

# Patient Adherence to Insulin Therapy in Diabetes Type 1 and Type 2 in Chronic Ambulatory Clinic of Jimma University Specialized Hospital, Jimma, Ethiopia.

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## Abstract

**Introduction:** Diabetes is highly prevalent, afflicting approximately 150 million people worldwide and this number is expected to rise to 300 million in the year 2025. It has been generally acknowledged for years that non adherence rates for chronic illness regimens and for lifestyle changes are ~ 50%. As a group, patients with diabetes are especially prone to substantial regimen adherence problems. It stresses the need for constant motivation and one to one level education at frequent intervals to ensure better compliance to the treatment of Diabetes Mellitus (DM).

**Objective:** To assess patient's adherence to insulin therapy in patients with type 1& type 2 Diabetes Mellitus at Chronic Ambulatory Clinic of Jimma University Specialized Hospital, Jimma, Ethiopia.

**Materials and Method:** A cross-sectional prospective study was carried out using semi structured questionnaire and interview. A total of 104 diabetic patients were included in the study by using convenience method of sampling from January 05-21, 2013 in ambulatory clinic of Jimma University Specialized Hospital. As the research has minimal risk involved the ethics committee allowed us to take verbal consent and the script of the verbal consent was used to take consent of the respondents.

**Results:** Out of this one mother relieved from her DM after delivery. So the total of 104 patients was included. Out of these 49% were males and 51% were females. Diabetes is more prevalent in adult age group (19-45 years) i.e. 56%. Regarding to the present study the average adherence rate was 61 percent, the reasons for missing insulin were living in distance area, being too ill, hectic work load, adverse drug reactions and missing clinical appointment

**Conclusion:** Adherence to diabetes treatment regimen is critical. In the present study the average adherence rate was 61 percent; and the reasons for missing insulin were living in distance area, being too ill, hectic work load, adverse drug reactions and missing clinical appointment. Continuous clinical monitoring and assessment of adherence should be done for provision of safe and effective diabetes therapy throughout the country.

**Keywords:** Adherence, Insulin therapy, Type 1 and type 2 Diabetes, Jimma, Ethiopia.

## Introduction

Diabetes is a major global public health problem, with challenging epidemiology. Diabetes is highly prevalent, afflicting approximately 150 million people worldwide, and this number is expected to rise to 300 million in the year 2025 much of this increase will occur in developing countries and will result from population ageing, unhealthy diet, obesity and a sedentary lifestyle. In developed countries, such as the United States, diabetes has been reported as the seventh leading cause of death and the leading cause of lower extremity amputation, end-stage renal disease and blindness among persons aged 18 - 65 years. The prevalence of diabetes in some Eastern Mediterranean countries is among the highest in the world.<sup>[1,4]</sup>

The word "adherence" is preferred by many health care providers, because "compliance" suggests that the patient is passively following the doctor's orders and that the treatment plan is not based on a therapeutic alliance or contract established between the patient and the physician. Both terms are imperfect and uninformative descriptions of medication-taking behavior<sup>[2]</sup>.

Insulin comes from drug manufacturers in three basic packages; vials, pens and cartridges/ pen fills. Insulin vials, either open or unopened, generally last for one month when stored at room temperature (15 – 30°C). All unopened vials should be stored in the refrigerator (2 – 8°C) away from the freezer, and are good until the expiration date printed on the label<sup>[3]</sup>.

It has been generally acknowledged for years that non adherence rates for chronic illness regimens and for lifestyle changes are ~ 50%. As a group, patients with diabetes are especially prone to substantial regimen adherence problems [5]. It stresses the need for constant motivation and one to one level education at frequent intervals to ensure better compliance to the treatment [4].

Adherence to therapy is a major impact factor with respect to treatment success. Poor adherence to diabetes therapy, may have serious long-term and detrimental effects as patients are not in adequate glycemic control, which negatively affects risk of diabetes-related complications. Landmark studies, such as the United Kingdom Prospective Diabetes Study (UKPDS), have shown that glycemic control as measured by glycosylated hemoglobin (HbA1c) is a very important risk factor of complications, including blindness, amputations and cardiovascular disease [5].

Non-compliance remains a major health problem more high quality studies are needed to assess these aspects and systematic reviews/meta-analyses are required to study the effects of compliance in enhancing the effects of interventions [5].

A number of tools and strategies are available for practicing physicians to effectively introduce and implement appropriate treatments and optimize patient understanding of and adherence to effective interventions [6].

Diabetes mellitus is a one of the most significant health problems, especially in many western countries. The main goals in diabetes care are good metabolic control, minimization of complications due to diabetes and good quality of life. To achieve these goals adherence to self-care is crucial, because most of diabetes care is carried out by patients and their families Diabetes is a serious and incurable disease, but mostly invisible. This is mostly because of flexible insulin treatment, which enables people with diabetes to live a more normal life than before [7].

Despite the increase in insulin use, the majority of insulin-treated patients are not able to attain and maintain satisfactory long-term glycemic control. The barriers to achieving good glycemic control include poor medication adherence, *hypoglycemia*, poor optimization of insulin doses, lack of intensification of insulin regimens ,especially the use of more intensive insulin regimens that require more frequent injections, the and use of both meal and basal insulin [8].

Hypoglycemia is less common in people with T2DM than in those with T1DM. However, this problem has become progressively more frequent with advanced duration of T2DM and the use of intensive insulin therapy. Insulin-treated patients who perform fasting are at risk of hypoglycemia, hyperglycemia, diabetic ketoacidosis, dehydration and thrombosis [8].

So the present study was initiated to assess patients' adherence to insulin therapy and complications due to non adherence in patients with type 1& type 2 diabetes mellitus.

## **Materials and Method**

### **Study area, design and period**

Jimma is 346km far from the capital city Addis Ababa, Ethiopia at an altitude of 1780m above sea level. Jimma University Specialized Hospital (JUSH) located in Jimma has different departments and delivers diversified health services including DM. A cross-sectional prospective study was carried out using semi structured questionnaire and interview. A total of 104 diabetic patients were included in the study by using convenience method of sampling from January 05-21, 2013 in ambulatory clinic of Jimma University Specialized Hospital.

### **Source and study population**

The study population consisted of all diabetic patients attending their follow up at chronic ambulatory clinic of JUSH during the study period. Type 1 & type 2 diabetic patients taking insulin for minimum of 6 months were included in the study and patients who are unable to hear, unable to communicate and mentally disabled, patients treated with only oral hypoglycemic, patients not taking any medication, newly diagnosed diabetic patients, Patients taking insulin for less than 6 months were excluded from the study.

### **Ethical Consideration**

Consent was obtained from Post graduate and Student Research Committee, Department of Pharmacy to carryout the research work in the health facility. The purpose of the study was explained to the study subjects and verbal consent was obtained before the interview. Any misunderstanding from the patient side was corrected. The respondents were convinced to tell accurate information for the data included in the questionnaire. The patient's identity was maintained confidentially throughout the study period. As the research has minimal risk involved the ethics committee allowed us to take verbal consent and the script of the verbal consent was used to take consent of the respondents.

### Results

Table 1: Socio-demographic characteristics of respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables		Numbers	Percent (%)
Sex	Male	51	49
	Female	53	51
Age	<18years	19	18
	19-45 years	60	56
	46-64yeras	21	20.2
	>64yeras	4	3.8
Marital Status	Married	61	58.6
	Single	28	27
	Divorced	2	1.9
	Windowed	2	1.9
	Separated	11	10.6
Educational Level	Illiterate	25	24
	Primary school (1-6)	30	28.8
	Secondary school (7-12)	27	26
	College/university	12	11.5
	Diploma or Degree	10	9.6
Ethnicity	Amhara	12	11.5
	Oromo	65	62.5
	Tigre	15	14.4
	Others	11	10.6
Occupation	Farmer	56	53.6
	Merchant	23	22.11
	Government's employee	12	11.5
	Others	13	12.5
Monthly Income	<150	45	43.26
	151-600	32	30.76
	601-1000	20	19.23
	>1000	7	6.73

Out of 104 patients 49% were males and 51% were females. Diabetes is more (56%) prevalent in adult age group (19-45 years). The majority (62.5%) of the respondents was from Oromo ethnicity. Nearly 75% of the respondents had a low monthly income which was less than 600 Ethiopian Birr (Table 1).

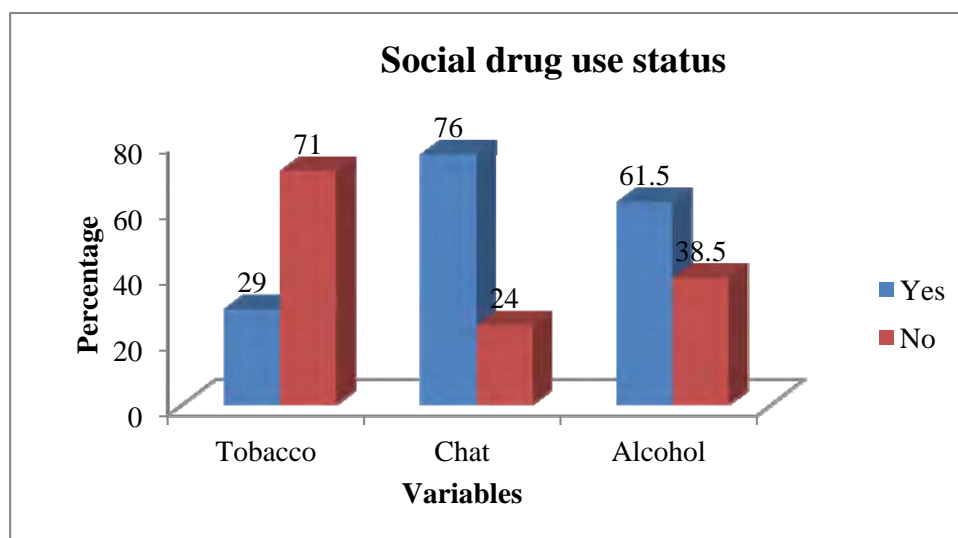


Figure 1: Social drug use status of the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

The respondents had experience of using social drugs and with great proportion (76%) were chat chewers followed by (61.5 %) alcohol consumers (Figure 1).

Table 2: Diabetic profile of the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables		Number	Percent (%)
Family history of DM	Yes	79	76
	No	25	24
Type of DM	Diabetes type 1	46	44.2
	Diabetes type 2	58	55.8
Presence of other chronic diseases	Yes	38	36.5
	No	66	63.5
Other chronic diseases	Hypertension	32	84.2
	Blindness	3	8
	Foot ulcer	2	5.2
	Others	1	2.6
Did the diabetes develop during pregnancy	Yes	12	23
	No	41	77
Did the diabetes persist after delivery	Yes	11	92
	No	1	8
Duration of diabetes	6 months - 2 year	38	36.5
	2 -5 years	43	41.5
	5-8 years	18	17.5
	8-10years	5	4.5
	>10years	0	0
Clinic attendance	never missed appointment	48	46
	missed 1-2 appointments	25	34
	Missed >2 appointment	21	20
Frequently monitoring of Blood Pressure (BP)	Yes	30	29
	No	74	79
Reasons for not checking BP	I have no BP equipment	52	70.2
	I don't have the skill	18	24.3
	Far away from clinic	4	5.4
Number of daily injections	1	62	60
	2	40	38.5
	3	2	1.5
	4	0	0

As depicted in Table 2, 76% of the respondents had family history of DM. Type 2 Diabetes accounts for 55.8% of the respondents while type 1 for 44.2%. Out of 53 female respondents 77% were free of DM complication during pregnancy. 46% of the respondents never missed appointment to attend clinic; however, 34% and 20% missed appointments at least once or more than twice respectively. 79% of the respondents couldn't check their BP and among them 24.3% had no skill to use the instrument. Almost all the respondents (98.5%) had at least two injections of insulin per day.

Table 3: Dietary profile of respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables		Numbers	Percent (%)
Did you get dietary advice?	Yes	54	52
	No	50	48
Types of foods to be consumed	Milk w/o sugar	2	3.7
	Green leafy vegetables	45	83.3
	Tea/coffee w/o sugar	4	7.4
	High protein diet	3	5.5
Types of foods to be avoided	Roots & tubers	4	5.8
	Carbohydrate diet	23	33.8
	Fruits (e.g. Mango & banana)	12	17.6
	Alcohol	28	41.2
	Soft drinks	1	1.5
Taking medication with food	Yes	82	79
	No	22	21
Reason for not to taking medication with food	The medication is ineffective with food	1	4.5
	Food increases the side effect	4	18.2
	I don't know	16	72.3
	Others	1	4.5

52% of the respondents had dietary advice during their visit to clinic/physician. The dietary profile of the respondents 83.3% preferred green leafy vegetables and types of food they have to avoid 41.2% of them avoided alcohol consumption (Table 3).

Table 4: Knowledge of respondents about diabetes mellitus in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables		Numbers	Percent (%)
Have you had any DM related symptoms in the past month	Yes	35	34
	No	69	66
The symptoms that patients experienced	Increased thirst	6	17.14
	Frequent urination at night	9	25.7
	High blood sugar	6	17.14
	Morning headaches	10	28.6
	Night sweats	2	5.7
	Intense hunger	2	5.7
	Fainted or lost consciousness	6	17.14

66% of the respondents had DM related symptoms in the past month among which morning headache was the prevalent symptom (28.6%) (Table 4).

Table 5: Physical activity of the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables	Number		Percent (%)					
Performing physical activity	Yes	67	54.5					
	No	37	35.5					
<b>Types of the physical activities</b>	<b>Duration of physical activity/week</b>							
	<b>30min</b>		<b>30-60min</b>		<b>1-3hrs</b>		<b>&gt;3hrs</b>	
	No.	%	No.	%	No.	%	No.	%
Stretching or strengthening exercises	3	3	4.5	1.5	1	1.5	2	1.5
Walking exercise	1	1.5	6	9	20	30	4	3.8
Swimming exercise	3	4.5	3	4.5	3	4.5	3	4.5
Bicycling (including stationary Exercise)	3	4.5	3	4.5	1	1.5	3	4.5
Other aerobic exercise	1	1.5	1	1.5	1	1.5	0	0

54.5% the total respondents performed physical activity and the rest didn't perform any physical activities. 30% of the respondents performed walking exercise for 1-3 hours per week (Table 5).

Table 6: Compliance to antidiabetic medication by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables	Number	Percent (%)
Medication taken as per information given by physician	Yes	102 98
	No	2 2
Reasons for not taking medication	Regimen too complex	0 0
	The time to take is not appropriate	1 50
	I can't adhere to dietary regimen	1 50
	Take only when felt sick	0 0
	In the past month did you get insulin	No 11 10.5
	Yes 93 89.5	
Reasons for missing insulin therapy	Ran out of medication	3 27.3
	Color change of injection (expired)	6 54.5
	Seriously sick	2 18.18
	Fear of pain of injection	0 0
Are there any missed doses	Yes	63 61
	No	41 39
Doses missed	1	6 9.5
	2	17 27
	3	19 30
	4	21 33.5
	Reason for missed doses	Forget
	Away from home	8 12.7
	Too busy	14 22.2
	Ran out of medication	7 11.1
How missed doses handled	Double the dose	23 36.5
	Wait for the next dose	28 44.4
	Take immediately	12 19.1

98% of the respondents took antidiabetic medication as per the advice given by physician. Nearly 90% of the respondents had insulin therapy in the past months. More than half of the respondents missed insulin therapy

due to change in the colour of the injection or expiration. Nearly 70% of respondents missed the doses for various reasons as described in Table 6 above.

Table 7: Attitude of respondents towards antidiabetic medication in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variable	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	No.	%	No.	%	No.	%	No.	%	No.	%
If diabetic patients feel well, they would stop taking their medications	0	0	0	0	0	0	54	52	50	48
Diabetic patients will get sicker if they stop taking their medications	58	56	46	44	0	0	0	0	0	0
Antidiabetic medications will cause blindness	10	9.6	24	23.1	35	33.7	15	14.4	20	19.23
Diabetes is a disease that causes health complications	68	65.4	22	21.3	14	13.5	0	0	0	0
Antidiabetic treatment will prevent or delay diabetes complications	70	67.3	20	19.23	14	13.5	0	0	0	0
Difficulty to take antidiabetic medication at work	56	53.8	24	23.1	10	13.5	0	0	0	0
Family members should help DM patients to take medication	86	83	10	9.6	8	7.7	0	0	0	0
Living far from diabetic clinics may cause problems complying with treatment	76	73	26	25	2	2	0	0	0	0
Low income may cause problems complying with treatment	58	56	38	8	7.7	0	0	0	0	0
Diabetic patients should comply with physicians advice and prescription	61	36.5	8	7.7	16	15.4	0	0	0	0

More than 50% of the respondents disagreed that they would stop taking antidiabetic medication, if they felt well. However, none of the respondents disagreed to giving up antidiabetic medication which would make them sicker. The majority (86.7%) of the respondents believe that diabetes can lead to health complications and nearly same number of the respondents believed that antidiabetic treatment will prevent or delay diabetic complications (Table 7).

Table 8: Potential barriers not to take insulin injection by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables	Numbers	Percent (%)
Presence of potential barriers not to take insulin	Yes	46
	No	58
Potential barriers that patients faced not to take insulin injection	Hypoglycemia	2
	Self-injection	29
	Failure of diabetes therapy	2
	Fear of needles	5
	Weight gain	4
	Complexity of regimen	4

More than half of the respondents (56%) had no potential barrier for not taking insulin. However, for those who complained fear of self-injection was the major (63%) potential barrier for not taking insulin (Table 8).

Table 9: Difficulty in taking insulin injection by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Variables		Number	Percent (%)
Any difficulties to take insulin injection	Yes	48	46
	No	56	54
Difficulties faced by patients during insulin injection	Insulin at prescribed time or with meals every day	5	46
	Following healthcare professional instructions	19	39
	Preparing injections	13	27
	Adjusting insulin doses	10	21
	Changing timing of insulin to meet daily needs	9	19
	Choose frequency of injections	1	2

More than 50% of the respondents had no difficulties in taking insulin injection. However, following health care professionals instructions and preparation of insulin injection with dose adjustment to meet daily doses were the major difficulties not to take insulin injection appropriately (Table 9).

Table 10: Reasons for nonadherence to insulin medication among diabetic patients in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Reasons for nonadherence	Number	Percent (%)
Poor physician and patient relationship	55	53
Alcoholism	18	17
Lack of patient access to medical care	16	15.4
Adverse effects of the medication	15	14.6
Others	0	0

Poor patient and physician relationship was the major (53%) reason for nonadherence to antidiabetic medication among other factors like adverse effect of the medication, alcoholism etc. (Table 10).

Table 11: Reasons for adherence to antidiabetic medication by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Reasons for adherence	Number	Percent (%)
Psychological and practical supports	42	40.4
Convenience of regimens	15	14.6
Believe in efficacy of treatment	14	13.5
Confidence of taking medications in front of others	4	3.8
Less severity of disease symptoms/illness	17	16.4

Among other reasons, psychological and practical support from family was found to be major (40.4%) reason for good adherence towards antidiabetic medication (Table 11).



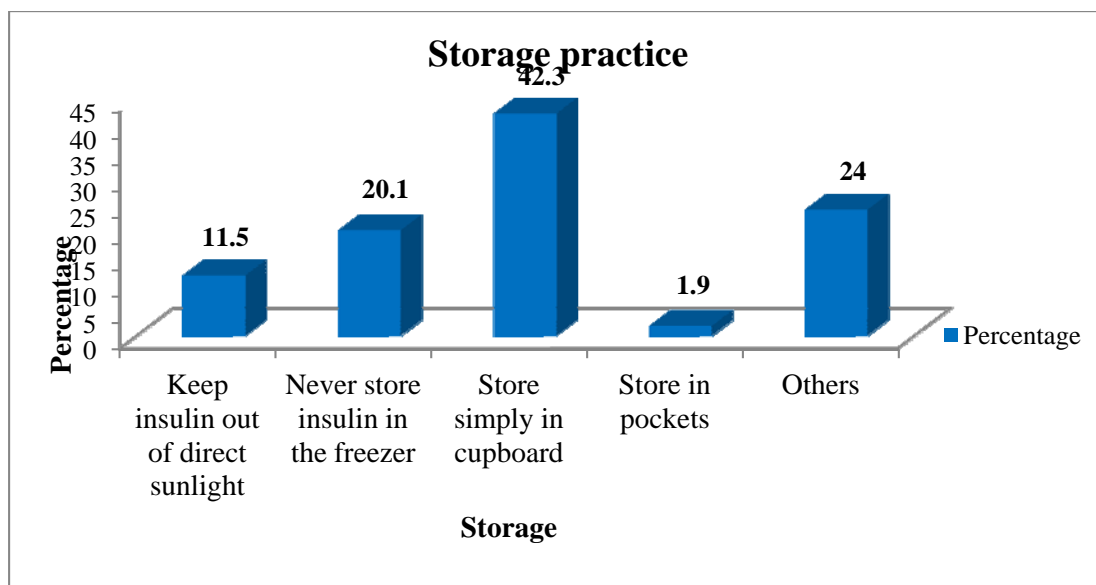


Figure 2: Insulin storage practice by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

Different modes of insulin injection storage practice were perceived and among which storage in simple cupboard accounted for 42.3% of the cases (Figure 2).

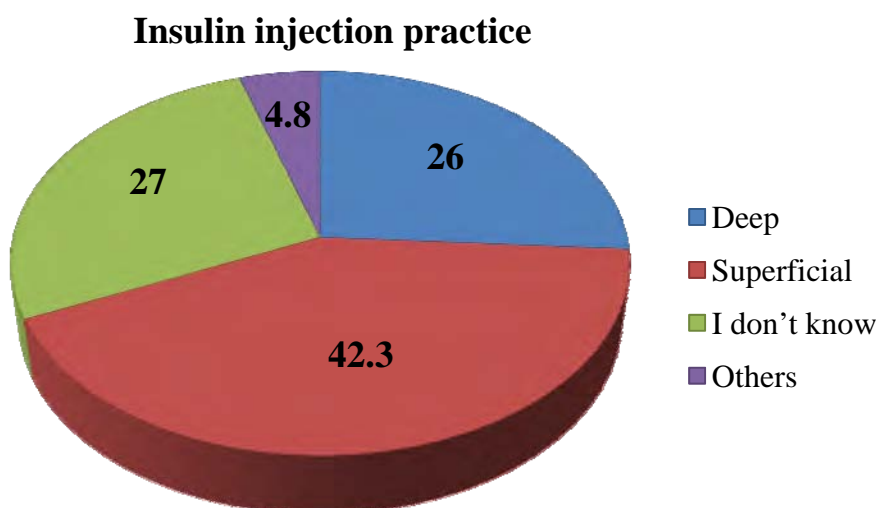


Figure 3: Knowledge of insulin injection practice by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

42.3% of the respondents know how to administer insulin injection superficially. However, those who don't know how to administer insulin injection accounts for 27% (Figure 3).

Table 12: Insulin injection site rotation and practice by the respondents in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

	Variable	Number	Percent (%)
Insulin injection site	Give injections in the abdomen, thighs and back of the upper arm whenever possible	53	52
	Choose a slightly new location for each injection	30	29
	Always inject insulin into fatty tissue instead of muscle	10	9.6
	Keep accurate records of injection site rotation	6	5.7
	Give your injections in the same general area at the same time each day	5	4.8

As depicted in Table 12, nearly half (52%) of the respondents rotates insulin injection sites to different injection areas like the abdomen, thighs and back of the upper arm whenever possible.

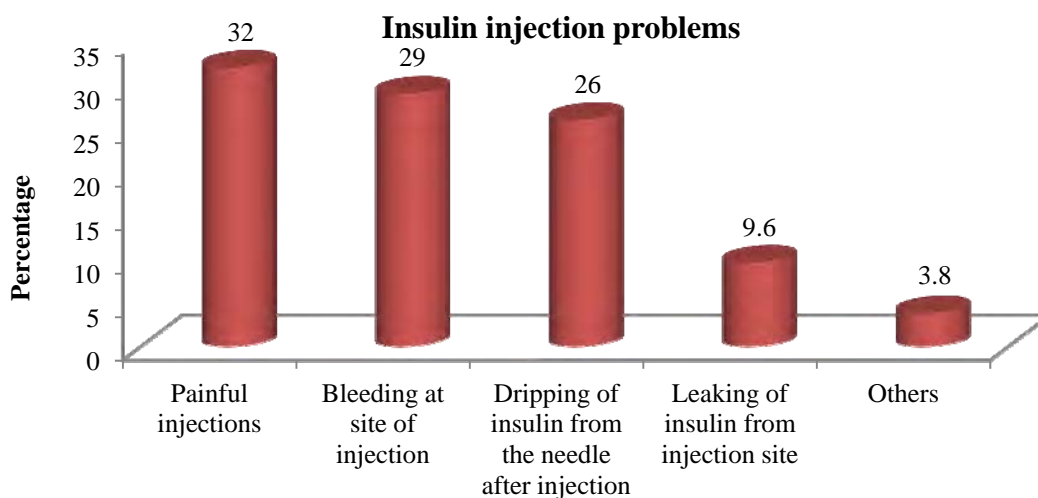


Figure 4: Insulin injection problems faced by the respondents during injection in Chronic Ambulatory Clinic, Jimma University Specialized Hospital from January 05-21, 2013.

As depicted in figure 4, the respondents faced some problems during insulin injection among which painful injection, bleeding at the site of injection and dripping of insulin from the needle after injection were the major problems that accounted for 32%, 29% and 26% respectively of the cases.

#### Discussion

In the present study out of 104 diabetic patients 49% were males and 51% were females. Diabetes is more prevalent in adult age group (19-45 years) i.e. 56%. 58.6 of them were married. Out of these 28.8 of them learned the primary school. The greatest proportion of the respondents (62.5%) was Oromo and 53% of them were farmer. 43.26% had less than 150 birr monthly income.

In a study done to investigate physician's therapeutic practice and the compliance of diabetic patients attending rural primary health units in Alexandria tells that the personal and socio-demographic characteristics of the sample of 600 diabetic patients that men represented 48.3% of the sample while women formed 51.7%; the men to women ratio being 1: 1.1. The age of diabetic patients ranged from 25 to 81 years. Married patients comprised 83.0% and 10.8% were single. About one-third (34.5%) of diabetic patients were illiterate and 41.2% were manual workers illustrates the relationship between different types of compliance with diabetes regimen and gender<sup>[9]</sup>.

When compared to this study, Out of 104, 79% of the respondents always took their medication with food, while 54.5% of the patients always perform physical activity. This may be due to counseling they got from Medical interns and pharmacists. Only 2.2% of the always complied with dietary regimen, while none of the patients always complied with exercise regimen<sup>[9]</sup>.

When compared to this study, 36.5% of the respondents had other chronic disease such as hypertension, blindness, foot ulcer and HIV AIDS. Among these, 84.3% of them had hypertension compared to the study done in the University of Texas at Austin showed that; fifty-nine participants completed the internet survey. Approximately 57% of study participants were male, 85% were Hispanic, and the mean age was  $50.4 \pm 10.3$  years. Over 50% of participants had hypertension or dyslipidemia and were taking 3 or more medications. Participants (52.6%) reported their health status as good or excellent<sup>[10]</sup>.

In the present study 41.5% of the respondents had 2-5 years of the diabetes duration, with the average of 5 years duration of diabetes compared to the study done in Al Hasa region of Saudi Arabia showed that a total of 468 patients participated in the study, while 67 refused, giving a response rate of 87.47%. Two-thirds of the participants were from the urban area. The average age of the participants was 58 years ( $SD \pm 11.64$ ) and more than half of them were females (58.8%). The majority of the participants were uneducated (64.7%,  $n = 303$ ). Most were married (84.4%,  $n = 395$ ). The median duration of diabetes was 10 years (range four years - thirty-two years)<sup>[11]</sup>.

In the present study, 98% of the patients took their medication as information given by HP. In the past months the percentage of the population got insulin was 89.5%. 54.5% of them did not get insulin because the medication changed its color i.e. expired, ran out the medication or the patient was seriously sick. 61.5% of

them missed the doses they had to take and missed doses were 33.5% of the prevalent one and the reason was they forgot (54%), too busy or away from home or ran out of medication. Most of them (44.4%) waited for the next dose. 54% of the patients disagreed, if diabetic patients feel well, they would stop taking their medications. 56% knew that Diabetic patients will get sicker if they stop taking their medications. 65.4% of them strongly believe as Diabetes is a disease that causes health complications. 67.3% of the respondents strongly believe that medications for the treatment of diabetes will prevent or delay diabetes complications, this may be due to symptomatic relief after the administering the medication and counseling from health professionals.

A study done by internet survey in China, France, Japan, Germany, Spain, Turkey, the UK or the USA showed that out of 1250 physicians (600 specialists, 650 primary care physicians) who treat patients with diabetes and telephone survey of 1530 insulin-treated patients (180 with Type 1 diabetes, 1350 with Type 2 diabetes) shows that one third (33.2%) of patients reported insulin omission/non-adherence at least 1 day in the last month, with an average of 3.3 days. Three quarters (72.5%) of physicians report that their typical patient does not take their insulin as prescribed, with a mean of 4.3 days per month of basal insulin omission/non-adherence and 5.7 days per month of prandial insulin omission/non-adherence. Patients and providers indicated five most common reasons for insulin omission/non-adherence was that they are too busy or travelling or skipped meals or stress/emotional problems or public embarrassment. Physicians reported low patient success at initiating insulin in a timely fashion and adjusting insulin doses. Most physicians report that many insulin-treated patients do not have adequate glucose control (87.6%) and that they would treat more aggressively if not for concern about hypoglycemia (75.5%). Although a majority of patients (and physicians) regard insulin treatment as restrictive, more patients see insulin treatment as having positive than negative impacts on their lives<sup>[12]</sup>.

When compared to the present study, sixty one (61%) out of 104 patients were adherent while thirty-one (31%) were not adherent. This may be due to no refills, poor health status, fewer disease states, and low educational status. Another study done in North America showed that eighty-seven (72.5%) out of 120 patients were adherent while thirty-three (27.5%) were not adherent. Of the 74 patients who had goal blood glucose control, sixty-eight (91.9%) were higher in those that adhere to anti-diabetic medication when compared with non-adhering patients<sup>[13]</sup>.

### Conclusion

Diabetes is highly prevalent, afflicting approximately 150 million people worldwide, and this number is expected to rise. Therefore, treatment and care is crucial for the survival of patient living with DM and must link in the community response. Adherence to diabetes treatment regimen is critical, patient must take 100 percent of the prescribed pills to achieve blood glucose less than 126 mg/ml. In the present study the average adherence rate was 61 percent; and the reasons for missing insulin were living in distance area, being too ill, hectic work load, adverse drug reactions and missing clinical appointment. Continuous clinical monitoring and assessment of adherence should be done for provision of safe and effective diabetes therapy throughout the country. Strengthening of training activities targeting clinical staff at the primary care level are needed to ensure that a DM patient is properly cared and on the prevention of DM complication.

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