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RESEARCH ARTICLE

ACHIEVEMENT OF THERAPEUTIC GOALS IN A SAMPLE OF IRAQI ADULTS WITH TYPE 2 DIABETES MELLITUS.

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Key words:-

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Abstract

Background:- Diabetes mellitus is a chronic illness that requires continuing medical care and ongoing patient self-management education. Achieving glycemic goals help to prevent acute complications and to reduce the risk of long-term complications.

Objective:- to evaluate a sample of Iraqi patients with type 2 diabetes, regarding percentage of patients who achieve the therapeutic goals of treatment.

Patients and Methods:- This was a cross sectional study of 200 patients with type 2 diabetes in Al-Kadhimia Teaching Hospital/Baghdad city. This study evaluated the achievement of target goals for glucose, lipid and blood pressure as suggested by the American Diabetes Association guidelines.

Results:- The mean HbA1c was $9.4 \pm 2.6\%$ and the percentage of patients achieved glycemic control (HbA1c $< 7\%$) was only 27%. And about 55% of hypertensive patients achieved the recommended target. The percentages of those who achieved the target value for dyslipidemia were 73.5% for low density lipoprotein cholesterol, 29% for triglyceride, and only 37.5% for high density lipoprotein cholesterol.

Conclusion:- The results of this study of Iraqi patients with type 2 diabetes mellitus demonstrated that 73% of cases with hyperglycemia, 45% of cases with hypertension, and 60% to 70% of cases with dyslipidemia had not reached their targets.

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Abbreviations:-

- HbA1c :Glycated hemoglobin
- DM :Diabetes mellitus
- CV :Cardiovascular
- BP :Blood pressure
- BMI :Body mass index
- TG :Triglyceride
- LDL-C :Low density lipoprotein cholesterol
- HDL-C:High density lipoprotein cholesterol

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Introduction:-

Type 2 diabetes mellitus (T2DM) is one of the most common health problems facing mankind and is a major public health problem. The pathogenesis of T2DM is complex and involves the interaction of genetic and environmental factors. From a pathophysiologic standpoint, persons with T2DM consistently demonstrate three cardinal abnormalities: resistance to the action of insulin in peripheral tissues, particularly muscle and fat but also liver, defective insulin secretion particularly in response to a glucose stimulus and increased glucose production by the liver.^[1]

Diabetes is an important public health problem, one of four priority noncommunicable diseases (NCDs) targeted for action by world leaders. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades^[2].

In addition to the 415 million adults who are estimated to currently have diabetes, there are 318 million adults with impaired glucose tolerance, which puts them at high risk of developing the disease in the future.^[3]

The increasing prevalence of type-2 diabetes, which is attributable to a growing population, an increase in life expectancy^[4]. Hypertension is the most frequent (90%) among the co-morbid disease conditions^[5] and further increases the risk for disease and treatment related complications^[6]. The combination of both hypertension and diabetes accelerates the progression of diabetes related complications such as diabetic nephropathy, retinopathy, left ventricular hypertrophy, and diastolic heart failure and doubles the risk of stroke, CV and all-cause mortality as compared to non-diabetic patients with hypertension^[7].

Therapeutic goals :-

The aim of treatment is to relieve the symptoms of hyperglycemia and to achieve as near normal metabolism as is practicable. The nearer the body weight approaches the ideal level and the closer the blood glucose is kept to normal, the more the total metabolic profile is improved and the lower the incidence of vascular disease and specific diabetic complications. Excellent glycaemic control may also retard the progression of pancreatic β -cell failure.^[8]

Box 1: Treatment Goals for Adults with Diabetes ^[8]	
INDEX	GOAL
Glycemic control	
A1C	<7.0
Preprandial capillary plasma glucose	4.4–7.2 mmol/L (80–130 mg/dL)
Peak postprandial capillary plasma glucose	<10.0 mmol/L (<180 mg/dL)
Blood pressure	<140/90
Lipids	
Low-density lipoprotein	<2.6 mmol/L (<100 mg/dL)
High-density lipoprotein	>1.1 mmol/L (>40 mg/dL) for male patients & >1,3 mmol/L (>50 mg/dL) for female patients)
Triglycerides	<1.7 mmol/L (<150 mg/dL)

Aim of the study:

The purpose of this study is to evaluate patients with type 2 diabetes, regarding percentage of patients who achieve the targets of glycemic control, blood pressure, lipids, & body weight.

Patients&Methods:-

This cross sectional study was performed in Al-Kadhimia Teaching Hospital medical city in Baghdad. The patients were collected by random sampling, from diabetic population who attend the diabetes clinic and medical ward in this hospital, patient with type 1 diabetes mellitus were excluded. Patient who were registered as having type 2 diabetes, & receiving diabetes treatment selected randomly excluding those who were newly diagnosed within six months.

A total of 200 patients were analyzed (106 women, 94 men). Patients' clinical data were recorded and included subject gender, age, duration of diabetes, diabetes treatment method, and the number of antihypertensive drugs used

were analyzed. Body mass index (BMI) and blood pressure were measured. BMI was calculated by dividing the measured weight (kg) by the squared height (m²).

Glycated hemoglobin (HbA1c), pre-prandial & postprandial blood glucose level, and lipid profile were checked, based on these results, each goal was investigated.

Diabetes management goals were HbA1c less than 7%, pre-prandial blood glucose level <130 mg/dL, postprandial blood glucose level <180 mg/dL, systolic blood pressure <140 mm Hg, and diastolic blood pressure <90 mm Hg. LDL-C less than 100 mg/dL, triglycerides less than 150 mg/dL, HDL-C greater than 40 mg/dL in men, and over 50 mg/dL in women were set. The patient management goals were established in accordance with the guidelines of the American Diabetes Association^[9].

Statistical methods:-

All data was expressed as mean±standard deviation, and Microsoft office excel 2007 was used for entry of data and to perform all statistical analysis.

The comparison among the blood glucose, & blood pressure, groups were analyzed using t-tests and chi-square tests; with a significance level was set at P<0.05.

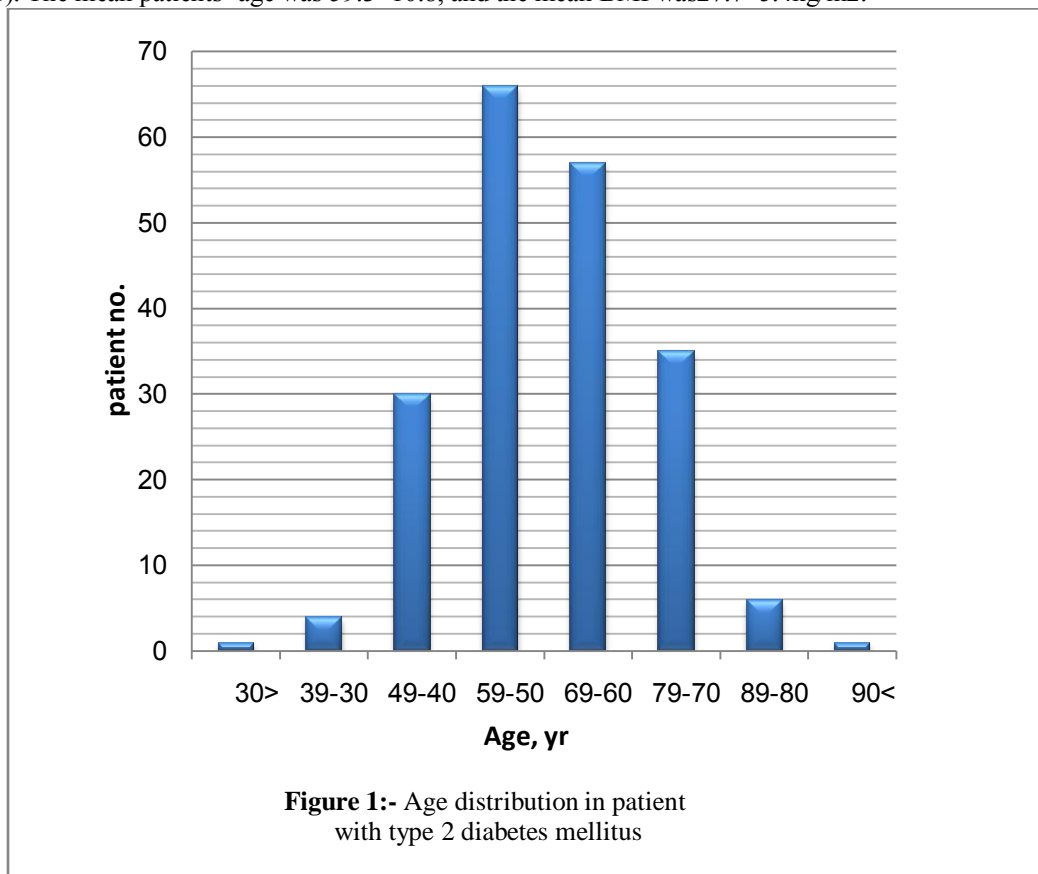
Ethical consideration:-

Informed consent was obtained from all patients enrolled in this study.

Results:-

Patient characteristics:-

Among the 200 patients analyzed in this study, 106 were female, and 94 were male. Peak incidence at the 6th decade (Figure 1). The mean patients' age was 59.3±10.8, and the mean BMI was 27.7±5.4kg/m².



Among the participants, 28.5% (57 patients) were classified as overweight, possessing a BMI between 25 & 30 kg/m². And about 31% of patients classified as obese, having BMI greater than 30 kg/m².

Among the patients, 33.0% had been diagnosed with diabetes duration more than ten years. In addition 54.5% of patients (109 of the total patients) had been diagnosed with hypertension (Table 1).

Table 1:- Characteristics of the study subjects.

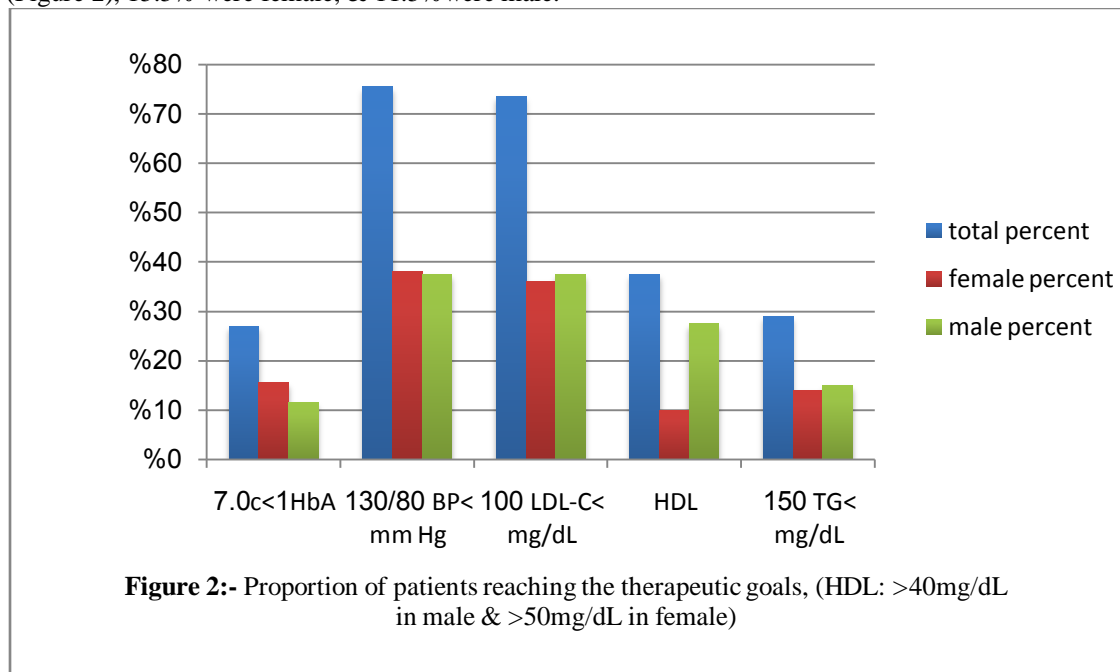
Characteristic	Men (n=94)	Women (n=106)	Total (n=200)
Age, yr	58.6±10.2	59.7±11.3	59.3±10.8
BMI, kg/m ²	25.8±3.7	29.5±6.1	27.7±5.4
DM duration, yr	9.2±6.4	10.2±7.7	9.7±7.1
HbA1c, %	9.7±2.7	9.1±2.6	9.4±2.6
Preprandial glucose	174.8±66.1	168.7±61.5	171.6±63.4
postprandial glucose	234.6±81.27	233.4±90.7	233.9±85.98
Blood pressure, mm Hg			
Systolic	124.04±13.8	128.2±17.3	126.3±15.8
Diastolic	82.02±7.8	83.2±8.6	82.7±8.2
Lipid profile			
LDL-C, mg/dL	89.6±23.8	97.1±29.3	93.5±26.9
HDL-C, mg/dL	44.4±15.6	38.1±13.1	41.1±14.6
Triglyceride, mg/dL	199.3±81.6	213.9±76.1	207.04±78.7
Prevalence of hypertension, %	37.2%	69.8%	54.5 %

*Data are presented as mean±standard error.

BMI, body mass index; DM, diabetes mellitus; LDL-C, low density lipoprotein cholesterol; HDL, high density lipoprotein cholesterol.

Blood glucose control:-

Of the 200 patients who had registered, 27% had reached their goal of maintaining an HbA1c level less than 7.0% (Figure 2), 15.5% were female, & 11.5% were male.



Among the 106 female participants, 31 (29.2%) reached their treatment goal, and among the 94 male participants, 23 (24.5%) reached their treatment goal; there was no significant difference between males & females in achieving glycemic control. (P=0.4) (Table 2).

Table 2:- Characteristics of the study subjects according to their achievement of HbA1c control.

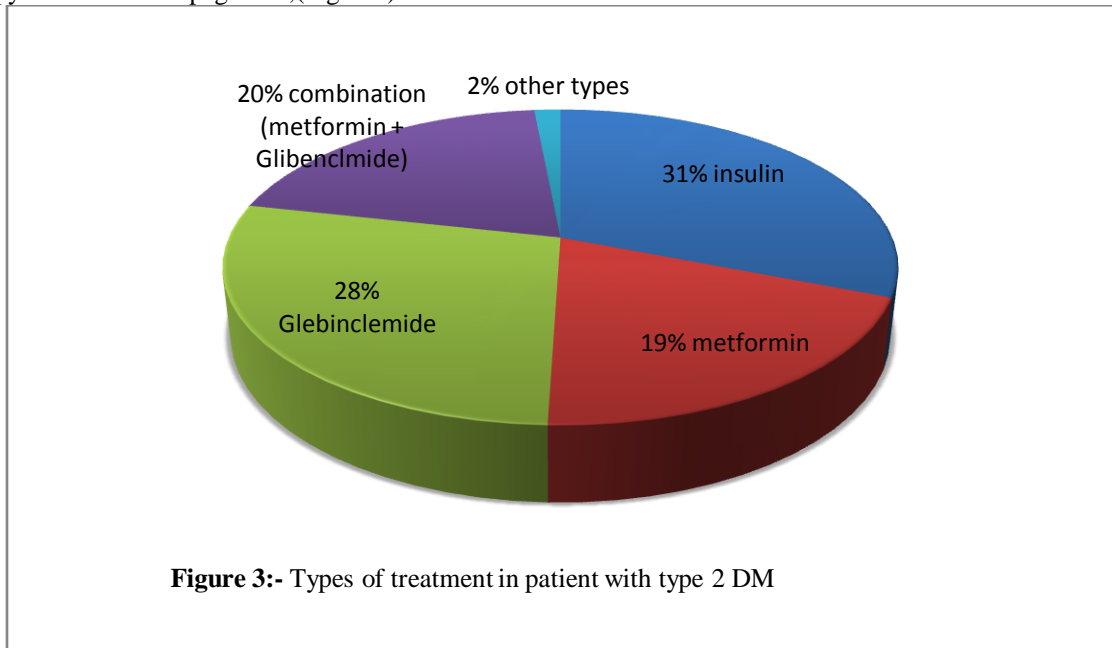
Characteristic		A1c		P. value
		≤7%	>7%	
Sex	Female	31	75	0.4
	Male	23	71	
BMI, kg/m ²		27.3±5.5	27.9±5.4	0.47
Duration, yr		7.9±7.2	10.4±6.9	0.029

* Data are presented as mean±standard error or number.

The average time since diagnosis of the patient group who reached their treatment goal was 7.9±7.2 years and the average time since diagnosis of the patient group who failed to reach their treatment goal was 10.4±6.9 years. The shorter was the time since diagnosis, the higher was the treatment success rate (P=0.029) (Table 2).

Of the 200 patients who had registered, 28% (15% of them were female, 13% male) had reached their goal of maintaining a pre-prandial blood glucose level less than 130mg/dL. Also 36% of the patients had a postprandial glucose level of less than 180mg/dL.

In this study about 31 % of the patients received insulin, 19.5 % treated with metformin, 28% using glibenclamide, 20% of them use combination therapy (metformin + glibenclamide), & 1.5 % use other form of combination therapy: metformin&repaglinide,(Figure3).



Blood pressure control:-

Among the participants in this study, 54.5% (n=109) had hypertension, among which 35 patient were male & 74 patient were female.and55% of these patients had controlled blood pressure (Figure 4).

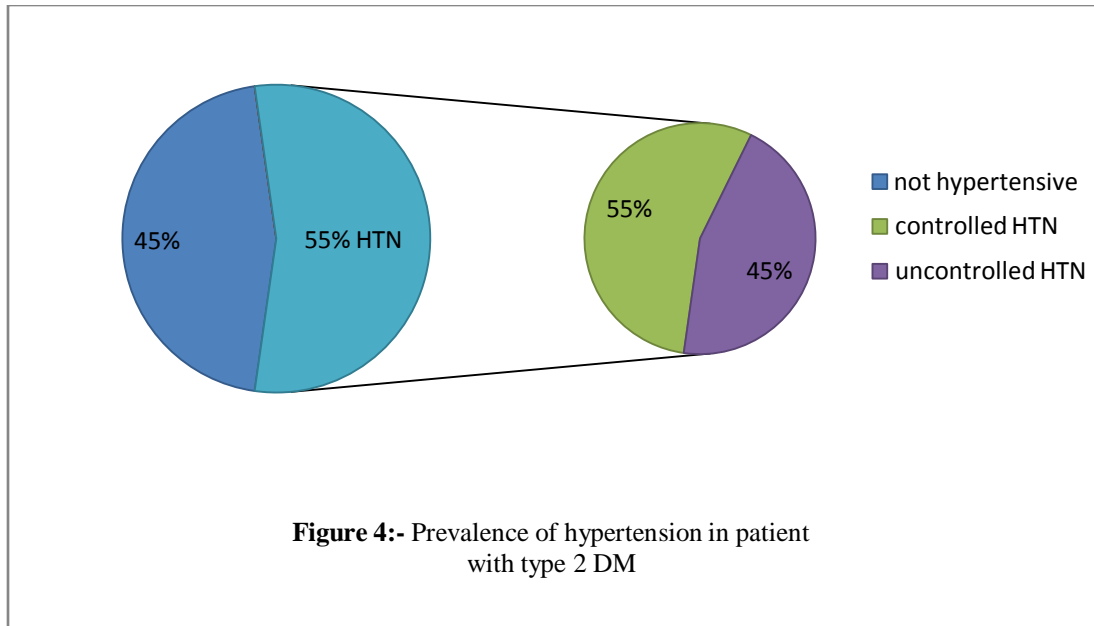


Figure 4:- Prevalence of hypertension in patient with type 2 DM

About 78% of the participants was taking one type of antihypertensive drugs, and 22% were taking two types of antihypertensive drugs.

About 75% of the patient who had controlled blood pressure was taking one type of antihypertensive medications, the rest (25%) with two types. The percentage of treatment success in patients who were taking only one type of antihypertensive drug was high.

Among the 35 male participants, 16 (45.7%) reached their treatment goals, and among the 74 female participants, 44 (59.5%) reached their treatment goals. There was no significant difference between males & females regarding controlling blood pressure (P=0.17).

Lipid control:-

The percentage of patients who reached their serum lipid level goals of LDL-C (<100 mg/dL), triglycerides (<150 mg/dL), and HDL-C (>40 mg/dL in males, >50 mg/dL in females) were 73.5%, 29%, and, 37.5% respectively (Figure 5).

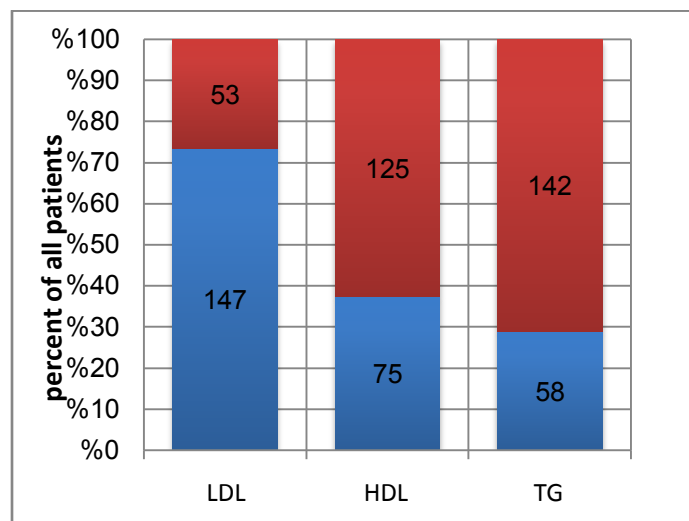


Figure 5:- The percentage of patients who reached their serum lipid level goals of LDL-C (<100 mg/dL), HDL-C (>40 mg/dL in males, >50 mg/dL in females), and triglycerides (<150 mg/dL), the blue part of the column.

Eye and foot care:-

About 68.5% of the patients did n't observe there foot for any complications, the rest 31.5% did annual foot care, among those 20 % were females, 11.5% were males (Figure 6). Also about 33.5% of the patients (about 67 of the total number.) performed regular eye examination screening for diabetic retinopathy, 19% were females, & 14.5% were males (Figure 7).

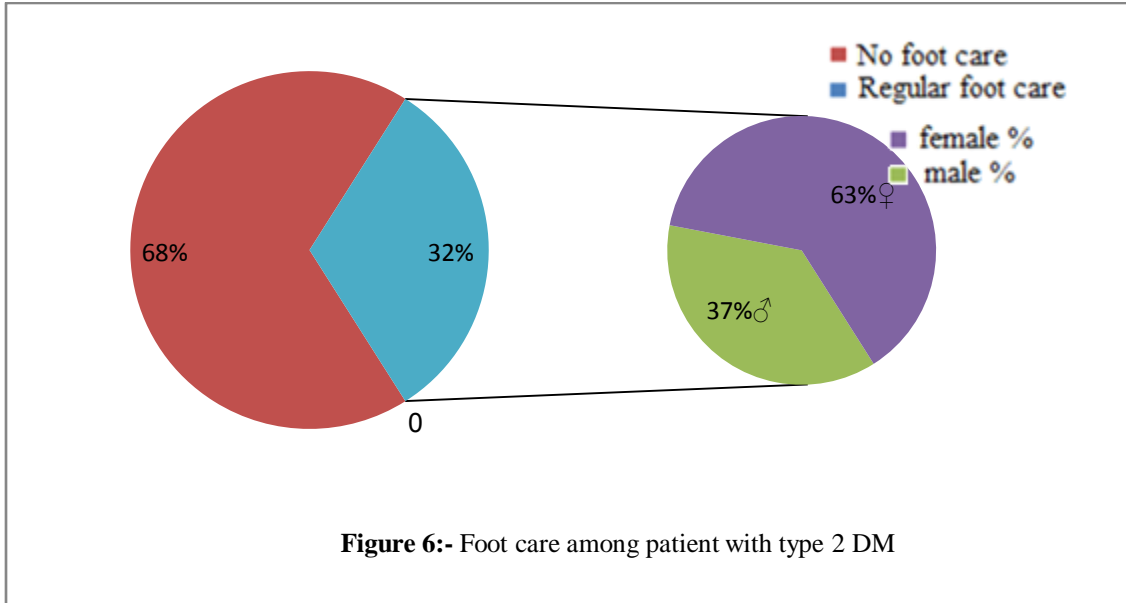


Figure 6:- Foot care among patient with type 2 DM

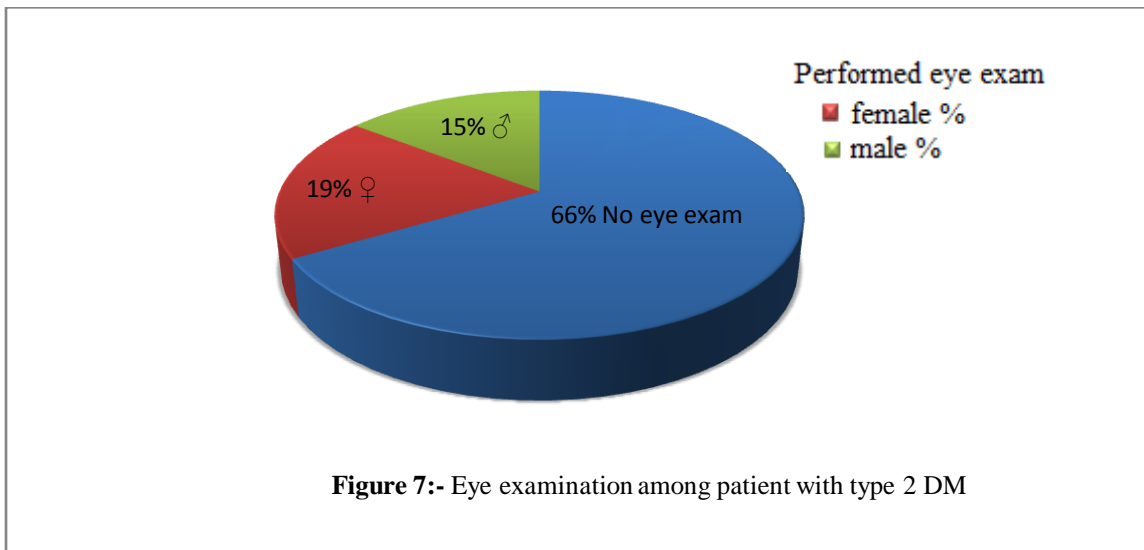


Figure 7:- Eye examination among patient with type 2 DM

Discussion:-

T2DM in Iraq has high prevalence, as by STEP survey conducted by ministry of health in 2006, 10.4% of Iraqi adults above 24 year age had high fasting plasma glucose⁽¹⁰⁾

There is no clear Iraqi national estimate on overall glycemic control and how medical centers and diabetic patients follow the guidelines of treatment and regular follow up to detect complications in type2 DM.

This present study aims to give an idea about the current situation of management goals of type 2 DM in a sample of Iraqi patients who attend a governmental diabetic clinic in Baghdad who offers only basic follow up and essential medications, metformin, glibenclamide and insulin.

In this study, only 27% of patients reached their HbA1c goal of less than 7.0%, which means that nearly three quarters of patient are out of control putting them at high risk for complications and increase the burden of the disease on the society.

When this study was compared with studies from other countries, nearly similar results seen in a report by Akbar^[11] In Saudi Arabia, only 27% of the patients reach target level of glycemic control. In Jordan study by M. Khattabet al^[12] show that about 34.9% of patients with type 2 DM have HbA1c below 7%. Also reports by Lieblet al.^[13] involving data from eight countries based on the European Diabetes Policy Group Guidelines, 31% had an HbA1c less than 6.5% and in reports by Sone et al.^[14] from Japan, 29.3% had an HbA1c less than 7.0%.

The results reported by Harris et al.^[15] show that 44.6% of patients have reached the target of and HbA1c less than 7.0%. In the American National Health and Nutrition Examination Survey (NHANES)^[16], 57.1% of patients have reached the target HbA1c of less than 7.0%. In study by Korean diabetes association, Kang AY, et al.^[17] 51.8% have reached their goal of maintaining an HbA1c level less than 7.0%.

When the characteristics of patients who have reached their target for glycemic control and patients who have not reached their target for glycemic control are compared, our study shows no differences in the target success rate comparing males and females, similar to other studies that have shown no differences between men and women,

The results of patients followed in private clinic may be better due to availability of more recent anti diabetic drugs which are not offered in governmental centers.

We can explain the poor glycemic results in this study by lack of educational support for those patients, irregular supply of medications and investigations in the governmental sector.

Regarding increases in BMI on HbA1c^[12-13], Unlike that reported by Lee et al.^[18], which shows that male have higher control rate, while study by Korean diabetes association, Kang AY, et al.^[16] shows that females have the higher control rate in reaching target glycemic control.

In the present study, the mean duration of diabetes in patients who successfully reach their treatment goals was 7.9±7.2 years, and the mean duration in patients who do not reached their treatment goal was 10.4±6.9 years. The shorter is the duration of diabetes, the higher is the treatment success rate (P=0.029) (Table 2). Glycemic control becomes more difficult as diabetes progresses, and the necessity for additional drug actions and the use of insulin increasing.

Of the total participants 54.5% (n=109) have hypertension. Among hypertensive patients, about 55% reached their target which is higher than the result of Kang AY, et al.^[16], 32.2% below the target 130/80 mm Hg.

The patients who reach their serum lipid level goals of LDL-C (<100 mg/dL), triglycerides (<150 mg/dL), and HDL-C (>40 mg/dL in males, >50 mg/dL in females) are 73.5%, 29%, and, 37.5% respectively. These results are lower than the 66.3% for LDL-C, 57.9% for triglycerides, and 51.8% for HDL-C reported by Kang AY, et al.^[16] but are higher than the 35.7% for LDL-C reported by Lim et al.^[19] in their study on dyslipidemia patients at a tertiary hospital. The results also lower in comparison with that results reported by the NHANES^[15]: 46.6% triglycerides, and 58.0% HDL-C. but there is higher success rate in this study regarding the LDL-C which is about 46.5% by the NHANES^[15] which may be explained by increasing use and availability of statins.

Limitation:-

There are several limitations in this study. This study was performed at one hospital in Baghdad city and the study did not include a large variety or a large number of patients. Therefore, in the future, a larger scale study will be required to establish the success rates and complications in type 2 diabetes patients.

Conclusions:-

In conclusion, this study shows that 73% of cases with hyperglycemia, 45% of cases with hypertension, and 60% to 70% of cases with dyslipidemia have not reached their targets. More research and clinical effort will be required to achieve the targets of hyperglycemia, hypertension, and dyslipidemia.

Disclosure:-

Authors have no conflict of interests, and the work was not supported or funded by any drug company.

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