Effect of attitude of NIDDM Saudi patients toward Insulin therapy on their adherence to antidiabetic treatment regimen

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Abstract: **Background: Saudi Arabia is vulnerable to the global diabetes epidemic and has the second-highest rate of DM in the Middle East, with seven million and three million patients with diabetes and pre-diabetes, respectively. However, there are many individuals with T2DM who are reluctant to start insulin therapy due to its painful injection, limitations in daily activities, and hypoglycemia Furthermore, unwillingness to commence using insulin was common in about one third (34.6%) of Saudi participants with Type 2 diabetes such as keeping insulin as a last resort, restriction of lifestyle, problematic hypoglycemia, perception of failure to care for diabetes previously, and worries related to weight gain.**

Aim of the study: this study aimed to assess the attitude of NIDDM patients toward insulin therapy and its effect on their adherence to their therapeutic regimen i.

Material and methods: A descriptive correlational research design was followed in this study, A convenience sample of 161 Saudi NIDDM patients were selected to participate in the current study. 3 tools were used to collect the required data; Tool one is the sociodemographic and medical data , Tool two is Insulin Treatment Appraisal Scale (ITAS).Tool three is Hill-Bone Compliance to Diabetes Therapy Scale (DM-HBP).

Results: The present study provides evidence for a neutral attitude among 82.7% and negative among 17.3% of the participants toward insulin therapy. Correlation analysis indicated that there is no association between attitude and adherence to the 3 subscales, adherence to medication (r = -.08, p = .26), appointment keeping (r = -.08, p =. 29) and adherence to diet (r = .04, p = .53).

Conclusions: No association between attitude and adherence to the 3 subscales, adherence to medication was found.

Keywords: **attitude, NIDDM Saudi patients, Insulin therapy & medication adherence and compliance.**

1. INTRODUCTION

Non-Insulin Dependent Diabetes Mellitus (NIDDM) is a heterogeneous disease that results from a combination of abnormalities in both insulin secretion and insulin action. Nevertheless, beta-cell autoimmunity, which is characteristic of IDDM, is present in up to 10 to 33 percent of subjects diagnosed clinically with NIDDM [1] In addition to oral hypoglycemic agents, administration of insulin was often necessary to attain good glucose control in type 2 diabetes. Insulin NPH became the basal insulin therapy of choice and additional NPH to metformin and/or sulfonylureas became the standard of care [2].

In the Middle-East and North Africa Region, 1 in 6 adults (73 million) are living with diabetes and the number of adults with diabetes expected to reach 95 million by 2030 and 136 million by 2045.It has the highest percentage (24.5%) of diabetes-related deaths in people of working age. Diabetes-related expenditure in the Middle-East and North Africa Region

totals USD 33 billion in 2021 [3]. Ongoing diabetes self-management education and support are critical to preventing acute complications and reducing the risk of long-term complications [4]

Saudi Arabia is vulnerable to the global diabetes epidemic and has the second-highest rate of DM in the Middle East, with seven million and three million patients with diabetes and pre-diabetes, respectively [5,6]. Insulin pump therapy and multiple daily injections are the two most common treatments that provide intensive insulin therapy which is associated with a decrease in HbA1c levels and in micro- and macrovascular complications in patients with T1DM [7]. Successful health outcomes will not be achieved if adherence to the treatment plan is not assured. Patients' adherence to insulin therapy and other diabetes management practices including medication and lifestyle modifications, may help reduce the complications as well as the overall healthcare burden of diabetes. Improved medication and treatment adherence can significantly reduce economic and healthcare problems [5] **.**

Previous study showed an overall good practice in taking insulin regularly. The knowledge level of the participants was influenced effectively by gender, marital status, educational level, job, frequency of follow-up, having visited a diabetic educator, duration of insulin therapy, and experiencing a hypoglycemic event. Knowledge revealed a significant influence in self-insulin administration, meal-skipping after taking insulin, use of home glucose monitoring, keeping snacks nearby, and taking insulin in relation to meals. In some of the practice parameters, patients with high knowledge scores had better practice. [8]. However, there are many individuals with T2DM who are reluctant to start insulin therapy [9] due to its painful injection, limitations in daily activities, and hypoglycemia [10] Furthermore, unwillingness to commence using insulin was common in about one third (34.6%) of Saudi participants with Type 2 diabetes such as keeping insulin as a last resort, restriction of lifestyle, problematic hypoglycemia, perception of failure to care for diabetes previously, and worries related to weight gain. In addition, participants with tertiary education were 48% less likely to be willing to initiate insulin therapy as compared to those who had only a primary education [11] Therefore, insulin therapy could have both positive and negative effects on patients' quality of life (QOL) [10]

Several studies have been conducted in Saudi Arabia to assess the level of treatment adherence. However, few studies have investigated the attitude of Saudi patients with NIDDM towards insulin therapy So, this study aimed to assess the attitude of NIDDM patients toward insulin therapy and its effect on their adherence to their therapeutic regimen including diet, antidiabetic agent and follow up schedule.

Aim of the study: the aim of the current study is to assess the attitude of NIDDM Saudi patients toward Insulin therapy and its effect of their adherence and compliance toward medication regimen.

2. MATERIALS AND METHODS

A descriptive correlational research design was followed in the current study This study was carried out from February 2023 to May 2023 at one PHCs, MOH Riyadh city at Kingdom of Saudi Arabia. A convenient subject of 161 patients were interviewed, the inclusion criteria for the selection of the subjects in this study were: Saudi patients with type two DM (NIDDM).

Data were collected from patients using a questionnaire sheet. The questionnaire consisted of 3 main parts:

Part one is the sociodemographic and medical data, such as age, gender, education and duration of illness.

Part two is **Insulin Treatment Appraisal Scale (ITAS)** is a valid self-report instrument that would seem useful in people with type 2 diabetes who have difficulty accepting insulin treatment. Examination and discussion of ITAS scores in clinical care can help to tailor education and treatment to the patient's needs. Also, the instrument has potential to assess changes in the appraisal of insulin over time, both in individuals and groups. It is developed by Frank J Snoek, Søren E Skovlund and Frans Power, 2007, It consisted of 20 statements measured on 5 level Likert scale (strongly disagree, agree, agree nor disagree, agree & strongly agree) [12]. **The total possible score ranges from 0 to 80**. A higher score signifies a more negative appraisal of insulin. The total scores of the positive and negative subscales can be calculated by summing the scores of the four positive and 16 negative statements, respectively

Part three is **Hill-Bone Compliance to Diabetes Therapy Scale (DM-HBP).** The scales were developed with National Institutes of Health (NIH) funds; therefore, they are available for use at no cost; the scales are free after taking an official use permission. It was developed in English and other 9 languages. HB-HBP is a 14-item scale that assesses patient

behaviors for three important behavioral domains of Diabetes treatment (i.e., the three (3) sub-scales): Appointment Keeping (3-items) Diet (e.g., reduced sugar) (2-items) Medication Adherence (9-items) This brief instrument provides a simple method for clinicians in various settings to assess patients' self-reported adherence and to plan appropriate interventions. According to the author this tool is valid for any chronic disease just name of the disease by the selected disorder [13].

Pilot study was carried out on 10 participants to test the clarity and relevance of the tool. These 10 participants were not added to the actual sample size.

Ethical considerations. An official permission to carry out the study was secured by sending official letters to the Directors of PHC in order to obtain permission for data collection. Each participant was interviewed individually by the researchers, and after explaining the aim of the study his/her oral consent to participate in the study was obtained. Conduction of interviews was carried out individually and establishing communication and a trusting relationship was important. The major ethical issue encountered was maintaining the confidentiality of the patients and health centers. The researchers ensured this by omitting patient identities from the questionnaires, and aggregating the results at the district level. Each interview lasted for approximately 20-30 minutes according to participant's response. The tools were filled by the researcher during health assessment.

The collected data were organized, tabulated, and statistically analyzed using the Statistical Package for Social Sciences version 21 for Windows. Descriptive statistics as number and percentages were used to describe the study sample and answer research questions 1 and 2. Chi square test was used for categorical data in research question 3 and 4. In addition, Pearson correlation was used to test association between attitude and adherence. Level of significance was set as p-value of 0.05 and less.

3. RESULTS

The aim of this study was to assess the effect of attitude of Non-Insulin Dependent Diabetes Mellitus (NIDDM) Saudi patients toward insulin therapy on their adherence to antidiabetic treatment regimen. To assess this aim, 5 research questions were asked:

1. What is the attitude of NIDDM Saudi patients toward insulin therapy?

2. To what extent do NIDDM Saudi patients adhere to antidiabetic treatment regimen?

3. Does the attitude of NIDDM Saudi patient differ by their demographic characteristics?

4. Does the adherence of NIDDM Saudi patient to the medication differ by their demographic characteristics?

5. Is there a relationship between attitude toward insulin therapy and adherence to antidiabetic treatment regimen among INDDM Saudi patients?

Descriptive statistics of the study participants in table 1 showed that participants age distributed similarly in the 3 age groups as 35.2% were in the age group of 40 to less than 50 years old, 33.3% were in the age group of 30 to less than 40 years and 31.5 % were in the age group of 50 years old and above. For gender, 53.1% were female and 46.9% were males. Regarding education, 28.4 % were holding a university degree, 27.8% had a secondary school degree, while 26% had a primary school degree. As for the duration of having diabetes, 40% had their diabetes for 3 to 5 years ago, 30% had their diabetes for about 2 years ago while almost 18% had their diabetes diagnosed for about 10 years ago in addition to 11.7% diagnosed with diabetes for more than 10 years.

Table 1: Demographic characteristics of the study participants

Demographic Characteristics of the Sample (N = 162)		
Variables	**Number**	**Percentage**
Age		
30 to less than 40 yeas	54	33.3%
40 to less than 50 years	57	35.2%
50 years and above	51	31.5%
Median & Mode = 2		

Gender		
Male	76	46.9%
Female	86	53.1%
Education		
Read & write	20	12.3%
Primary school	42	25.9%
Secondary school	45	27.8%
University	46	28.4%
Post graduate	9	5.6%
Duration of having DM		
1 to 2 years	49	30.2%
3 to 5 years	65	40.1%
5 to 10 years	29	17.9%
More than 10 years	19	11.7%

Research question 1: What is the attitude of NIDDM Saudi patients toward insulin therapy?

Descriptive statistics presented in table 2 revealed that 33.3% disagree while 29% agree that taking insulin means that they have failed to manage their diabetes with diet and tablets, 46.9% agree and 28.4% neutral that taking insulin means that their diabetes has become much worse. Taking insulin helps to prevent complications of diabetes reported neutral among 48.4% and disagreement among 46.9% of the participants, while taking insulin means other people see me as a sicker person reported agreement among 49.4% and strong agreement among 31.5% of participants. Almost similar percentages reported agreement (43.2%) and neutral (45.7%) that taking insulin makes life less flexible respectively. 38% of the participants agree that they are afraid of injecting themselves with a needle, while almost half of participants agree and were neutral that taking insulin increase the risk of hypoglycemia. 52% disagree and 36.4% were neutral that taking insulin helps to improve their health. Majority (64.2%) were neutral that insulin cause weight gain, taking insulin means that they have to give up activities they enjoy (82.7%), it is difficult to inject the right amount of insulin correctly at the right time every day (65.4%), and taking insulin helps to improve their energy level (82.7%). Managing insulin injections takes a lot of time and energy reported agreement among 44% and neutral response among 47% of participants respectively. About one third (34%) reported disagreement that taking insulin means that their health will deteriorate. Similar percentage reported variant degree of response in terms of neutral (38.3%), disagree (23.5%), and strong disagreement (28.4%) that injecting insulin is embarrassing, while one third (32%) reported strongly agree and more than one third (38.9%) agree that injection of insulin is painful. Meanwhile, similar percentage reported either neutral or disagree that taking insulin makes it more difficult to fulfil their responsibilities (at work, at home) and taking insulin helps to maintain good control of blood glucose. On the other hand, similar percentages were either agreeing or neutral that being on insulin causes family and friends to be more concerned about me and taking insulin makes them more dependent on their doctors.

Total score of attitudes was calculated and found to be neutral among 82.7% and negative among 17.3% of the participants.

Table 2: NIDDM participants' attitude toward insulin therapy

Variable	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
# (%) N = 162					
1. Taking insulin means I have failed to manage my diabetes with diet and tablets.	10 (6.2)	47 (29)	36 (22.2)	54 (33.3)	15 (9.3)
2. Taking insulin means my diabetes has become much worse	21 (13)	76 (46.9)	46 (28.4)	15 (9.3)	4 (2.5)
3. Taking insulin helps to prevent complications of diabetes	1 (0.6)	0 (0)	78 (48.1)	76 (46.9)	7 (4.3)

4.	Taking insulin means other people see me as a sicker person.	51 (31.5)	80 (49.4)	31 (19.1)	0(0)	0(0)
5.	Taking insulin makes life less flexible.	18 (11.1)	70 (43.2)	74 (45.7)	0(0)	0(0)
6.	I'm afraid of injecting myself with a needle	30 (18.5)	62 (38.3)	32 (19.8)	23 (14.2)	15 (9.3)
7.	Taking insulin increases the risk of low blood glucose levels (hypoglycemia).	1 (0.6)	78 (48.1)	82 (50.6)	1 (0.6)	0(0)
8.	Taking insulin helps to improve my health.	0 (0)	0 (0)	59 (36.4)	84 (51.9)	19 (11.7)
9.	Insulin causes weight gain.	1 (0.6)	43 (26.5)	104 (64.2)	13 (8)	1 (0.6)
10.	Managing insulin injections takes a lot of time and energy.	14 (8.6)	71 (43.8)	76 (46.9)	1 (0.6)	0 (0)
11.	Taking insulin means I have to give up activities I enjoy.	1 (0.6)	10 (6.2)	134 (82.7)	15 (9.3)	2 (1.2)
12.	Taking insulin means my health will deteriorate.	1 (0.6)	37 (22.8)	47 (29)	55 (34)	22 (13.6)
13.	Injecting insulin is embarrassing.	1 (0.6)	15 (9.3)	62 (38.3)	38 (23.5)	46 (28.4)
14.	Injecting insulin is painful.	52 (32.1)	63 (38.9)	30 (18.5)	17 (10.5)	0(0)
15.	It is difficult to inject the right amount of insulin correctly at the right time every day	14 (8.6)	17 (10.5)	106 (65.4)	25 (15.4)	0 (0)
16.	Taking insulin makes it more difficult to fulfil my responsibilities (at work, at home).	2 (1.2)	35 (21.6)	50 (30.9)	70 (43.2)	5 (3.1)
17.	Taking insulin helps to maintain good control of blood glucose.	0 (0)	0 (0)	50 (30.9)	75 (46.3)	37 (22.8)
18.	Being on insulin causes family and friends to be more concerned about me	32 (19.8)	80 (49.4)	50 (30.9)	0 (0)	0 (0)
19.	Taking insulin helps to improve my energy level.	4 (2.5)	7 (4.3)	134 (82.7)	17 (10.5)	0 (0)
20.	Taking insulin makes me more dependent on my doctor.	20 (12.3)	80 (49.4)	62 (38.3)	0 (0)	0 (0)
Total Attitude		# (%) N = 162				
Positive		0 (0)				
Neutral		134 (82.7)				
Negative		28 (17.3)				

Research question 2: To what extent do NIDDM Saudi patients adhere to antidiabetic treatment regimen?

Adherence to antidiabetic treatment regimens include 3 subscales; adherence to medication, appointment keeping and adherence to diet. Regarding adherence to medication, 63% of participants reported good attitude and 37% reported fair attitude. Appointment keeping reported 85.2% fair, 9.3% poor and 5.6% good attitude. As for adherence to diet, 66% of the participants reported fair, 28.4% good and 5.6% poor attitude as shown in table 3.

Table 3: NIDDM Saudi patients' adherence to antidiabetic treatment regimen

Adherence to antidiabetic treatment regimen subscales	Good		Fair		Poor	
	# (N =162)	%	# (N= 162)	%	# (N = 162)	%
1	Adherence to medication	102	63%	60	37%	0	0%
2	Appointment keeping	9	5.6%	138	85.2%	15	9.3%
3	Adherence to diet	46	28.4%	107	66%	9	5.6%

Research question 3: Does attitude of NIDDM Saudi patient differ by their demographic characteristics?

As shown in table 4, Chi square test exposed that education reported significance association with attitude (X^2 = 7.56, p = .03). Duration was approaching significance association with attitude (X^2 = 6.02, p = .05). On the other hand, age and gender reported no significance association with attitude (X^2 = 4.94, p - .08) and (X^2 = .31, p = .35) respectively.

Table 4: NIDDM Saudi patient demographic characteristics and their attitude

Demographics	NIDDM Saudi patients' attitude toward insulin therapy				Chi square	P value
	Neutral N = 116		Negative N = 46			
	#	%	#	%		
Age						
30 to less than 40 yeas	34	29.3%	20	43.5%	4.94	.08
40 to less than 50 years	40	34.5%	17	37%		
50 years and above	42	36.2%	9	19.6%		
Gender						
Male	56	48.3%	20	43.5%	.301	.35
Female	60	51.7%	26	56.5%		
Education						
Read & Write	17	14.7%	3	6.5%	7.56	.03
Primary school	28	24.1%	14	30.4%		
Secondary school	33	28.4%	12	26.1%		
University	29	25%	17	37%		
Post graduate	9	7.8%	0	0%		
Duration						
1 to 2 years	35	30.2%	14	30.4%	6.02	.05
3 to 5 years	44	37.9%	21	45.7%		
5 to 10 years	19	16.4%	10	21.7%		
More than 10 years	18	15.5%	1	0.6%		

Research question 4: Does adherence of NIDDM Saudi patient differ by their demographic characteristics?

Chi square test used to find if any of the subscale's adherence to medication, appointment keeping and adherence to diet differ by demographic variables such as age, gender, education and duration of having diabetes. Results indicated that age reported significant association with appointment keeping (X^2 = 7.06, df = 4, p = .03) and adherence to diet (X^2 = 11.34, df = 4, p= .01) meaning that older patients were more likely to keep their appointments and adhere to diabetic diet. On the other hand, duration of having diabetes showed significance association with adherence to medication (X^2 = 7.72, df = 3, p = .04) indicating that patient who had diabetes for many years, were more likely to adhere to their diabetes medication. Results of research question 3 are presented in table 5.

Table 5: Adherence of NIDDM Saudi patient and their demographic characteristics

variable	Adherence to Medication			Appointment Keeping			Adherence to Diet		
	Chi-square value	df	P value	Chi-square value	df	P value	Chi-square value	df	P value
Age	.65	2	.72	7.06	4	.03	11.34	4	.01
Gender	.077	1	.45	1.87	2	.38	1.23	2	.53
Education	2.04	4	.73	8.86	8.	.24	7.55	8	.26
Duration	7.72	3	.04	2.85	6	.79	9.28	6	.10

Research question 5: Is there a relationship between attitude toward insulin therapy and adherence to antidiabetic treatment regimen among INDDM Saudi patients?

Correlation analysis indicated that there is no association between attitude and adherence to the 3 subscales, adherence to medication (r = -.08, p = .26), appointment keeping (r = -.08, p =. 29) and adherence to diet (r = .04, p = .53). There was a significant correlation among the adherence subscales as adherence to diet significantly moderate associated with adherence to medication (r = .15*, p = .04) and appointment keeping (r = .23*, p = .003) indicating that patient who adhere to diet kept

their appointments and were more likely to adhere to their medication. Correlation between attitude and adherence is presented in table 6.

Table 6: Relationship between attitude toward insulin therapy and adherence to antidiabetic treatment regimen among INDDM Saudi patients

	Adherence to Medication		Appointment Keeping		Adherence to Diet	
	r	p	r	p	r	p
Attitude	- .08	.26	- .08	.29	.04	.53
Adherence to Diet	.15*	.04	.23*	.003	-	-

4. DISCUSSION

Among the various types of Diabetes Mellitus, non-insulin-dependent diabetes (NIDDM) is the most common and is rapidly increasing in many populations around the world [14]. Our study aimed to assess the effect of attitude of Non-Insulin Dependent Diabetes Mellitus (NIDDM) Saudi patients toward insulin therapy on their adherence to antidiabetic treatment regimen.

Attitude of NIDDM Saudi patients toward insulin therapy

In this study, a high percentage (82.7%) of neutral attitude was shown among respondents while a smaller number (17.3%) expressed a negative attitude toward insulin therapy. This result comes in contrast with several studies where negative attitudes towards insulin therapy were much more frequently discussed [15] and higher resistance to insulin therapy [16]. Furthermore, in Saudi Arabia, different studies reported that 24.4% to 24.6% of the Saudi diabetic patients refused or have negative attitudes toward insulin [17]. This discrepancy in attitude rate from the previous study and the results of this study may be due to population characteristics or perhaps a function of cultural and health care system factors [18].

Extent of NIDDM Saudi patients' adherence to antidiabetic treatment regimen

The findings of this study revealed a high percentage (85.2%) adherence to antidiabetic treatment regimen related to appointment keeping, 66% adherence to diet, and 63% adherence to medication. Previous studies revealed varying degrees of adherence rates. In UAE, 2014 a self-reported adherence rate was 84% [19] and an adherence rate of 77.1% in a region in Saudi Arabia [20]. Moreover, higher rates were also reported in Nepal [21] and India [22]. Differences in sample size and the measures used could partially elucidate the discrepancies between the studies [23]. In this present study, female dominance is noticeable, a higher percentage (28.4%) received University education and are 3 to 5 years (40.1%) DM patients. A previous study [19] concluded similar findings.

Does the attitude of NIDDM Saudi patient differ by their demographic characteristics?

Education and duration of diabetes mellitus reported a significant association with attitude among NIDDM patients in this current study. In the same vein, the findings of Rodriguez, 2012 [24] revealed that education and disease duration are variables that influence the knowledge and attitude of Diabetes Mellitus patients. Additionally, a study in Saudi Arabia reported [25], that patient's characteristic showed an association between knowledge and attitude. Patients with these characteristics have greater probability of obtaining knowledge and have no barriers in communicating with the health care team, and may grasp knowledge correctly which affects attitude [26]. However, this study also showed that age and gender characteristic have no significant association with attitude. This comes in contrast with a previous study [27] where age and gender of the respondents had a significant influence on attitude. Differences in association could be attributed to the characteristics of the sample in different studies [23]. It is important to note that gender and age provides patients with individualized approach to treatment. A similar study concluded the same findings [28].

Does the adherence of NIDDM Saudi patient to the medication differ by their demographic characteristics?

Adherence is the degree to which the behavior of an individual such as taking medication and following prescribed diet aligns with the recommendations of the healthcare professional [29]. This current study revealed a significant association between age variable with appointment keeping and adherence to diet. This signifies that older patients were more likely to keep their appointments and adhere to diabetic diet. Compared to a study in Tabuk, Saudi Arabia, sociodemographic factors such as age do not have significant association with adherence [20]. However, in a French national survey, age factor was found to be significantly associated with adherence [30]. On the other hand, this study also reported significant association between duration of having diabetes with adherence to medication establishing that patients who had diabetes for many

years, were more likely to adhere to their diabetes medication. A study in United Arab Emirates revealed a similar result where it was noted that patients with a duration of diabetes ≤ 5 years were more compliant to their medication than those with diabetes > 5 years, which was found to be statistically significant [19]. This disparity in the adherence may be attributed to the differences in awareness of the importance of medication adherence, measures to enhance adherence in different nations, and scales used to measure adherence levels in those studies [20].

Is there a relationship between attitude toward insulin therapy and adherence to antidiabetic treatment regimen among INDDM Saudi patients?

This study reported no association between attitude and adherence to medication, appointment keeping and adherence to diet. Although it can be noted that the results also revealed a significant correlation among adherence scales to diet and appointment keeping moderately associated with adherence to medication. This represents that patients who adhere to diet kept their appointments and were more likely to adhere to their medication. In a study in Japan, it was reported that there are differences between the responses of patients towards insulin therapy [31]. In comparison, a study in Ethiopia reported that favorable attitude toward insulin therapy and regular follow ups through appointment keeping increases adherence signifying that they are more likely to adhere to treatment [32]. Adherence is influenced by many factors including the healthcare system, support from the healthcare team and ease of pharmacy access and utilization [33]. Though patient education is the key to improving compliance, use of compliance aids, proper motivation and support is also shown to increase medication adherence [34]. Crucial to good management of this disease is therapeutic adherence [35] with emphasis on behavior towards taking medication, following a diet and lifestyle changes corresponding to agreed healthcare provider recommendation [36]. In the Kingdom of Saudi Arabia, improved efforts were significant to Diabetes Mellitus management. This included standardization of care delivery focusing on services through multidisciplinary care teams and implementing diabetes registries utilized by case managers [37].

5. CONCLUSIONS

The present study provides evidence for a neutral attitude among 82.7% and negative among 17.3% of the participants toward insulin therapy.

Correlation analysis indicated that there is no association between attitude and adherence to the 3 subscales, adherence to medication ($r = -.08$, $p = .26$), appointment keeping ($r = -.08$, $p = .29$) and adherence to diet ($r = .04$, $p = .53$).

Also, there was a significant correlation among adherence subscales as adherence to diet significantly moderate associated with adherence to medication ($r = .15*$, $p = .04$) and appointment keeping ($r = .23*$, $p = .003$) indicating that patient who adhere to diet kept their appointments and were more likely to adhere to their medication. Based on the results of the current study

6. RECOMMENDATION

Recommendation will be as the following:

1- Conduct the study on a large sample and on more than one PHCC and more than one city to ensure generalization.

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