Compliance Issue in Type II Diabetes: Does it Reduce the Prevalence of Cardiovascular Risk Factors?

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ABSTRACT:

BACK GROUND:

Type 2 diabetes, which is the most common form of diabetes, has an alarming increasing rate. It is a recognized risk factor for cardiovascular disease (CVD). Non-compliance with healthy life styles, anti-diabetic drugs and diet are the central issues in patient's management as it might synergist other CVD risk factors.

OBJECTIVE:

The aims of this study were to find out the compliance, prevalence of CVD risk factors, and any association between them in type 2 diabetic patients.

METHODS:

A cross-sectional design and a convenient sample of 820 diabetic patients were used in conducting this study for the period from the 1st October, 2006 to 31st December, 2008. A Structured questionnaire was used to collect demographic information from the patients. 10 questions were used to determine the patient's compliance. The classic risk factors; obesity, hyperglycemia (HG), hypertension (HT), and hypercholesterolemia (HC), have been studied for each patient and compared with his/her compliance to find any association.

RESULTS:

The results of this study revealed that there were only 187 out of 820 (22.80%) with good compliance and 297 (36.22%), 336 (40.98%) patients with fair and poor compliance respectively. The prevalence of obesity, over weight, uncontrolled HG, HT (systolic, diastolic or both) and presence of HC in our diabetic patients were 27.32%, 36.83%, 51.95%, 40.73 and 30.37 respectively. Good compliance was associated significantly with normal body weight, controlled HG, absence of HT, and absence of HC.

CONCLUSION:

The study concluded that less than one third of our diabetic patients had good compliance. CVD risk factors are prevalent among them, and this prevalence is associated significantly with the level of compliance. Understanding the reasons behind these forms of non-compliance is an important key to the successful development of potential program to decrease the CVD risk factors and associated complications.

KEYWORDS: compliance, diabetes, cardiovascular

INTRODUCTION:

Diabetes mellitus (DM) is a chronic illness that requires continuous medical care to prevent acute and long-term complications [(1).] The tide of DM is rising worldwide, posing a significant and growing threat to global health [(2)]**.** It has been reported that 10.4% of the Iraqi population has been diagnosed as having diabetes [(3)].Total annual economic burden of diabetes is believed to approach $100 billion in the United States[(4).] The heaviest burden of diabetes on patients, families and healthcare systems arises from the long-term cardiovascular complications associated with the disease. Patients with type 2 diabetes are at a 2–4 fold higher risk of cardiovascular events, especially coronary events, compared with subjects without diabetes[(5)]. Cardiovascular disease and stroke are rapidly growing problems, and are the major causes of illness and deaths in the Eastern Mediterranean Region, accounting for 31% of deaths. Approximately 75% of CVD can be attributed to conventional risk factors and according to the World Health Organization (WHO), the prevalence of cardiovascular disease in diabetic patients ranges from 26% to 36%; in addition, CVD accounts for a great majority of deaths[(6)].

Compliance is defined as "the extent to which a person's behavior coincides with medical or health advice". The word compliance indicates that patients obey physicians' instructions. For diabetic patients, "behavior" is taking oral medications and/or insulin injections, following diets, ensuring good glycemic control, and making adherence to different aspects of diabetes care centers. Thus, the

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interaction between the patient and health care provider is important in the management of type II diabetes [7].

The low compliance by diabetic patients to professional recommendations is a major therapeutic challenge today. Several large clinical trials have shown that changes in lifestyle or taking medication can prevent or delay the complications of type II diabetes, but actually the change in lifestyle is not always easy for most people, especially when we want to maintain these changes over the long-term to minimize health risks [8].

Few studies about diabetes patient compliance in Arab countries have been published. The first study has been conducted in Saudi Arabia, which is carried out at Al-Manhal primary health care center, aimed at identifying determinants of compliance among diabetic patients attending that clinic [9]. The second study has been conducted in College of Pharmacy; Nablus Palestine[10], and a third study conducting in Baghdad concentrated on investigating the compliance behavior only [11]. The aims of this study are:

1- Finding out the degree of compliance in our diabetic patients

2- Investigating the CVD risk factors in those patients

3- Assessing any association between the compliance and CVD risk factors

PATIENTS AND METHOD:

- **Study design and period:** This is a cross-sectional study conduced for the period from 1st October, 2006 to 31st December, 2008.
- **Study setting:** Participants were recruited from The Specialized Center for Endocrinology & Diabetes - Baghdad. Informed consents were taken before data collection.
- **Study population:** Type II diabetes patients attending the above center. The diagnosis was fully established by the specialists in the center and each patient had a file that contains the demographic and medical information. Each registered diabetic patient is supposed to visit the center at least once every month, to be followed up by the caring physician, examined for any complaint or complication, tested for blood sugar, receive his/her drugs or be referred to the hospital for check-up. Further, a health education checklist is covered by the physician who chooses the most relevant topic every visit.
- **Study sample:** A convenience sample of 820 patients from the above center was chosen.
- **The inclusion criteria are:**

a- Patients diagnosed with type II diabetes mellitus for 5 to 10 years.

b- Those above 30 years of age.

c- Patient had file with complete information.

- **Data collection:** After explaining the objectives of the study to the patient, the data were collected by using specially constructed questionnaire; the questionnaire (constructed by the researcher and validated by a number of experts) covered the following Items:

1- Demographic data including age, sex, occupation, marital status, educational level, residence.

2- Estimation of patient's compliance: Measurement of compliance was done by using a modified scoring system depending on the original one created by French researchers, Girerd X et al. [12]. A panel of experts in diabetes care and research reviewed the system for comprehensiveness. The questionnaire tests appointment compliance, therapeutic compliance, dietary compliance and adherence to regular physical exercise.

The compliance has been assessed during a personal interview using a 10-item graded questionnaire. Each item has five possible answers. Each answer has 2 to 10 points, and the patients might get from 20 to 100 scores. Patients collecting 75% or more of the points are considered in the good compliance category. Patients collecting 50%-74% of the points are considered in the fair compliance group, and finally, patients collecting less than 50% are considered poor compliers.

3- Investigation of risk factors;

a- Obesity was assessed by calculation of Body Mass index (BMI): BMI was calculated as WT in Kg /HT in (Meter^2). Height was measured without shoes with the person standing erect on a flat surface and it was recorded to the nearest centimetre. Weight was measured with the person wearing light clothing and recorded to the nearest 0.1 kg. Healthy person falls between a BMI of 18.5 and 24.9. Underweight, overweight, and obesity were considered when BMI were <18.5, 25.0 -29.9 and ≥30.0 respectively [13].

b- Assessment of controlled HG was done through HbA_1C % level. HbA_1C % level is used as proxy measure of long term glycemic control in all researches of people with diabetes. The patient whose HbA1C % level was 6.5% or below was considered to be with controlled HG [14].

c- Blood pressure (BP) was measured and evaluated using a mercury sphygmomanometer and a standard clinical protocol according to the JNC-VI report [15]. Blood pressure was measured twice in the sitting position after 5 minutes of resting. The two readings of the systolic and diastolic BP separated by 2 minutes were averaged to the nearest 2 mmHg from the top of the mercury

meniscus. Systolic BP was recorded at the first appearance of sounds, and diastolic BP at phase V at the disappearance of sounds. HT was defined as systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg. BP measurement was designated into two levels either presence or absence of hypertension. The validity of the sphygmomanometers was ensured by calibration prior to their use.

d-Total Serum cholesterol was measured and designated into three levels based on the recommendations of the US Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol: Normal (< 200 mg/dl), borderline (200-239 mg/dl) and high (≥240 mg/dl). (16).

- **Statistical analysis:**

1-Descriptive statistical: Tables, graphs, frequency and percentages.

2- Inferential statistical: Chi square test was used to find the association between the compliance and the related variables.

Data were entered and analyzed by Statistical Package for Social Sciences (SPSS) version 11. P-value <0.01 (to decrease the probability of type I error) was considered significant.

RESULTS:

1- The level of compliance:

The results of this study revealed that there were only 187 out of 820 (22.80%) with good compliance and 297 (36.22%), 336 (40.98%) patients with fair and poor compliance respectively. The associations between compliance and age, gender, occupation, marital status and residence were statistically significant (Table 1).

Regarding the age, the proportions of good compliance was decreased first from 19.19% in age group 20-39 years to 16.07% in age group 40-49 years, then increased as the age advanced; 29.82% in age group 50-50 years to 38.09% in age group ≥60.

Female gender was more complier than male. The proportion of good compliance was 32.61% in female versus 16.47% in male. Also, retired patients were more compliers than other jobs; the proportion of good compliance was 91.30%, followed by 52.78% in students but 21.56 in official workers, 20.31 in free workers, and 19.49% in house wives.

Marital status appeared to be also affecting the compliance as the results showed single patients have 41.18% proportion of good compliance in comparison to 20.31% for married patients. While the proportions in divorced and widow patients were 24.05% and 14.28% respectively. The patients living in urban areas showed 32.94% proportion of good compliance compared with 16.79% for patient living in rural areas.

2-The prevalence of cardiovascular risk factors:

The prevalence of obesity, over weight, uncontrolled HG, HT (systolic, diastolic or both) and presence of HC were 27.32%, 36.83%, 51.95%, 40.73% and 30.37% respectively (Tables 2, 3, 4 and 5).

BMI was significantly associated with age, gender, occupation, marital status and residence. Over weight and obesity constituted 52.35%, 76.19%, 58.77% and 54.76% of patients with age groups 30-39 years, 40-49 years, 50-59 years and ≥60 years respectively. 37.15% of male patients were obese in comparison to 12.11% in female, but over weight prevalence was 24.90% in male versus 55.28% in female.

The prevalence of obesity was 13.89%, 21.19%, 22.75%, 35.55%, and 35.53% in students, house wives, official workers, free workers, and retired patients respectively.

Uncontrolled HG was also significantly associated with age, gender, but not occupation, marital status and residence. The highest proportion of uncontrolled HG was seen in age group 30-39 years (71.51%), then in age groups ≥60 (47.62%), and in age group 50-59 years (44.30%), while the lowest was in age group 40-49 years (42.24%). Male gender has had 59.04% proportion of uncontrolled hyperglycemia versus 40.99% in female.

HT (systolic, diastolic or both) showed a significant association with age, gender and occupation only. 73.81% of age group ≥60 years were found to have elevated blood pressure in comparison to 9.30%, 39.29%, and 54.39% in age groups 30-39 years, 40-49 years, and 50-59 years respectively. The proportion of HT in male gender was 57.43% versus 14.91% in female. Retired patients had the highest proportion regarding the job (72.37%) in comparison to 19.44%, 23.43%, 46.41%, and 48.30% in students, free workers, official workers and house wives respectively.

HC was associated significantly with age, gender, occupation, marital status and residence. It was present in 50% of age group ≥60 years, 34.65% of age group 50-59 years, 25.30% of age group 40-49 years and 25% of age group 30-39 years. It was also present in 38.35% of male versus 18.01% of female. Regarding job distribution, the highest proportion of HC was present in retired patients (53.95%) compared with 16.67%, 26.95%, 28.74, 31.36%, students, free workers, official workers, and housewives respectively. regarding marital status, the lowest proportion was in single patient

(11.76%) and the highest was in divorced patients (46.83), while in still-married and widow patient the proportion were 30.38% and 39.68%. Patients from urban area showed 34.54% proportion of HC in comparison to 8.40% in patient from rural area.

3- The association between compliance level and prevalence of cardiovascular risk factors:

Good compliance was associated significantly with normal body weight, controlled HG, absence of HT, and absence of HC. (Table 6)

The results revealed that 68.98% of patients with good compliance had normal body weight in comparison to 26.60% in patient with fair compliance and 25.30% in patients with poor compliance. In other words, patients with poor compliance had obesity rate of 39.28% and over weight rate of 35.12% in comparison to 19.25% and 11.76% in patients with good compliance.

HG was better controlled in patients with good compliance. 70.07% of patients with good compliance had controlled blood sugar in comparison to 57.91% and 27.08% in patients with fair and poor compliance.

Normal blood pressure was found in 78.07% of patients with good compliance in comparison to 66.67% and 42.26% in patients with fair and poor compliance.

HC was absent in 66.31% of patients with good compliance in comparison to 47.81% and 30.06% in patients with fair and poor compliance.

DISCUSSION:

The overall goal of diabetic management is to help individuals with diabetes to achieve optimal health and to prevent the occurrence of complications. This requires a team effort that includes diabetes health care professionals and the individuals who must deal with this chronic condition on a daily basis with excellent compliance. Diabetic patients with their families must gain the necessary knowledge, life skills, resources and support needed to reach that goal [7].

This study highlighted the aspect of compliance in our patients (type II DM) in order to elaborate a measurement scale that can be used to assess the level of compliance in our clinics hoping to achieve an optimal compliance level to avoid the long term complications of the disease. The compliance of patient was estimated and classified into good, fair, and poor depending on items which are fundamental in DM control; regularity of the center's visits, adherence to treatment regimen, balancing food intake, physical exercise and self monitoring. For each of the above items, a score was given according to the patient response; the final scoring was made by summation of all items scores.

The results of this study revealed that there were only 187 out of 820 (22.80%) with good compliance and 297 (36.22%), 336 (40.98%) patients with fair and poor compliance respectively. This means that 77.20% of our patients have fair and poor compliance which is a high and alarming proportion that may lead to more complications among our patients and hence more burdens on the health system. This finding is in agreement of that found by Naji F et al [11] (75.29% of patients with fair and poor compliance). Waleed Sweileh et al [10] in Palestine found that the rate of fair and poor compliance was 58.9%. The same figures were found in India [17], but these rates had decreased in Turkey and England [18,19]. In this study, we selected only patients with age of 30 years and above as type II DM is more common above this age and in order to omit any bias regarding teen age compliance. It was found that age is significantly associated with compliance and the compliance was increased with advance of age as good compliance was 38.09% in age group ≥60. This finding might related to the increase in health concern and experience with aging, but other studies found that younger is more compliant than elderly [11,18,19].

Regarding gender, the study showed that females were more compliant than males; this might be related to more obedience of female gender to the instructions of the health care providers, a finding which agrees with other studies [11,17,18,19].

There was a significant associated between the compliance and the occupation of the patients. That indicates the patient might have good or bad compliance depending on his/here job, or in other words, job might affect compliance. This study disagrees with Naji F et al [11], but agrees with Uitewaal, et al. [19], and Bhattacharya, et al. [17].

Marital status showed a significant association with compliance as single patient was more compliant than married. This finding disagrees with that of Naji F et al [11], Bhattacharya, et al. [17], and Puder and Keller [20] who found that compliance was better in married patients.

Urban residence patients were found to be more compliant than rural patients. This might related to many reasons especially those related to education and availability of health care facilities, but this factor was not studied in the above researches.

Educational level was not studied in this study as demographic factor. This is because the well known role of education in patient life and compliance was obvious. The level of education plays an important role to increase knowledge and understanding of the disease, to promote self-management, to achieve optimal control of blood

glucose levels, to prevent the acute and chronic complications of diabetes, to increase awareness and comfort with new technologies that may improve their ability with day-to-day management issues [21], and several findings implied that best disease control is achieved when those with type II diabetes had a high degree of knowledge of diabetes, including positive attitudes, good meal plan adherence, and few perceived barriers to physical activity [11,17,18,19,21].

Cardiovascular diseases (coronary heart disease, stroke, peripheral vascular disease) are the most important cause of mortality and morbidity among patients with type 2 diabetes [22]. For that reason, this study investigated the prevalence of these factors in our patients. Obesity and over weight were prevalent in 27.32% and 36.83%, and BMI had showed a highly significant association with compliance. Diet is considered the backbone of any treatment plan for type II diabetes mellitus and dietary recommendations are essential [14]. This study was in agreement with that of Wendel et al. [16] who showed that better perceived adherence to an exercise plan and greater self- care abilities were associated with lower BMI, and obesity in the type II diabetes patients was more likely due to poor dietary habits and lack of exercise. Obesity also complicates the management of type II diabetes by increasing insulin resistance and blood glucose concentrations [23].

The first reports on glucose as a risk factor for cardiovascular complications were published in 1965 in the U.K. (the Bedford Study) [24], and the U.S. (the Tecumseh Study [25]. A recent meta-analysis of 20 studies has demonstrated that hyperglycemia contributes to cardiovascular complications in patients with type 2 diabetes and intensive glucose control reduces effectively these complications [26]. This study found that hyperglycemia was better controlled in patients with good compliance. 70.07% of patients with good compliance had controlled blood sugar in comparison to 57.91% and 27.08% in patients with fair and poor compliance. These observations were extended by Kuusisto et al. to older type 2 diabetic patients; aged from 65 to 74 years at baseline. HbA_1c was a significant predictor not only for CHD events, but also for fatal or nonfatal stroke [27].

The prevalence of clinical HT in this study was 40.73% which is higher than that of non diabetic population. Several studies have examined blood pressure levels in general populations, the prevalence rates for HT have been reported to range between 10% to over 17% of the above 20 years population. A prevalence rate of 12% was found in an Iraqi community [28,29], but with good compliance the prevalence of HT return to near usual level (as it found in this study). The prevalence of HT in good compliance patient was 21.93% and normal blood pressure was found in 78.07%.

The overall prevalence of HC in this study was 30.37%. Good complaints showed HC prevalence of 17.65% versus 27.94% and 39.58% in patients with fair and poor compliances. The prevalence rates for HC have been reported to range between 5% to over 7.6% of the above 20 years population in Eastern Mediterranean region [30]. The result of this study revealed a higher prevalence of HC in diabetic patients, but this prevalence can be reduced significantly by good compliance.

In summary, the results obtained from this study indicate that most of our diabetic patients (77.20%) had fair and poor compliance, which is a high and alarming proportion that may lead to more complications among our patients and hence more burdens on the health system. This problem associated with high prevalence of CVD risk factors which are already significant public health problems in these patients, but this prevalence can be significantly reduced by good compliance. Good compliance has a positive reduction effect on CVD risk factors, suggesting that the prevention of CVD in diabetes may be achieved by improving patient compliance. However, further studies would be required to obtain a complete picture of the compliance in diabetes and other cardiovascular risk factors.

Table 1: Compliance of the diabetic patients regarding their demographic characters

	Compliance						Total		P value
	Good		Fair		Poor				
	No	%	No	%	No	%	No	%	
Age									
30-39	33	4.02	56	6.83	83	10.12	172	20.98	
40-49	54	6.59	85	10.37	197	24.02	336	40.98	0.000
50-59	68	8.29	117	14.26	43	5.24	228	27.80	
≥60	32	3.90	39	4.76	13	1.59	84	10.24	
Gender									
Male	82	10.00	135	16.46	281	34.27	498	60.73	0.000
Female	105	12.08	162	19.76	55	6.71	322	39.27	
Occupation									
Student	19	2.32	11	1.34	6	0.73	36	4.39	
House wife	23	2.80	51	6.22	44	5.37	118	14.39	0.000
Official worker	72	8.78	131	15.98	131	15.98	334	40.73	
Free worker	52	6.34	72	8.78	132	16.10	256	31.22	
Retired	21	2.56	32	3.90	23	2.80	76	9.27	
Marital status									
Single	42	5.12	26	3.17	34	4.15	102	12.44	0.001
Married	117	14.27	235	28.66	224	27.32	576	70.24	
Divorced	19	2.32	23	2.80	37	4.51	79	9.63	
Widow	9	1.10	13	1.59	41	5.00	63	7.68	
Residence									
Urban	165	20.12	263	32.07	261	31.83	689	84.02	0.000
Rural	22	2.68	34	4.15	75	9.15	131	15.98	
Total	187	22.80	297	36.22	336	40.98	820	100	

Table 2: BMI of the diabetic patients regarding their demographic characters

	BMI						Total		P value
	Normal (or below)		Over Wt		Obese				
	No	%	No	%	No	%	No	%	
Age									
30-39	82	10.00	42	5.12	48	5.85	172	20.98	
40-49	80	9.76	154	18.78	102	12.44	336	40.98	0.000
50-59	94	11.46	77	9.39	57	6.95	228	27.80	
≥60	38	4.63	29	3.54	17	2.07	84	10.24	
Gender									
Male	189	23.05	124	15.12	185	22.56	498	60.73	0.000
Female	105	12.80	178	21.71	39	4.76	322	39.27	
Occupation									
Student	26	3.17	5	0.61	5	0.61	36	4.39	
House wife	32	3.90	61	7.44	25	3.05	118	14.39	0.000
Official	126	15.37	132	16.10	76	9.27	334	40.73	
worker	97	11.83	68	8.29	91	11.10	256	31.22	
Free worker	13	1.59	36	4.39	27	3.29	76	9.27	
Retired									
Marital status									
Single	53	6.46	26	3.17	23	2.80	102	12.44	
Married	206	25.12	212	25.85	158	19.27	576	70.24	0.001
Divorced	23	2.80	32	3.90	24	2.93	79	9.63	
Widow	12	1.46	32	3.90	19	2.32	63	7.68	
Residence									
Urban	268	32.68	234	28.54	187	22.80	689	84.02	0.000
Rural	26	3.17	68	8.29	37	4.51	131	15.98	
Total	294	35.85	302	36.83	224	27.32	820	100	

Table 3: Hyperglycemia control in the diabetic patients regarding their demographic characters

	Hyperglycemia				Total		P value
	Controlled		Uncontrolled				
	No	%	No	%	No	%	
Age							
30-39	39	4.76	133	16.22	172	20.98	
40-49	184	22.44	152	18.54	336	40.98	0.000
50-59	127	15.49	101	12.32	228	27.80	
≥60	44	5.36	40	4.88	84	10.24	
Gender							
Male	204	24.88	294	35.85	498	60.73	0.000
Female	190	23.17	132	16.10	322	39.27	
Occupation							
Student	25	3.05	11	1.34	36	4.39	
House wife	46	5.61	72	11.78	118	14.39	0.018
Official	156	19.02	178	21.71	334	40.73	
worker	126	15.37	130	15.85	256	31.22	
Free worker	41	5.00	35	4.27	76	9.27	
Retired							
Marital status							
Single	56	6.83	46	5.61	102	12.44	
Married	281	34.27	295	35.98	576	70.24	
Divorced	26	3.17	53	6.46	79	9.63	0.025
Widow	31	3.78	32	3.90	63	7.68	
Residence							
Urban	331	35.49	358	48.54	689	84.02	0.991
Rural	63	12.56	68	3.41	131	15.98	
Total	394	48.05	426	51.95	820	100	

Table 4: Presence of hypertension in diabetic patients regarding their demographic characters

	Hypertension (systolic, diastolic or both)				Total		P value
	Absent		Present				
	No	%	No	%	No	%	
Age							
30-39	156	19.02	16	1.95	172	20.98	
40-49	204	24.88	132	16.10	336	40.98	0.000
50-59	104	12.68	124	15.12	228	27.80	
≥60	22	2.68	62	7.56	84	10.24	
Gender							
Male	212	25.85	286	34.88	498	60.73	0.000
Female	274	33.42	48	5.85	322	39.27	
Occupation							
Student	29	3.54	7	0.85	36	4.39	
House wife	61	7.44	57	6.95	118	14.39	0.000
Official worker	179	21.83	155	18.90	334	40.73	
Free worker	196	23.90	60	7.32	256	31.22	
Retired	21	2.56	55	6.71	76	9.27	
Marital status							
Single	56	6.83	46	5.61	102	12.44	
Married	335	40.85	241	29.39	576	70.24	
Divorced	53	6.46	26	3.17	79	9.63	0.210
Widow	42	5.12	21	2.56	63	7.68	
Residence							
Urban	424	51.71	265	32.32	689	84.02	0.002
Rural	62	7.56	69	8.41	131	15.98	
Total	486	59.27	334	40.73	820	100	

Table 5: Presence of hypercholesterolemia in diabetic patients regarding their demographic characters

	Hypercholestremia			Total	P value
	Absent	Borderline	Present		
	No %	No %	No %	No %	
Age					
30-39	67 8.17	62 7.56	43 5.24	172 20.98	
40-49	192 23.41	59 7.20	85 10.37	336 40.98	0.000
50-59	94 11.46	55 6.71	79 9.63	228 27.80	
≥60	14 1.71	28 3.41	42 5.12	84 10.24	
Gender					
Male	143 17.44	164 20.00	191 23.29	498 60.73	0.000
Female	224 27.32	40 4.88	58 7.07	322 39.27	
Occupation					
Student	18 2.20	12 1.46	6 0.73	36 4.39	
House wife	55 6.71	26 3.17	37 4.51	118 14.39	0.000
Official worker	176 21.46	62 7.56	96 11.71	334 40.73	
Free worker	106 12.93	81 9.88	69 8.41	256 31.22	
Retired	12 1.46	23 2.80	41 5.01	76 9.27	
Marital status					
Single	58 7.07	32 3.90	12 1.47	102 12.44	
Married	264 32.20	137 16.71	175 21.33	576 70.24	0.000
Divorced	26 3.17	16 1.95	37 4.51	79 9.63	
Widow	19 2.32	19 2.32	25 3.05	63 7.68	
Residence					
Urban	266 32.44	185 22.56	238 29.02	689 84.02	0.000
Rural	101 12.32	19 2.32	11 1.34	131 15.98	
Total	367 44.76	204 24.88	249 30.37	820 100	

Table 6: The association between compliance of the studied sample and cardiovascular risk factors

	Compliance			Total	P value
	Good	Fair	Poor		
	No %	No %	No %	No %	
BMI					
Normal	129 15.73	79 9.63	86 10.49	294 35.85	0.000
Over Wt	22 2.68	162 19.76	118 14.39	302 36.83	
Obese	36 4.39	56 6.83	132 16.10	224 27.32	
Hyperglycemia					
Controlled	131 15.97	172 20.98	91 11.10	394 48.05	0.000
Not controlled	56 6.83	125 15.24	245 29.88	426 51.95	
Hypertension					
Absent	146 17.80	198 24.15	142 17.32	486 59.27	0.000
Present	41 5.00	99 12.07	194 23.66	334 40.73	
Hypercholestremia					
Absent	124 15.12	142 17.32	101 12.32	367 44.76	0.000
Borderline	30 3.66	72 8.78	102 14.44	204 24.88	
Present	33 4.02	83 10.12	133 16.22	249 30.36	
Total	187 22.80	297 36.22	336 40.98	820 100	

CONCLUSION:

The study concluded that less than one third of our diabetic patients had good compliance. CVD risk factors are prevalent among them, and this prevalence is associated significantly with the level of compliance. Understanding the reasons behind these forms of non-compliance is an important key to the successful development of potential program to decrease the CVD risk factors and associated complications.

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