 7. Conclusion

According to the results of this study carried out at the government hospital in Lahore, Pakistan, diabetes has a number of substantial risk factors. It is noted in diabetic patients, that the ratio of male patients (36) is less than the ratio of female patients (64). The reason behind may be the available patients in the hospital during our survey. After complete analysis, it is stated that the risk factors like problems of kidney, tests ranges, age, profession, and issues with the sanitary system are correlated with marital status. Some factors have gender-based effects, like other complications in females involved in diabetes.

Comparably, environmental factors and personal issues of medications were affected by the living area of patients.

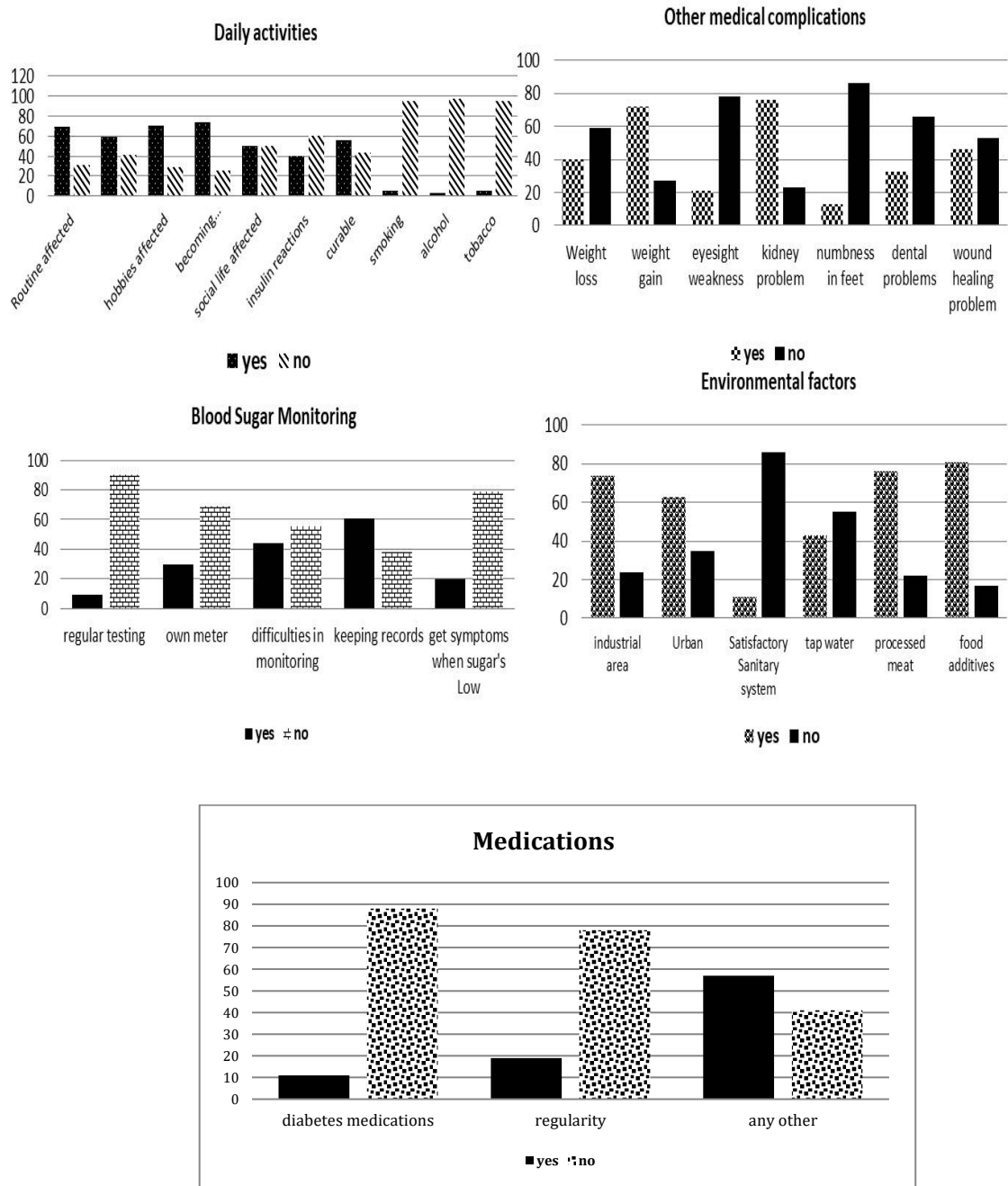


Figure 1: Variable representation in graphs.

**Table 1:** Descriptive statistics of demographic variables.

Variable	Classification	Patients' Gender				Total	
		Male		Female		Count	%age
		Count	%age	Count	%age		
Age	20-35	6	42.9	8	57.1	14	14
	36-50	15	38.5	24S	61.5	39	39
	51-65	9	25.7	26	74.3	35	35
	66-80	5	41.7	7	58.3	12	12
Relationship status	Single	3	30	7	70	10	10
	Married	31	34.4	59	65.6	90	90
Strength of family	5-Jan	20	40	30	60	50	50
	10-Jun	9	20	36	80	45	45
	18-Nov	3	60	2	40	5	5
Families with patients	0-4	32	39	50	61	82	82
	9-May	1	8.3	11	91.7	12	12
	14-Oct	3	50	3	50	6	6
Occupation	Housewife	2	3.6	54	96.4	56	56
	Office Job	13	65	7	35	20	20
	Others	20	83.3	4	16.7	24	24

**Table 2:** Other variables.

Variable	Classification	Patients' Gender				Total	
		Male		Female		Count	%
		Count	%	Count	%		
Exercise regularly	No	16	45.7	19	54.3	35	35
	Yes	20	30.8	45	69.2	65	65
Kind of exercise	None	9	34.6	17	65.4	26	26
	Walk	25	35.7	45	64.3	70	70
	Other	3	60	2	40	5	5
Exercise days per week	None	11	39.3	17	60.7	28	28
	Daily	23	37.1	39	62.9	62	62
	After 1 day	1	20	4	80	5	5
	After 2 days	1	20	4	80	5	5
Session duration	None	9	34.6	17	65.4	26	26
	15 min	7	24.1	22	75.9	29	29
	30 min	7	28	18	72	25	25
	1 hour	13	65	7	35	20	20
Time of exercise	None	11	39.3	17	60.7	28	28
	Morning	21	39.6	32	60.4	53	53
	Afternoon	0	0	9	100	9	9
	Evening	4	40	6	60	10	10

Variable	Classification	Patients' Gender				Total	
		Male		Female		Count	%
		Count	%	Count	%	Count	%
Exercises should be avoided	Yes	2	40	3	60	5	5
	No	34	35.8	61	64.2	95	95
Hobbies were hindered by health	No	17	54.8	14	45.2	31	31
	Yes	19	27.5	50	72.5	69	69
More emotional as a result of diabetes	No	9	36	16	64	25	25
	Yes	27	36	48	64	75	75
Having diabetes affects daily routines	No	15	50	15	50	30	30
	Yes	22	31.4	49	70	70	70
Household chores were interfered with by health	No	22	52.4	20	47.6	42	42
	Yes	14	24.1	44	75.9	58	58
Social life is affected by diabetes	No	20	40.8	29	59.2	49	49
	Yes	16	31.4	35	68.6	51	51
Feel any kind of change after taking insulin	No	29	47.5	32	52.5	61	61
	Yes	7	17.9	32	82.1	39	39
Diabetes can be cured	No	10	22.2	35	77.8	45	45
	Yes	26	47.3	29	52.7	55	55
Do you Smoke?	Yes	10	100	0	0	10	10
	No	26	28.9	64	71.1	90	90
Alcohol consumption	Weekly	1	100	0	0	1	1
	Monthly	1	50	1	50	2	2
	Never	34	35.1	63	64.9	97	97
Tobacco consumption	No	28	31.1	62	68.9	90	90
	Cigarette	6	100	0	0	6	6
	Any other	2	50	2	50	4	4
Duration	0-5 years	32	33.7	63	66.3	95	95
	6-40 years	4	80	1	20	5	5
Number of meals taken per day	Two times	13	37.1	22	62.9	35	35
	Three times	22	36.7	38	63.3	60	60
	Four times	1	20	4	80	5	5
How often do you snack?	One time	13	30.2	30	69.8	43	43
	Two time	16	40	24	60	40	40
	Never	7	41.2	10	58.8	17	17
Eating away from home on a weekly basis	Once per Week	12	50	12	50	24	24
	Twice in week	3	50	3	50	6	6
	Never	21	30	49	70	70	70



Variable	Classification	Patients' Gender				Total	
		Male		Female		Count	%
		Count	%	Count	%		
Out-of-home meals	Junk food	0	0	15	100	15	15
	Chinese	5	100	0	0	5	5
	Desi	31	38.8	49	61.3	80	80
Meal skipping	Yes	7	23.3	23	76.7	30	30
	No	29	41.4	41	58.6	70	70
Diabetic weight loss	Yes	17	37.8	28	62.2	45	45
	No	29	44.6	36	55.4	65	65
Diabetic weight gain	Yes	30	41.1	43	58.9	73	73
	No	6	22.2	21	77.8	27	27
Vision problems	Yes	12	52.2	11	47.8	23	23
	No	24	31.2	53	68.8	77	77
Problems with the kidneys	Yes	30	40.5	44	59.5	74	74
	No	8	28.6	20	71.4	28	28
Foot numbness, tingling, or loss of feeling	Yes	6	42.9	8	57.1	14	14
	No	30	34.9	56	65.1	86	86
Having a dental issue	Yes	19	55.9	15	44.1	34	34
	No	17	25.8	49	74.2	66	66
Issues with wound healing	Yes	13	31	29	69	42	42
	No	23	39.7	35	60.3	58	58
Blood sugar testing	Yes	4	40	6	60	10	10
	No	32	35.6	58	64.4	90	90
Having a blood sugar meter	Yes	16	50	16	50	32	32
	No	20	29.4	48	70.6	68	68
Trouble in monitoring blood sugar level	Yes	16	35.6	29	64.4	45	45
	No	20	36.4	35	63.6	55	55
Blood sugar level	0-200	13	38.2	21	61.8	34	34
	201-400	19	41.3	27	58.7	46	46
	410-600	9	45	11	55	20	20
Keeping record	Yes	26	42.6	35	57.4	61	61
	No	11	28.2	28	71.8	39	39
Getting indication in case of low blood sugar	Yes	10	45.5	12	54.5	22	22
	No	27	34.6	51	65.4	78	78
Consuming diabetes medications	Yes	7	53.8	6	46.2	13	13
	No	30	34.5	57	65.5	87	87
Type of medicine	None	6	50	6	50	12	12
	Diabetes tablets	17	37	29	63	46	46
	Insulin	7	31.8	15	68.2	22	22

Variable	Classification	Patients' Gender				Total	
		Male		Female		Count	%
		Count	%	Count	%	Count	%
Regularly taking medicine	Yes	12	57.1	9	42.9	21	21
	No	25	31.6	54	68.4	79	79
Any other type of medicine consumption	Yes	23	41.1	33	58.9	56	56
	No	13	31	29	69	42	42
Visiting doctor	Weekly	11	52.4	10	47.6	21	21
	Monthly	19	34.5	36	65.5	55	55
	Once a year	8	33.3	16	66.7	24	24
Residence near industrial area	Yes	31	41.3	44	58.7	75	75
	No	7	28	18	72	25	25
Type of industry near	Eatables	4	40	6	60	10	10
	garments	6	66.7	3	33.3	9	9
	Others	1	12.5	7	87.5	8	8
	None	27	37	46	63	73	73
Place of residence	Rural Area	17	47.2	19	52.8	36	36
	Urban Area	21	32.8	43	67.2	64	64
Satisfactory sanitary system	Yes	3	30	7	70	10	10
	No	35	38.9	55	61.1	90	90
Type of drinking water	Tap water	19	45.2	23	54.8	42	42
	Filter water	29	42.6	39	57.4	68	68
Processed meat consumption	Yes	22	31.4	48	68.6	70	70
	No	16	31.4	14	57.4	30	30
Food additive usage	Yes	27	31.4	53	66.3	80	80
	No	11	31.4	9	45	20	20

**Table 3:** Major risk factors associated with patients living in industrial areas.

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Family Patients and industrial areas do not have any association.	1.488	2	0.482	Not significant
H <sub>0</sub> : Industrial areas and regular exercise are not associated	0.342	1	0.581	Not significant
H <sub>0</sub> : Industrial areas and exercise types are not associated	6.301	2	0.044*	Significant
H <sub>0</sub> : Industrial area has no association with days per week you exercise	1.832	3	0.632	Not significant
H <sub>0</sub> : length of each session is not associated with industrial area	0.710	3	0.916	Not significant
H <sub>0</sub> : Industrial areas and times of exercise are not associated	5.978	3	0.154	Not significant
H <sub>0</sub> : Industrial area is not associated with any specific exercise you avoid	0.136	1	0.788	Not significant
H <sub>0</sub> : industrial area is not associated with Hobby or activity interfered with health	0.358	1	0.558	Not significant

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Industrial area is not associated with emotions	0.758	1	0.388	Not significant
H <sub>0</sub> : Industrial area is not associated with affected routine life	0.032	1	0.861	Not significant
H <sub>0</sub> : Industrial area is not associated with health affected Domestic chores	0.876	1	0.352	Not significant
H <sub>0</sub> : Industrial area is not associated with affected social life	0.884	1	0.348	Not significant
H <sub>0</sub> : Industrial area is not associated with any change after taking insulin	2.346	1	0.127	Not significant
H <sub>0</sub> : Industrial area is not associated with curable disease	1.663	1	0.199	Not significant
H <sub>0</sub> : Industrial area is not associated with smoking	1.719	1	0.192	Not significant
H <sub>0</sub> : Industrial area is not associated with drink alcohol	1.014	2	0.615	Not significant
H <sub>0</sub> : Industrial area is not associated with usage of tobacco	3.571	2	0.178	Not significant
H <sub>0</sub> : Industrial area is not associated with Since when smoking.	0.271	1	0.613	Not significant
H <sub>0</sub> : Industrial area is not associated with number of meals usually taken per day	5.828	2	0.065	Not significant
H <sub>0</sub> : Industrial area is not associated with snacks taken per day	0.219	2	0.911	Not significant
H <sub>0</sub> : Industrial area is not associated with times a week do you eat out	1.432	2	0.488	Not significant
H <sub>0</sub> : Industrial area is not associated with meals eaten away from home	1.005	2	0.606	Not significant
H <sub>0</sub> : Industrial area is not associated with meals you skip	1.319	1	0.252	Not significant
H <sub>0</sub> : Industrial area is not associated with weight loss	0.146	1	0.705	Not significant
H <sub>0</sub> : Industrial area is not associated with weight gain	0.105	1	0.749	Not significant
H <sub>0</sub> : Industrial area is not associated with eyesight weakness	0.008	1	0.936	Not significant
H <sub>0</sub> : Industrial area is not associated with kidney problem	5.861	1	0.016*	Significant
H <sub>0</sub> : Industrial area is not associated with Foot numbness, tingling, or loss of feeling	0.673	1	0.413	Not significant
H <sub>0</sub> : Industrial area is not associated with dental problem	0.209	1	0.649	Not significant
H <sub>0</sub> : Industrial area is not associated with wound healing problem	0.000	1	0.991	Not significant
H <sub>0</sub> : Industrial area is not associated with testing blood sugar	0.421	1	0.519	Not significant
H <sub>0</sub> : Industrial area is not associated with own a blood sugar meter	2.911	1	0.089	Not significant

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Industrial area is not associated with difficulties monitoring your blood sugar	0.064	1	0.803	Not significant
H <sub>0</sub> : Industrial area is not associated with Usual range of tests.	6.642	2	0.037*	Significant
H <sub>0</sub> : Industrial area is not associated with record blood sugars	0.023	1	0.884	Not significant
H <sub>0</sub> : Industrial area is not associated with getting signs or symptoms when your blood sugar is low	0.275	1	0.602	Not significant
H <sub>0</sub> : Industrial area is not associated with taking diabetes medications	0.268	1	0.607	Not significant
H <sub>0</sub> : Industrial area is not associated with kind of medicine taken	6.491	3	0.091	Not significant
H <sub>0</sub> : Industrial area is not associated with regular in taking medicine	0.152	1	0.699	Not significant
H <sub>0</sub> : Industrial area is not associated with any other medications	0.210	1	0.658	Not significant
H <sub>0</sub> : Industrial area is not associated with meeting doctor	0.833	2	0.661	Not significant
H <sub>0</sub> : Industrial area is not associated with kind of industry	72.888	3	0.000*	Significant
H <sub>0</sub> : Industrial area is not associated with habitat	0.079	1	0.778	Not significant
H <sub>0</sub> : Industrial area is not associated with sanitary system	0.003	1	0.966	Not significant
H <sub>0</sub> : Industrial area is not associated with kind of water drunk	0.064	1	0.803	Not significant
H <sub>0</sub> : Industrial area is not associated with Usage of processed meat	0.008	1	0.936	Not significant
H <sub>0</sub> : Industrial area is not associated with Usage of food additives	3.098	1	0.079	Not significant

**Table 4:** Association of marital status with all other variables.

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Marital status is not associated with age.	82.640	37	0.000*	Significant
H <sub>0</sub> : Marital status is not associated with gender	0.356	1	0.553	Not significant
H <sub>0</sub> : Marital status is not associated with family strength	7.678	13	0.865	Not significant
H <sub>0</sub> : Marital status is not associated with family Patients	5.043	8	0.754	Not significant
H <sub>0</sub> : Marital status is not associated with profession	60.939	35	0.005*	Significant
H <sub>0</sub> : Marital status is not associated with regular exercise program or routine you are following.	0.053	1	0.826	Not significant
H <sub>0</sub> : Marital status is not associated with type of exercise done.	1.704	2	0.428	Not significant

<b>Statements</b>	<b>Chi-square</b>	<b>d.f.</b>	<b>p-value</b>	<b>Conclusion</b>
H <sub>0</sub> : Marital status is not associated with no. of days per week exercise was done	2.449	3	0.486	Not significant
H <sub>0</sub> : Marital status is not associated with how long at each session of exercise was	2.141	3	0.545	Not significant
H <sub>0</sub> : Marital status is not associated with time of day do you usually exercise	3.224	3	0.359	Not significant
H <sub>0</sub> : Marital status is not associated with your physician told you to avoid any specific exercise	.576	2	0.751	Not significant
H <sub>0</sub> : Marital status is not associated with your health interfered with your hobbies or recreational activities?	.034	1	0.858	Not significant
H <sub>0</sub> : Marital status is not associated with do you think diabetes makes you more emotional?	0.003	1	0.964	Not significant
H <sub>0</sub> : Marital status is not associated with diabetes affected your routine life.	0.071	1	0.792	Not significant
H <sub>0</sub> : Marital status is not associated with if health was interfered with household chores.	0.141	1	0.710	Not significant
H <sub>0</sub> : Marital status is not associated with if diabetes affected your social life.	1.043	1	0.308	Not significant
H <sub>0</sub> : Marital status is not associated with if you feel any change in your body after taking insulin injections.	0.204	2	0.904	Not significant
H <sub>0</sub> : Marital status is not associated with if you think diabetes, is curable disease.	0.611	1	0.436	Not significant
H <sub>0</sub> : Marital status is not associated with if you smoke.	3.510	1	0.062	Not significant
H <sub>0</sub> : Marital status is not associated with if you drink alcohol.	0.120	2	0.939	Not significant
H <sub>0</sub> : Marital status is not associated with if you use tobacco.	0.220	2	0.897	Not significant
H <sub>0</sub> : Marital status is not associated with since how long ago you are using tobacco.	0.267	5	0.999	Not significant
H <sub>0</sub> : Marital status is not associated with no. of meals do you usually eat per day.	0.531	3	0.913	Not significant
H <sub>0</sub> : Marital status is not associated with no. of times you take snacks per day.	1.267	3	0.738	Not significant
H <sub>0</sub> : Marital status is not associated with no. of times a week do you eat away from home.	3.702	3	0.297	Not significant

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Marital status is not associated with meals that are usually eaten away from home.	0.381	3	0.945	Not significant
H <sub>0</sub> : Marital status is not associated with if you ever skip meals.	0.531	3	0.913	Not significant
H <sub>0</sub> : Marital status is not associated with if you feel any weight loss after diabetes.	0.160	1	0.691	Not significant
H <sub>0</sub> : Marital status is not associated with if you feel any weight gain after diabetes.	0.012	1	0.918	Not significant
H <sub>0</sub> : Marital status is not associated with if your eyesight become weak after diabetes.	0.037	1	0.857	Not significant
H <sub>0</sub> : Marital status is not associated with if you have any kidney problem after diabetes.	0.008	1	0.933	Not significant
H <sub>0</sub> : Marital status is not associated with if you have any numbness/tingling/loss of feeling in your feet.	0.548	2	0.762	Not significant
H <sub>0</sub> : Marital status is not associated with if you have any dental problem after diabetes.	3.264	2	0.197	Not significant
H <sub>0</sub> : Marital status is not associated with if you have any wound healing problem after diabetes.	1.375	2	0.504	Not significant
H <sub>0</sub> : Marital status is not associated with if you test your blood sugar.	0.418	1	0.520	Not significant
H <sub>0</sub> : Marital status is not associated with if you have your own blood sugar meter.	0.767	1	0.383	Not significant
H <sub>0</sub> : Marital status is not associated with if you had any difficulties monitoring your blood sugar.	0.088	2	0.959	Not significant
H <sub>0</sub> : Marital status is not associated with Usual range of tests.	100.200	84	0.113	Not significant
H <sub>0</sub> : Marital status is not associated with record blood sugars.	0.239	1	0.627	Not significant
H <sub>0</sub> : Marital status is not associated with getting signs or symptoms when your blood sugar is low.	1.056	1	0.305	Not significant
H <sub>0</sub> : Marital status is not associated with taking diabetes medications.	0.815	1	0.368	Not significant
H <sub>0</sub> : Marital status is not associated with kind of medicine taken.	1.988	3	0.575	Not significant
H <sub>0</sub> : Marital status is not associated with regular in taking medicine.	2.488	2	0.290	Not significant
H <sub>0</sub> : Marital status is not associated with any other medications.	0.115	1	0.736	Not significant
H <sub>0</sub> : Marital status is not associated with meeting doctor.	1.280	3	0.735	Not significant

Statements	Chi-square	d.f.	p-value	Conclusion
H <sub>0</sub> : Marital status is not associated with kind of industry.	1.354	2	0.510	Not significant
H <sub>0</sub> : Marital status is not associated with habitat.	25.656	21	0.221	Not significant
H <sub>0</sub> : Marital status is not associated with sanitary system.	.232	2	0.892	Not significant
H <sub>0</sub> : Marital status is not associated with kind of water drunk.	6.307	2	0.044*	Significant
H <sub>0</sub> : Marital status is not associated with usage of processed meat.	.121	2	0.943	Not significant
H <sub>0</sub> : Marital status is not associated with usage of food additives.	.072	2	0.966	Not significant

**Table 5:** Test for normality.

Hypotheses	N	K-S Test	p-value	Conclusion
H <sub>0</sub> : Physical activities has normal value.	98	0.263	0.000	Not normal
H <sub>0</sub> : Daily activities has normal value.	100	0.374	0.000	Not normal
H <sub>0</sub> : Meals have normal value.	98	0.165	0.000	Not normal
H <sub>0</sub> : Other complications has normal value.	99	0.192	0.000	Not normal
H <sub>0</sub> : Blood sugar monitoring has normal value.	99	0.256	0.000	Not normal
H <sub>0</sub> : Medications have normal value.	96	0.170	0.000	Not normal
H <sub>0</sub> : Environmental factors have normal value.	98	0.186	0.000	Not normal

**Table 6:** Testing of patient's gender with the factors.

Alternative Hypothesis	Mann-Whitney U	p-value
Gender is affected by physical activities.	1100.500	0.986
Gender is affected by daily activities.	954.000	0.147
Gender is affected by meals.	863.000	0.072
Gender is affected by other complications.	862.600	0.043*
Gender is affected by blood sugar monitoring.	999.600	0.309
Gender is affected by medications.	890.600	0.169
Gender is affected by environmental factors.	905.600	0.110

**Table 7:** Habitat in conjunction with other factors.

Alternative Hypothesis	Mann-Whitney U	p-value
Habitat are affected by physical activities.	897.600	0.186
Habitat are affected by daily activities.	1061.600	0.760
Habitat are affected by meals.	986.500	0.457
Habitat are affected by other complications.	884.900	0.097
Habitat are affected by blood sugar monitoring.	976.000	0.329
Habitat are affected by medications.	712.000	0.010*
Habitat are affected by environmental factors.	378.900	0.000*

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