RESEARCH ARTICLE

COMPLIANCE OF SAUDI DIABETIC PATIENTS WITH THEIR DIABETIC MEDICATION.

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Manuscript Info	Abstract

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Background: In recent years there were a lot of studies showing increasing numbers of complication in diabetic patient in the world include Saudi population. Amongst the most important reasons for such complications is the non-adherence of diabetic patient with their medication, diet and exercise.

Objectives: To explore the rate and determinants of non-compliance with diabetic treatment regimen in Saudi Arabia population.

Subjects and methods: A cross-sectional study was conducted among Saudi diabetic patients. Online approach was adopted to enroll patients through filling the study questionnaire throughout the period between 1st to 30 October, 2016. Inclusion criteria were Saudi, diabetic and have online access patients. Our outcomes were compliance with anti diabetic medication and the associated factors. An online pretested semi-structured questionnaire was utilized for date collection.

Results: The study included 1473 Saudi diabetic patients. The age of 31.4% of them ranged between 41 and 60 years. Slightly more than half of them (54.1%) were males, married (52.2%), university educated (50.9%) and 60.1% of them were type 2 diabetic patients. Compliance with physicians` visits was reported by majority of them (80.2%). However, this compliance was perfect among 42.5% of patients. Glycated hemoglobin percentage exceeded 8% among 33.7% of patients. Minority of patients (8.7%) reported difficulty in getting anti-diabetic drugs. Using traditional medicine in treating diabetes was reported by 14.7% of the participants; however it was a lot among 2.3% of them. Daily compliance with diabetic drugs was reported among 60.3% of the patients. The commonest reported reasons for escaping a daily dose of anti-diabetic drugs were being not definitely explained by physician (52.7%) and forgetting (21.7%). Most of the participants reported being reminded by family members to have the drugs.The most frequent reported sources of patient`s information regarding diabetes were physicians (69.6%) and internet (59.9%). The determinants of none-compliance to anti-diabetic medications were young age, younger age at diagnosis, moderate educational level, type 2 diabetes, absence of co-morbid diseases, never compliance with physicians visits, treatment by anti-diabetics, use of traditional medicine and having information about diabetes from the family.

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Conclusion: Rate of non-compliance with anti-diabetic medication among Saudi diabetes is high and significantly associated with personal and diabetes-factors.

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Introduction:-

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces.[1] The prevalence of type 2 diabetes mellitus is increasing globally and has become a major public health problem.[2] In 2012, diabetes was the direct cause of 1.5 million deaths and in 2014, 9% of adults 18 years and older had diabetes.[1]

More than 80% of diabetes deaths occur in developing countries.[3] In Saudi Arabia, among patients attending a primary care clinic diabetes mellitus was present in 30%.[4] The rate of non-compliance in patients with chronic diseases in developed countries, on long-term treatment, is on the order of 50%. This could be even higher in developing countries (WHO-2010).[5] For example, in India, a study showed patient-reported adherence rates for medication in type 1 and type 2 diabetic patients of 83 and 78%, respectively; self monitoring blood glucose (SMBG) adherence was 70 and 64%, respectively; and appointment keeping adherence was 71 and 72%, respectively. The adherence rates observed for diet for type 1 and type 2 diabetic patients were 39 and 37%, respectively, and for exercise they were 37 and 35%, respectively.[6]

Non-compliance can be due to factors that are patient-centered, therapy-related, or healthcare system-related. The patient-centered factors can be demographic (age, gender, educational level, and marital status) and psychological (patients' beliefs and motivation towards the therapy, negative attitude, patient-prescriber relationship, understanding of health issues, and patient's knowledge). The therapy-related factors include route of medication, duration of treatment, complexity of treatment, and the side effects of the medicines. The factors associated with the healthcare system include availability, accessibility, and the physician.[6]

In recent years there were a lot of studies showing increasing numbers of complication in diabetic patient in the world include Saudi population.[7-9] Amongst the most important reasons for such complications is the non-adherence of diabetic patient with their medication, diet and exercise. Therefore, this study aimed to explore the rate and determinants of non-compliance with diabetic treatment regimen in our community in Saudi Arabia population.

Subjects and methods:-

A cross-sectional study was conducted among Saudi diabetic patients. Online approach was adopted to enroll patients through filling the study questionnaire throughout the period between 1st to 30 October, 2016. Inclusion criteria were Saudi, diabetic and have online access patients. We excluded those who were newly diagnosed with diabetes (less than one month) from the study. Our outcomes were compliance with anti diabetic medication and the associated factors.

Sample size of the current study was calculated assuming that the number of diabetics in Saudi Arabia is 3487000 in 2015,[10] 70% of diabetic patients are not compliant with any self-management approach.[11-13] At 99% confidence interval and 3% worst acceptable limit, the estimated sample size was 1547 using Epi-Info version, 7.

An online pretested semi-structured questionnaire was utilized for date collection. It was adopted from that used in a similar study carried out in Uganda.[14] It collected information regarding demographic characteristics of patients (age, gender, marital status and educational level), diabetes-related characteristics (type of diabetes, age at diagnosis, co-morbid diseases, compliance with physicians` visits, last HbA_1c level, difficulty in getting anti-diabetic drugs, diabetic therapy, side effects of anti-diabetic drugs, source of information regarding diabetes, using traditional medicine in treating diabetes, non-compliance with anti-diabetic daily dose and remaining system used to have anti-diabetic medication.

Therapeutic compliance means that the patient observes the medical recommendations, taking the medication, and maintaining a lifestyle as recommended by clinicians.[15, 16] In this study, Focus on medication compliance was considered. Compliance with diabetic medication was determined through self-reports of how patients had escape

daily dose in a month. In the present study, we considered patients who missed drugs for one day at least in the moth as non-compliant with anti diabetic drugs.

Approval of the regional research and ethics committee, Riyadh was obtained. Data were collected and analyzed using SPSS version 22. Descriptive statistics such as number, percent, means, median and standard deviation as well as analytic statistics such as chi-square tests were applied. Significance was determined at p value ≤ 0.05.

Results:-
The study included 1473 Saudi diabetic patients. The age of 31.4% of them ranged between 41 and 60 years. Slightly more than half of them (54.1%) were males, married (52.2%) and university educated (50.9%).Table 1

Table 1:- Demographic characteristics of the participants (n=1473)

	Frequency	Percentage
Age in years		
<18	204	13.8
18-25	376	25.5
26-40	315	21.5
41-60	463	31.4
>60	115	7.8
Gender		
Male	797	54.1
Female	676	45.9
Marital status		
Married	768	52.2
Single	634	43.0
Widowed	44	3.0
Divorced	27	1.8
Educational level		
Illiterate	93	6.3
Primary school	168	11.4
Intermediate school	115	7.8
Secondary school	348	23.6
University	749	50.9

From table 2, it is shown that 60.1% of them were type 2 diabetic patients. Age at diagnosis was less than 18 years among 36.4% of them and ranged between 26 and 40 years among 27.1% of patients. Co-morbid diseases were reported among 38.6% of them; mainly hypercholesterolemia (18.9%) and hypertension (11.1%). Compliance with physicians` visits was reported by majority of them (80.2%). However, this compliance was perfect among 42.5% of patients. Glycated hemoglobin percentage exceeded 8% among 33.7% of patients. Minority of patients (8.7%) reported difficulty in getting anti-diabetic drugs. Insulin was taken by 56.3% of patients whereas regulator and anti-diabetics were reported by 29.1% and 12.6% of patients. Almost one-fifth of patients (20.9%) reported side effects of anti-diabetic drugs. Using traditional medicine in treating diabetes was reported by 14.7% of the participants; however it was a lot among 2.3% of them. Daily complaiance with diabetic drugs was reported among 60.3% of the patients.

Table 2:- Diabetes-related characteristics of the participants

	Frequency	Percentage
Type of diabetes		
Type 1	587	39.9
Type 2	886	60.1
Age at diagnosis		
<18	536	36.4
18-25	205	13.9
26-40	399	27.1
41-60	313	21.2
>60	20	1.4

Co-morbid diseases		
No	905	61.4
Hypertension	164	11.1
Hypercholesterolemia	278	18.9
Others	326	22.1
Compliance with physician`s visit		
Yes, perfect	625	42.5
Yes, sometimes	556	37.7
Never	292	19.8
HbA1c (%) (n=933)		
<5.7	58	6.2
5.7-6.4	139	14.9
6.5-7	177	19.0
7.1-8	244	26.2
>8	315	33.7
Difficulty in getting anti-diabetic drugs		
Yes	128	8.7
No	1030	69.9
Little bit	315	21.4
Diabetes therapy*		
Insulin	829	56.3
Regulator	429	29.1
Anti-diabetics	185	12.6
Others	84	5.7
Side effects of anti-diabetic drugs		
Yes	308	20.9
No	1165	79.1
Using traditional medicine in treating diabetes		
Yes, a lot	34	2.3
Yes, a little	183	12.4
Tried and stopped	363	24.6
Never	893	60.7
How many days in the month, you escape taking daily dose		
Never		
1-5	889	60.3
6-10	428	29.1
11-15	75	5.1
>15	22	1.5
	59	4.0
When you feel better, you stop your daily dose		
Yes	223	15.1
No	1250	84.9
Reason for escaping a daily dose		
Forgetting	319	21.7
Dose not definitely explained by physician	776	52.7
Difficulty to obtain drugs	18	1.2
Multi-drugs lead to confusion	45	3.1
Never	40	2.7
How do you remind yourself to have daily dose		
My memory	214	14.5
Family member remind me	1085	73.8
Mobile application	242	16.4
Pill box	122	8.3
Others	59	4.0

* Sum exceeds 100%

Patients who stopped treatment when felt well represented 15.1% of the participants. The commonest reported reasons for escaping a daily dose of anti-diabetic drugs were being not definitely explained by physician (52.7%) and forgetting (21.7%). Most of the participants reported being reminded by family members to have the drugs.

The most frequent reported sources of patient`s information regarding diabetes were physicians (69.6%) and internet (59.9%) as illustrated in figure 1.
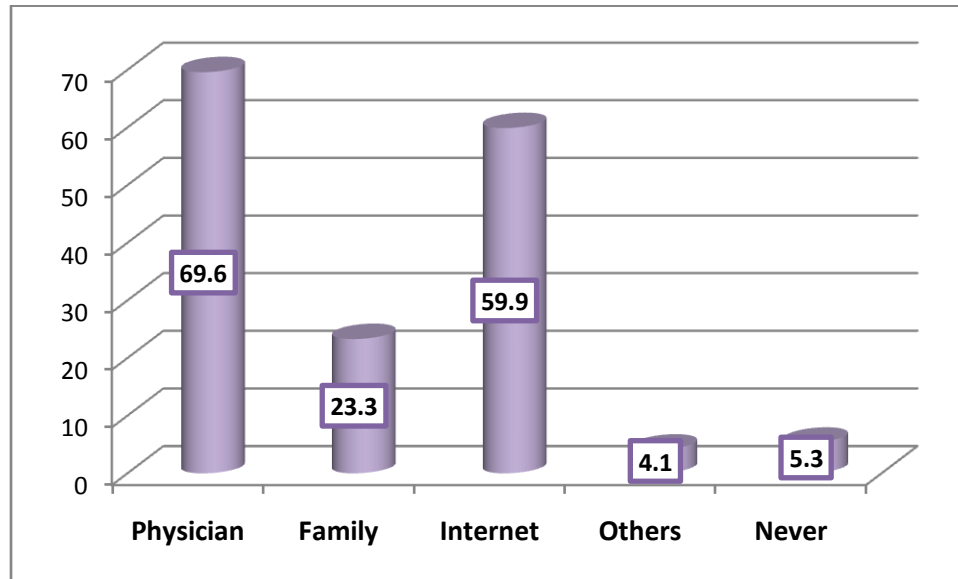

Figure 1:- Source of information regarding diabetes.

Table 3 presents the determinants of none-compliance to anti-diabetic medications. Regarding patient`s age, the highest rate of non-compliance was reported among patients aged 18-25 years (51.6%) whereas the lowest rate was reported among those aged over 60 years (23.5%), $p<0.001$. Regarding educational level, the highest rate of non-compliance was observed among secondary school graduates (49.1%) whereas the lowest rate was reported among primary school graduated (20.2%), $p<0.001$. Type 2 diabetic patients were more likely to be non-compliant than type 1 diabetic patients (42.6% versus 35.2%), $p=0.004$. Regarding age at diabetes diagnosis, the highest rate of non-compliance was reported among patients whose age at onset ranged between 18 and 25 years (51.2%) whereas the lowest rate was observed among those whose age at diagnosis ranged between 41-60 years (32.3%), $p<0.001$. Diabetic patients with co-morbid diseases were less likely to be not compliant to anti-diabetic therapy compared to those without such diseases (36.8% versus 41.4%), $p=0.043$. Patients who perfectly compliant with physicians` visits were more likely to be less non-compliant with anti-diabetic drugs compared to those who never being compliant with physicians` visit (27.4% versus 52.1%), $p<0.001$. Patients treated with anti-diabetics had higher significant rate of non-compliance with drugs compared to those treated with insulin (49.2% versus 35.6%), $p=0.003$. Patients who are using traditional medicine a lot treated had higher significant rate of non-compliance with drugs compared to those tried them and then stopped (52.9% versus 37.7%), $p=0.037$. The highest non-compliant rate was reported among patients whose source of information about diabetes was the family (64.9%) whereas the lowest rate of non-compliance was reported among patients with source of information about diabetes other than physicians, family and internet (28.6%). The difference was statistically significant, $p=0.006$.

Table 3:- Factors associated with non-compliance with diabetic management

	Compliance with diabetic management		p-value
	Yes N=889	No N=584	
Age in years <18 (n=204) 18-25 (n=376) 26-40 (n=315) 41-60 (n=463)	147 (72.1) 182 (48.4) 186 (59.0) 286 (61.8)	57 (27.8) 194 (51.6) 129 (41.0) 177 (38.2)	

>60 (n=115)	88 (76.5)	27 (23.5)	<0.001
Gender			
Male (n=797)	466 (58.5)	331 (41.5)	
Female (n=676)	423 (62.6)	253 (37.4)	0.109
Marital status			
Married (n=768)	483 (62.9)	285 (37.1)	
Single (n=634)	366 (57.7)	268 (42.3)	
Widowed (n=44)	25 (56.8)	19 (43.2)	
Divorced (n=27)	15 (55.6)	12 (44.4)	0.223
Educational level			
Illiterate (n=93)	67 (72.0)	26 (28.0)	
Primary school (n=168)	134 (79.8)	34 (20.2)	
Intermediate school (n=115)	70 (60.9)	45 (39.1)	
Secondary school (n=348)	177 (50.9)	171 (49.1)	
University (n=749)	441 (58.9)	308 (41.1)	<0.001
Type of diabetes			
Type 1 (n=587)	381 (64.8)	207 (35.2)	
Type 2 (n=886)	508 (57.4)	377 (42.6)	0.004
Age at diagnosis			
<18 (n=536)	342 (63.6)	196 (36.4)	
18-25 (n=205)	99 (48.8)	104 (51.2)	
26-40 (n=399)	223 (55.9)	176 (44.1)	
41-60 (n=313)	212 (67.7)	101 (32.3)	
>60 (n=20)	13 (65.0)	7 (35.0)	<0.001
Co-morbid diseases			
No (n=905)	530 (58.6)	375 (41.4)	
Yes (n=568)	359 (63.2)	209 (36.8)	0.043
Compliance with physician`s visit			
Yes, perfect (n=625)			
Yes, sometimes (n=556)	454 (72.6)	171 (27.4)	
Never (n=292)	295 (n=53.1)	261 (46.9)	
	140 (47.9)	152 (52.1)	<0.001
HbA1c (%) (n=933)			
<5.7 (n=58)	34 (58.6)	24 (41.4)	
5.7-6.4 (n=139)	84 (60.4)	55 (39.6)	
6.5-7 (n=177)	114 (64.4)	63 (35.6)	
7.1-8 (n=244)	159 (65.2)	85 (34.8)	
>8 (n=315)	183 (58.1)	132 (41.9)	0.430
Difficulty in getting anti-diabetic drugs			
Yes (n=128)			
No (n=1030)	75 (58.6)	53 (41.4)	
Little bit (n=315)	635 (61.7)	395 (38.3)	
	179 (56.8)	136 (43.2)	0.382
Diabetes therapy*			
Insulin (n=651)	419 (64.4)	232 (35.6)	
Regulator (n=266)	140 (52.6)	126 (47.4)	
Anti-diabetics (n=118)	60 (50.8)	58 (49.2)	
Others (n=70	45 (64.3)	25 (35.7)	
More than one drug (n=368)	225 (61.1)	143 (38.9)	0.003
Side effects of anti-diabetic drugs			
Yes (n=308)			
No (n=1165)	174 (56.5)	134 (43.5)	
	715 (61.4)	450 (38.6)	0.119
Using traditional medicine in treating diabetes			

Yes, a lot (n=34)	16 (47.1)	18 (52.9)	
Yes, a little (n=183)	96 (52.5)	87 (47.5)	
Tried and stopped (n=363)	226 (62.3)	137 (37.7)	
Never (n=893)	551 (61.7)	342 (38.3)	0.037
Source of information			
Physician (n=343)	220 (64.1)	123 (35.9)	
Family (n=49)	26 (53.1)	23 (64.9)	
Internet (n=261)	133 (51.0)	128 (49.0)	
Others (n=21)	15 (71.4)	6 (28.6)	
More than one source (n=721)	452 (62.7)	269 (37.3)	
Never (n=78)	43 (55.1)	35 (44.9)	0.006

Discussion:-

In recent years, there are a lot of studies showing increasing numbers of complication in diabetic patient in the world include Saudi population.[17] for that reason, this study was carried out to explore the most common cause or reasons that influence and affecting the complication. Literature review of number of researches which talked this felid revealed that there was a lot of reasons; one of them is compliance with diabetic medication and how it was highly affect the complication rate.

In this study, compliance with anti diabetic medication was 60.3%. In another study carried out in Uganda, [14] a compliance rate of 83.3% has been reported. Kamel et al., (1999)[18] reported that more than three quarters (78.3%) of the studied diabetic patients adhered well to the medical treatment prescribed. Also, a rate of 78.3% had been observed in another study conducted in Alexandria, Egypt (1997) by Shama.[19] In another study conducted in Ismailia city, Egypt (2003),[20] it was concluded that 89% of the diabetic patients have never forgot taking their medications or have forgot to take their medications sometimes. In India, a compliance rate of 61.1% has been reported.[21] In another Indian study, a rate of poor compliance of 74% has been reported.[22] In a recently conducted study in Saudi Arabia, the overall prevalence of therapeutic non-compliance of the participants was 67.9%.[16] The apparent difference between the present study and other studies could be attributed to the fact that in this study, compliance was considered as never forget taking anti-diabetic medications while in other studies compliance was defined as taking at least 80% of daily anti-diabetic dose and/or differences in health care settings and socio economic status of the patients.

In the present study, the rate of type 1 diabetes was high compared to other figures reported worldwide and this is due to the fact that we included only those who had online access and majority of them were younger in age where type 1 diabetes prevail.

In our study, moderate educated patients were more likely to be non-compliant. In another Saudi study,[16] higher educational levels of patients were found to be significantly associated with a higher compliance rate of the patients.. Another study have found the same results,[23] while some studies have found no such association.[24]A study conducted in the UK has shown that patients with a lower level of education have better compliance.[25]It may be presumed that patients with a lower educational level may have more trust in the physician's advice. However, these results show that education may not be a good predictor of compliance with anti-diabetic medications.

Never compliance with physicians` visits was an important factor in non-compliance in our study. This could be due to the forgetfulness. Forgetfulness has been widely published as an important cause of irregularity of follow-up. [26, 27]

The current study revealed that having information about diabetes from family was associated with higher rate of non-compliance compared to having such information from physicians or internet. The same has been reported in other similar studies.[16, 21, 22]

Patient physician relationship in this study has emerged as an important factor affecting patients' compliance. The most frequent mentioned reason for escaping medication was having inadequate information on anti-diabetic drugs from physicians. Those patients who did not get adequate information on dosage and side effects of the medicine, were more non-compliant. Numerous researches involving various diseases have evaluated the effect of the patient–physician relationship on patients' compliance, and has found it to be another strong factor in favour of patient compliance.[27-29] Compliance to treatment advice was good when the physicians were supportive, supplied vital information, and listened patiently to patients.[30]

In the present study, nearly a fourth of the respondents reported having difficulty either totally or partially in getting one of the drugs in their regimen from the hospitals. However this was not significantly associated with non-compliance. Other studies have reported anti diabetic drugs stock-outs as a major constraint in managing diabetes. [31-34]

In the current study, type 2 diabetic patients, younger aged patients and those who were at younger age at diagnosis were more likely to report non-compliance with anti-diabetic therapy. The same has been documented by others.[16, 21]

Traditional medicine was used by a considerable proportion of patients in this study. The same had been reported by others.[14, 35-37]

In the current study, we depend on self-rating of patient`s compliance which usually overestimate patients Compliance levels. [38]

Conclusively, rate of non-compliance with anti-diabetic medication among Saudi diabetes is high and significantly associated with young age, younger age at diagnosis, moderate educational level, type 2 diabetes, absence of co-morbid diseases, never compliance with physicians' visits, treatment by anti-diabetics, use of traditional medicine and having information about diabetes from the family.

Among important limitations of this study is the use of self reports as they might be subjective and may overestimate patients compliance rate. However, the assessments for compliance using self reports may make patients feel comfortable in telling the truth and may probably facilitate the identification of poor compliance. Online approach for recruiting patients affects definitely the representativeness and generalizability of results. However, this stud highlights the high non-compliance rate which consequently impacts the complication rate.

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