Egypt. J. Chem. Environ. Health, 1 (1):749-751 (2015)

Prevalence of Chronic Complication among diabetes patients attending diabetic clinic at KAUH in Jeddah: A Cross Sectional Survey

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Abstract

Background: Diabetes is one of the most common non-communicable diseases and is a major health problem globally (**Khanam P.A. et. al, 2015**). Diabetes mellitus is a long lasting sickness and quickly expanding in both gender and all ages. It includes different physiological capacities, organs and diverse systems and is connected with health complications (**Meo et al, 2015**).

Aims: To determine the prevalence of chronic complications and comorbidity among the type 2 diabetics attending diabetic clinic at KAUH in Jeddah.

Methods: A cross- sectional descriptive study was carried out among (200) Patients (73) male and (127) female at (KAUH) and Suleiman Fageeh Hospital with diagnosed diabetes type 2 with complications to be included in the study at their first visit to the outpatient endocrinology department between October 2014 and April 2015. Patients were enrolled consecutively from outpatients and inpatients. The data was collected by questionnaire include demographics characteristics, laboratory investigations collected from the patient's medical records to measuring the prevalence diabetes complications. Hospital length of stay was recorded. The results were analyzed by SPSS statistical package version 15.

Results: Overall most of male and female participants were have 2 or more of chronic disease (79, 5% & 85%) respectively. High prevalence of hypertension among female type2 diabetes patients than males (43.3 % vs. 38.4 % consecutively). Female patient had higher percent who take medication for high blood pressure & hypercholesterolemia than male (43.3% vs. 38.4%) and (57.5% & 53.4 %) respectively. Significant differences among our participants (male &female) in (Mean± SD) of **HbA1c** level in the blood at ($p<0.014$*). Also male patients were had higher percent of poor HbA1c level **(8.1-9%)** than females (16.4% vs. 15.0%) respectively. Likewise for very poor **HbA1c** level (**>9)** males had higher percent than females by (56.2% vs. 37%) respectively. The frequency of retinopathy among our patients was (57.5 % for males & 70.1% for females). The reported neuropathy in this study was (58.9%) for male & (69.3%) for female patients.

Conclusion: The result showed a high percentage of chronic complications among the diabetic patients of this region. The high percentage of hypertension and dyslipidemia among them are important co morbidity factors which if not controlled can cause further increase in the number of chronic complications. This emphasizes the need of national awareness program about the gravity of the problem. We recommend screening of high risk

groups and emphasize importance of early diagnosis of diabetes and detection chronic complications so that appropriate treatment initiated at the earliest.

Key words: Type 2 diabetes mellitus, chronic complications, hypertension, hypercholesterolemia and glycemic control (HbA1C).

Introduction

Diabetes is one of the most common non-communicable diseases and is a major health problem globally (**Khanam P.A. et. al, 2015**). Diabetes mellitus is a long lasting sickness and quickly expanding in both gender and all ages. It includes different physiological capacities, organs and diverse systems and is connected with boundless and pulverizing (crushing) health complications (**Meo et al, 2015**).

Type two Diabetes Mellitus (T2DM) is described by peripheral resistance of insulin, weakness in the regulation of hepatic glucose production and β-cell failure related to decline β-cell capacity (**Goldenberg, and Punthakee, 2013 and International Diabetes Federation, 2014).** The diabetes mellitus is well known for its significant effect on the morbidity and mortality of the population caused by its micro and macro vascular complications' resulting in huge burden on the health care system. The knowledge of the epidemiology of its Co-morbidity factors and the prevalence of its complication is very important for formulating the necessary policies and action plan. In the recent years, there have been only a handful small scale studies dealing with the prevalence of chronic complications among diabetes patients attending the Primary health Care facilities of Ministry Of Health in Saudi Arabia (**Ataur Rahman Khan, et al. 2014). Famuyiwa and co-workers 1992** studied the prevalence of diabetic complications among Type 1 and Type 2 diabetes in Saudi Arabia found that ischemic heart disease was present in (41.3%), stroke in (9.4%), foot infections in (10.4%), amputations in (5.1%), cataract in (42.7%), neuropathy in (35.9%), retinopathy in (31.5%), hypertension in 25% and nephropathy in (17.8%) of patients with Type 2 diabetes (**Famuyiwa et al, 1992). Al-Nozha MM, et al 2004** study from Saudi Arabia showed that diabetes is associated with significant high rate of long term complications. They reported that the prevalence of DM among Saudi adults between the ages of 30 to 70 years was (23.7 %). On the other hand **study by Whiting, et al, 2011** report that diabetes prevalence in Saudi Arabia is (23.4%) and arrives a peak in the (40 – 60) age group, the second highest prevalence rate is for (15- 44) age group and the third highest rate for the age group that over (60) years and he prevalence of diabetes in the world is (8.3%) (382 million people) (**Whiting, et al, 2011**). Diabetes has a relationship with significant morbidity and due to periodic visits related to complications; it places a formidable load on the health care system (**Wang F, et.al.2012).** There are two types of complications first type is macro-vascular such as (cardio and cerebrovascular) and the second type is micro-vascular such as (nephropathy and retinopathy) complications **(World Health Organization2008).**

The morbidity and mortality related to diabetes is a great global concern. The data from various studies have found diabetes as the growing cause of disability and premature death mainly through its chronic complications. Studies conducted in various countries have shown increased incidence of micro as well as the macro vascular complications among the

diabetic patients. Diabetes mellitus is one of the major risk factors for cardio vascular diseases. Approximately (30%) of patients treated in cardiovascular intensive care units have diabetes (**Kengne & Mbanya, 2005**). One study conducted in the central province of Saudi Arabia has found (24.1%) of the diabetic patient suffering from cardiac ischemic disease. Some epidemiological studies shown that the people with T2DM are at higher risk of cardiovascular diseases (CVD) which leading to death globally. And actual estimates of (21.9%) of total death by CVD are expected to rise to (26.3%) by 2030 (**World Health Organization2008**).

Diabetic retinopathy (DR) is fast emerging as the one of the commonest cause of blindness in the adult of developed countries. In addition, it is affecting almost all persons with duration of diabetes of 15 years (**Youssef H. et al, 2015**). According to WHO Diabetic retinopathy is the commonest cause of blindness among the working age group of the developed nation and over 2.5 million people are blind globally due to diabetes (**Khan, Wiseberg et al, 2010**). Recent studies conducted in central and eastern provinces of Saudi Arabia have found (34 and 31%) of diabetic retinopathy among the diabetic patients (**Alwakeel, et al 2009; Khan et al., 2010**).

Diabetic nephropathy is similarly a serious complication of diabetes and affects (30-40%) of all patients with diabetes (**Caring for Diabetes.com, 2012**). Diabetic nephropathy is a micro vascular complication which occurs in (20–40%) of patients with diabetes T2DM **(Ahn JH, et.al.2014 and Rossing P. 2006)**. It is leading to cause of end-stage renal disease (ESRD), requiring renal replacement therapy such as dialysis or transplantation (**Lopes AA. 2009; Jin DC. 2011; and Park CW, 2014).** In a clinic based study in Riyadh and a primary health care based study in Abha (Saudi Arabia), the researchers have found (41.3% and 12.8%) of the diabetic patients suffering from frank proteinuria (**Farag & Al Wakeel, 2011; Al-Homrany and Abdelmoneim, 2004).**

Triads of main complications of chronic hyperglycemia in diabetes are Nephropathy, together with Peripheral Neuropathy and retinopathy. In addition to the common predominantly sensory small fiber neuropathy and other types of diabetic neuropathy including autonomic neuropathy, mononeuropathy, mononeuropathy multiplex, radiculopathy, and radiculoplexus neuropathy (**Dyck PJ,, et.al.1993and Dyck PJB,et.al. 1999**). About (60%–70%) of people with diabetes have some forms of neuropathy which is extra underlying complications of diabetes, which are considered as a family of nerve disorders. Peripheral neuropathy (PN) is the most common complication of T2DM and patients with diabetes can develop nerve trouble at any time, but the risk increases with age and longer period of the disease (**Andriana M, 2015**).

Glycemic control Glycated Hemoglobin (HbA1C) test reflects patient average blood sugar level for the past two to three months. The higher HA1C level, the poorer blood glucose control and the higher risk of diabetes complications **(Larsen ML. et.al, 1990).** Current International Diabetes Federation guidelines recommend a target HbA1c <7.0%, but many people with diabetes worldwide find this difficult to achieve, increasing their risk of developing complications (**Litwak et al.2013).** Among patients with T2DM,

the good glycemic control is a backbone to the prevention of diabetic complications. In addition, these patients are generally treated with metformin and diet as the first-line therapy to obtain good glycemic control (**Marcus L. et al, 2015**); **(American Diabetes Association.2010; National Board of Health and Welfare (2010) and Inzucchi, et.al.2012).**

Another study by **Litwak et al.2013;** Multinational, open-label, observational study of 66,726 people with type 2 diabetes showed that the complication rates were high (27.2% had macro vascular complications and 53.5% had micro vascular complications), particularly in Russia, and use of vascular disease preventative drugs was lower than expected. Age, BMI, diabetes duration, LDL-C, and systolic blood pressure (SBP) were positively associated, and HDL-C negatively associated, with macro- and micro vascular complications (all $p < 0.05$). HbA1c and fasting plasma glucose (FPG) were negatively associated with macro vascular complications (both $p < 0.05$), which may be linked to the cross-sectional study design. The authors conclude that these results suggest a worldwide failure to achieve glycaemic targets. Better diabetes management with earlier initiation and optimization of insulin regimens (e.g., with insulin analogues in the A1chieve population) may reduce the prevalence of vascular complications, improve the lives of people with diabetes and reduce the burden on healthcare systems.

Environmental factors substantially contribute to the development of DM and are closely related to socioeconomic status (SES). SES is mainly evaluated by educational status, income, and occupation of the subject **(Galobardes B, et.al. 2006)** and has been reported to be linked to dietary habits, exercise frequency, and health behavior **(Brown AF, et.al. 2004)**. The inverse relationship between SES and alcohol and cigarette use has been well documented, and increased alcohol and cigarette consumption may be related to the higher occurrence of DM **(Choi BC, and Shi F, 2001)**. Additionally, it was noted that as SES increases, the likelihood of regular exercise also increases **(Yoon YS, et.al. 2006)**. Furthermore, people with a low SES are more likely to have exposure to toxic substances and are also less likely to have access to appropriate medical care **(Adler NE, and Newman K, 2002).** In this regard, previous studies suggested an inverse relationship between SES and DM **(Evans JM, et.al. 2000 and Agardh E, et.al. 2011)**. A14-year follow-up study in the United States confirmed that DM occurred more frequently in those with a low SES **(Lee TC, et.al. 2011).** Lifestyle improvement is one of the most important components in the management of type 2 diabetes mellitus (T2DM) **(Magkos F, et.al, 2009).** And can have sustainable positive effects on weight and cardiovascular risk factors **(Wing RR, et.al, 2010).** The most main factors that responsible for the rising prevalence of diabetes worldwide are less exercise and unhealthy dietary patterns. (**Hu FB et.al, 2001**).

The present study has been carried out to measuring the prevalence diabetes complications (ischemic heart disease, hypertension and long term complications of diabetes mellitus among patients) attending the diabetic clinic and their relation to glycemic control (HbA1c). The present study was conducted at King Abdul Aziz University Hospital (KAUH) and Suleiman Fakeeh Hospital among patients with diagnosed diabetes type 2 with complications to be included in the study at their visit to the outpatient

endocrinology department and was getting medication on regular basis from Society of Friends of diabetic patients in Jeddah city.

Materials & Methods

Study Design:

Sampling: A cross- sectional descriptive study was carried out among (200) Patients (73) male (36.5%) and (127) female (63.5%) diagnosed diabetes type 2 with complications and were getting medication on regular basis from Society of Friends of diabetic patients in Jeddah to be included in the study. Both sexes as well as all racial and ethnic groups aged from the age of 15to ≥65year were conducted. The mean age for female was (55.9 ±.12.3) and for male was (58.3 ±.12.2). All patients with active follow-up visits were included in the analysis. Patients who were diagnosed to have Type 1 diabetes, gestational diabetes and pediatric patients (age less than 15 years) were excluded from the study. Ethical approval from the Ethics and Research Committee for Applied Medical Sciences King Abdul-Aziz University. Permission was attained from the Unit of Biochemical Ethics Medicine at King Abdul-Aziz university hospital (KAAUH) and Suleiman Fakeeh Hospital Patient was given consent before the interview. The aim of the study was explained to the subjects.

Duration: The Data collection was initiated in October 2014 and completed in April2015.Patients were enrolled consecutively from outpatients and inpatients.

Location of the study: The present study was conducted at King Abdul Aziz University Hospital (KAUH) and Suleiman Fakeeh Hospital among patients with diagnosed diabetes type 2 with complications to be included in the study at their visit to the outpatient endocrinology department and were getting medication on regular basis from Society of Friends of diabetic patients in Jeddah in Jeddah city.

Methods: The present study has been carried out to measuring the prevalence diabetes complications developed after the proper diagnosis of T2DM and could be attributed to diabetes was considered in this study. (Ischemic heart disease, hypertension and long term complications of diabetes mellitus among patients) attending the diabetic clinic. The data was collected by questionnaire comprising demographics characteristics and a 24-hr recall for 3 days , laboratory investigations collected from the patient's medical records, medical examination; anthropometric measurements included weight, height, waist circumference, hip circumference, waist-hip ratio, Mid arm circumference, body mass index (BMI),and hand grip strength. Diabetes complications and hospital length of stay were recorded. The results were analyzed by SPSS statistical package version 15 and the results were tabulated and used the Harvard graphics packages version 4 for representing the results graphically.

Questionnaire design: An English questionnaire was developed for the purpose of data collection, which was pilot, tested and modified accordingly. A face- to- face interview with each participating Patients with diabetes complications. The interview was of 20 to 30 minutes duration (**Karlsson et al, 2009**). The questionnaire contains several sections:

Socio-demographic data: which include questions on basic socio-economic characteristics of the households. It also collects data on individual characteristics as the : age, nationality, marital status, educational status of the patient and the wife/husband (if

married), income source, average of household income, place of residence, type of dwelling, number of family members.

Laboratory data: It includes blood analysis, urine and the degree of glycemic control by level glycosylated hemoglobin (HbA1C), fasting plasma glucose, oral glucose tolerance, random blood glucose, urine glucose test, urine spot for microalbumin. We also, measured the lipid profile (total cholesterol, triglyceride, LDL and HDL cholesterol). The results were taken from records of KAAUH and Fakeeh hospital. Diagnosis of dyslipidemia was based on the 2004 American Diabetes Association (ADA) treatment guidelines, which recommend that the following lipid criteria should be met for patients with diabetes: low density lipoprotein-cholesterol (LDLC) < 2.6 mmol/L (100 mg/dl), triglycerides < 1.7 mmol/L (150 mg/dl) for both gender and high density lipoprotein cholesterol (HDL-C) > 1.0 mmol/L (40 mg/dl) in men and >1.3 mmol/L (50 mg/dl) in women.

Accordingly, International Diabetes Federation (IDF) and joint American Diabetes Association (ADA) / European Association for the Study of Diabetes (EASD) (EASD) guidance recommend 2012: targets the degrees of glycemic control by level glycosylated hemoglobin (HbA1C) have four levels: at less than (<7%) good level, at (7.1-8%) fair level in addition, at (8.1-9%) (Poor level) Moreover, at more than (9%) very poor level;

Ethical Considerations: Permission was attained from Ethics and Research Committee for Applied Medical Sciences King Abdul-Aziz University. Permission was attained from the Unit of Biochemical Ethics Medicine at King Abdul-Aziz university hospital (KAAUH) and Suleiman Fakeeh Hospital Patient was given consent before the interview.

The statistical analysis included: Descriptive Statistics: arithmetic means or average, median and standard deviation. Explore provides more descriptive statistics, including the standard errors, minimum, maximum, percentiles and other descriptive statistics and information.

The results were analyzed by SPSS statistical package version 15 (**1994**) and the results were tabulated and used the Harvard graphics packages version 4 for representing the results graphically **(Harvard 1998).**

Result & Discussion:

The diabetes mellitus is well known for its significant effect on the morbidity and mortality of the population caused by its micro and macro vascular complications' resulting in huge burden on the health care system. The knowledge of the epidemiology of its Co-morbidity factors and the prevalence of its complication is very important for formulating the necessary policies and action plan. In the recent years, there have been only a handful small scale studies dealing with the prevalence of chronic complications among diabetes patients attending the Primary health Care facilities of Ministry Of Health in Saudi Arabia (**Ataur Rahman Khan, et al. 2014).** Diabetes prevalence in Saudi Arabia is (23.4%) and arrives a peak in the (40 – 60) age group, the second highest prevalence rate is for(15-44) age group and the third highest rate for the age group that over 60 years. The prevalence of diabetes in the world is (8.3%) (382 million people) (**Whiting, D.R.et al, 2011**). The present study was conducted at King Abdul Aziz University Hospital (KAUH) and Suleiman Fakeeh Hospital in Jeddah among patients with diagnosed diabetes

type 2 with complications to be included in the study at their visit to the outpatient endocrinology department in Jeddah city to determine the prevalence of chronic complications and comorbidity among the type 2 diabetics.

A cross- sectional descriptive study was carried out among (200) Patients (73) male (36.5%) and (127) female (63.5%) diagnosed diabetes type 2 with complications to be included in the study. Both sexes as well as all racial and ethnic groups aged from the age of 15to ≥65year were conducted. The percent distribution of diabetic patients age according to gender presented in Table (1) as we can see the majority percent of patients age was between (50 to <60) years old (41.1% for males and 33.1% for females). Followed by (26% for male & 28.3% for female) ranging from (59 - <70) years old.

Socioeconomic status (SES) Characteristics

Table (1) illustrates the Percent distribution of socioeconomic status of diabetic patients according to gender, the no. of Saudi patients was (120) (60%); (45 males and 75 females) but non Saudi were (40%) (80) (28 males and 52 females).

Socioeconomic state measured in terms of income, education and occupation has been found to be negatively associated with mortality and morbidity from almost every diseases, this relationship been found have in almost every country people have access to health care (**Sheldon cohen et al, 2006)**. Moreover researchers have found that highly stressed individual have low SES low income and low education those individual have to cope with the stressful life **(Laura D. and David 1999).**

The country of Saudi Arabia is among the richest and highest per caption income countries of the world. This high income combined with food affluence and lack of nutritional awareness has led to a state of over-nutrition of macronutrients and malnutrition of micronutrients among the population (**Madani et al, 2000**). Our result revealed that the percent of participants whose were had income from 6000 to 10000 Saudi Reyal and more than 10000 were (39.5 %) (HSES) & (59.5%) were living in (LSES) and (42%) who live in rent flat. The majority of our participates (65%) whose family size was between 3-6 members. Our study disagreement with the previous study by **Madani et al., 2000.** Likewise the present study revealed that diabetic patients with complications had (LSES) more than (HSES) and this agreement with our previous study about malnutrition among colorectal cancer patients pre and post treatments in **KAUH in Jeddah 2012 which** revealed that only (30%) from our participants had high socio economic level (HSEL) from (6000, >10,000SR). This result verified that most of our participated in low socioeconomic status level (LSESL). Furthermore, people with a low SES are more likely to have exposure to toxic substances and are also less likely to have access to appropriate medical care **(Adler NE, and Newman K, 2002).** In this regard, previous studies suggested an inverse relationship between SES and DM **(Evans JM, et.al. 2000 and Agardh E, et.al. 2011)**. A14-year follow-up study in the United States confirmed that DM occurred more frequently in those with a low SES **(Lee TC, et.al. 2011).** A community study based random sample were collected in Geneva canton age of Participants were (35-74) years done by **Bruna Galobardes et. al 2001** they were asked to fill a questionnaire about CVD

risk factors and semi qualitative food frequency questionnaire and revealed that 2767 from 2929 female were lived in low SES consumed low fish and vegetables but more fried food, sugars, pasta, potato, calcium, iron, vitamin A and vitamin D were also low.

Glycemic control Glycosylated hemoglobin (HbA1c) of Diabetic Patients Table (2) presented descriptive and percent distribution of blood level of glycosylated hemoglobin **(HbA1c**) of diabetic patients according to gender as we can see there was significant differences among our participants (male &female) in (Mean± SD) of **HbA1c** level in the blood at ($p<0.014$*). The (Mean ± SD) of **HbA1c** levels were (9.43±.2.26 and 8.65 ±.2.05) for male and female respectively. However, the **HbA1c** have four levels: at less than (<7%) good level, we found the (Mean ± SD) were (6.13±.0.37 and 6.3 ±.0.54) for male and female respectively. Moreover, at (7.1-8%) fair level we found the (Mean ± SD) were (7.53±.0.30 and 7.61 ±.0.34) for male and female respectively. In addition, at (8.1-9%) (Poor level) we found the (Mean ± SD) were (8.66±.0.34 and 8.6 ±.0.29) for male and female respectively. Moreover, at more than (9%) very poor level; we found the (Mean ± SD) were (10.88±.1.83 and 10.8 ±.1.5) for male and female respectively. The incidence of chronic complications in Type 2 DM patients was significantly correlated to the degree of hyperglycemia and diabetic control, as measured by the plasma glucose or the HbA1c level. In the present study, IHD and micro-vascular complications of DM were noticed to be more common in diabetics with poor and very poor glycemic control, which is concordance with international studies by **Stratton et al**. in a cohort study which found that 1% reduction in average HbA1c was associated with reductions of (14%) for myocardial infarction and (37%) for microvascular complications (**Stratton IM, et al, 2000**). On the other hand, prevalence of hypertension, frank nephropathy and peripheral vascular disease seem not to be related to the degree of glycemic control. Nephropathy prevalence was need other investigations such as microalbuminuria but was not available for our patients and our limited time (**Stratton IM, et al, 2000**).

The present study also demonstrated that fasting blood glucose levels among diabetic patients in male was higher than female was (10.28±7.16 vs. 9.28±3.53) respectively as in table (3). Likewise the mean of blood level of glycosylated hemoglobin **(HbA1c**) level for diabetic male was higher than female by (9.43 *vi* 8.65) respectively as in table (2). These results are consistent with each. Table (2) also shows that male patients were had higher percent of poor HbA1c level (**8.1 - 9%)** than females (16.4% vs. 15.0%) respectively. Likewise for very poor **HbA1c** level (**>9)** males had higher percent than females by (56.2% vs. 37%) respectively. Our evidences about these results in our study that females had higher percent of good **HbA1c** level than male (23% vs. 12%) and there was significant differences at ($p<0.03$*). These results revealed that may be females more committed by the instructions more than males. These results verified that people which has poor glycemic control, longer duration of diabetes associated hypertension, obesity and they are vulnerable to prevalence of diabetic microvascular complications.

Fasting blood glucose levels; Lipid Profiles & Hypertension

Diagnosis of dyslipidemia was based on the 2004 American Diabetes Association (ADA) treatment guidelines, which recommend that the following lipid criteria should be met for patients with diabetes: low density lipoprotein-cholesterol (LDLC) < 2.6 mmol/L (100 mg/dl), triglycerides < 1.7 mmol/L (150 mg/dl) for both gender and high density lipoprotein cholesterol (HDL-C) > 1.0 mmol/L (40 mg/dl) in men and >1.3 mmol/L (50 mg/dl) in women. Serum cholesterol of 0-5.20 mmol/L (200 mg/dl) or less was considered as normal.

Table (3): presented the descriptive and percent distribution of Lipid Profile and fasting blood glucose of diabetic patients according to gender. It's clear that statistically there was significant differences among our participants (male &female) in total cholesterol level at ($p<0.0114$*). The (Mean ± SD) of total cholesterol levels were (5.3±.4.12 and 4.31 ±.1.37) for male and female respectively. However, the (Mean ± SD) of triglyceride level were (2.01±.1.01& 1.53 ±.1.07) for male and female respectively and was high significant differences at ($p<0.002$**). In addition, the (Mean ± SD) of LDL were (2.28 ±.1.08, and 2.45, 1.24 ±.0.98) for male and female respectively and for HDL were (0.98± 0.49 &1.24± 1.49) for male and female respectively and statistically there was no significant among to gender in both parameters. The same table illustrates that the percent of male and female patients which who had hypercholesterolemia (≥ 5) was (30.1% &29.9%) respectively. Likewise, the same percent (30.1% &29.9%) were had hyper triglyceridemia at (≥2.31) level from triglyceride level for male and female respectively. A higher level of lipidaemia (30.1% for male and, 29.9% for female) for cholesterol and triglyceride, the prevalence of IHD in our study less than a higher level of lipidaemia (n=215, 42.9%) and cholesterol (n=199, 39.4%) rate reported by **Toth et al., 2012.** This a matter of concern as they are strong co morbidity factors for further complication. LDLc and HDLc are the known risk factors for the micro vascular complication especially among the diabetics (**Toth et al., 2012**). Routine measurement of LDLc and HDLc is required for all the diabetic patients. The UK prospective diabetes study (UKPDS) proved that in patients with type 2 diabetes the risk of complications was strongly associated with previous hyperglycemia. Any reduction in HbA1c is likely to reduce the risk of complications, with the lowest risk being in those with HbA1c values in the normal range (6.0%) **(Stratton, et al.2000).**

Blood Pressure:

Hypertension was based on a preexisting history of hypertension and measurement of blood pressure (BP), where systolic blood pressure (SBP) was greater than 130 mm Hg and/or a diastolic blood pressure (DBP) greater than 80 mm Hg. This was based on the seventh report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High blood pressure (**JNC) (Soto-Pedre E, et al, 2007**).

Table(4) illustrates the Descriptive and percent distribution of blood pressure of Diabetic Patients according to gender and the mean± SD among males for systolic BP ≥130mmHg (Hypertension) and <130 normal were (148.9± 16.15 and 113.54± 10.4) respectively , while the mean ± SD among females for systolic BP ≥130mmHg (Hypertension) was (156.6± 18.6) and <130 normal was (115.7± 8.7). Also, the percent of systolic BP ≥130mmHg (Hypertension) for males was (67.1%) and <130 normal was 32.9%, but the percent among females were (74%) and (26%) respectively and statistically

was significant differences between males and females at (P= 0.01*). In addition, the mean± SD for diastolic BP ≥80mmHg (Hypertension) for males and females were (88.0± 6.87 and 89.7± 11.2) respectively and the percent were (41%.1) for males and (53.5%) for females, while the mean ± SD and percent for diastolic BP <80normal were (64.14± 10.9) (58.9%) among males and (66.9± 9.18) (46.5%) among females, were statistically significant differences between males and females at (P=0.023*).

Our results verified a significantly higher prevalence of hypertension (67.1%) for male and (74%) for female diabetic patients as in able (4), Although studies by **Alwakeel et, al. and Akber *et al***. found that hypertension to be present in (78% and 60 %,) respectively, among diabetic patients (**Alwakeel JS, et al. 2008 & Akber *et al.*2001).So our** results consider less than these studies. On the other hand, studies by **Abdullah M. Krawagh, et al.2011** reported a relatively lower incidence rate of hypertension among Type 2 diabetes (41.9%) among Type 2 diabetes. Also, studies by **Al Nozha et al.2004** and **Famuyiwa et al. 1992** reported a relatively lower prevalence rate of hypertension among diabetes (34% and 25%, consecutively) compared to our study, nevertheless, the rate reported by these studies are still alarmingly high. Our study still much higher than the prevalence rate reported in these studies. Our study evidences in the correlations among macronutrient intake and blood pressure and lipid profile in table. This may be attributed to the lack of awareness of the complications of hypertension and hyperglycemia, in addition to an increased prevalence of other cardiovascular risk factors among Saudis.

Prevalence of diabetes complications: In this study, it addresses the rate of Type 2 diabetes complications in KAUH & Suleiman Fakaha setting as shown in figure(2) which illustrate the percent distribution of chronic diseases of diabetic patients according to gender, This study, like other studies from Saudi Arabia, showed most of male and female participants were have 2 or more of chronic disease (cancer , diabetes , CHD , obesity ,retinopathy , neuropathy, foot problem, hypertension , cholestrolaemia and liver disease) by percent (79,5% & 85%) respectively. Which is higher than that observed by another study in Al Ahsa district of Saudi Arabia to determine the prevalence of chronic complications and comorbidity among the type 2 diabetics attending the primary health care centers by (**Ataur Rahman Khan, et al. 2014)** which shown (72.72%) of the type 2 diabetic patients were suffering from one or more chronic complication among them (33.39%) were suffering from single, (25.29 %)**,** and in another studies in Malaysia (78%) (**Abougalambou et al., 2011**); in Libya (68.7%) (**Roaeid & Kadiki, 2011**) in India (60%) (**Vaz, et al, 2011**), China (**Liu, et al, 2010**) (52%) and Iran (51.9%) (**Afkhami-Ardekani & Zahmatkash, 2009**).However these differences may be due to different methodology and different epidemiological environment.

Unlike our Saudi study has found lower percentage of diabetic patients with single complication percent (9, 5% & 4.7%) for male and female respectively than other studies. However (79,5% & 85% with two or more of chronic disease) for male and female respectively, which higher than that observed in Pakistani study (**Shafiqur-Rahman, 2004)** (17% with single, 33% with two and 35% with three complications).However in Libyan

study (**Roaeid & Kadiki, 2011**), (36.7% had one, 20.1% had two and (11.9%) had three and more complication) and the same was true with Chinese study (**Liu et al., 2010**) where (30.5%) subjects had single category complication while (15.4% and 6.2 %) were suffering from three or more complications respectively. This difference might be due to associated co morbidity and the different duration of diabetes among the diabetic population. Many studies have found remarkable rural urban differences in the prevalence of type 2 diabetes and so also in its chronic complications (**Balasuriya, et al.2012; Zimmet et al., 1981**).

Table (1) Percent distribution of socioeconomic status of diabetic patients according to gender (N=200)

Characteristics	Male(73)		Female(127)		Total(200)	
	No.	%	No.	%	No.	%
Age						
<40	5	6.8	10	7.9	15	7.5
40-	8	11.0	23	18.1	31	15.5
50-	30	41.1	42	33.1	72	36.0
60-	19	26.0	36	28.3	55	27.5
70≥	11	15.1	16	12.6	27	13.5
Nationality						
Saudi Arabian	45	61.6	75	59.1	120	60.0
Non Saudi Arabian	28	38.4	52	40.9	80	40.0
Family Size						
<3	10	13.7	28	22.0	38	19.0
3-	29	39.7	46	36.2	75	37.5
6-	20	27.4	35	27.6	55	27.5
≥9	14	19.2	18	14.2	32	16.0
Housing						
private	15	20.6	20	15.8	35	17.5
rent	35	47.9	50	39.4	85	42.5
flat or Apartment	4	5.5	6	4.7	10	5.0
villa	4	5.5	4	3.1	8	4.0
private- flat	3	4.1	11	8.7	14	7.0
private- villa	2	2.7	6	4.7	8	4.0
rent- flat	10	13.7	30	23.6	40	20.0
Education						
illiterate	2	2.8	24	18.9	26	13.0
primary	13	17.8	55	43.3	68	34.0
Intermediate education	12	16.4	12	9.4	24	12.0
Secondary	20	27.4	15	11.8	35	17.5
university	26	35.6	21	16.6	47	23.5
Income by Saudi Reyal						
<1000	4	5.5	7	5.5	11	5.5
1000-3000	24	32.9	45	35.4	69	34.5
3000-6000	9	12.3	32	25.2	41	20.5
6000-10000	16	21.9	22	17.3	38	19.0
>10000	20	27.4	21	16.5	41	20.5

Table (2) Descriptive and percent distribution of blood level of glycosylated hemoglobin (HbA1c) of Diabetic Patients according to gender

Variables	Males(n=73)			Females(n=127)				
	(Mean ± SD)	Min	Max	(Mean ± SD)	Min	Max	F-value	p-value
HbA1c	9.43± .2.26	5.7	19.9	8.65 ±.2.05	5.19	14.5	6.18	0.014*
<7%(good)	6.13± .0.37	5.7	6.9	6.3 ±.0.54	5.19	7.0		
7.1-8%(fair)	7.53±. 0.30	7.1	8	7.61 ±.0.34	7.1	8.0		
8.1-9%(poor)	8.66± .0.34	8.1	9	8.6 ±.0.29	8.1	9		
>9(very poor)	10.88± .1.83	9.1	19.9	10.8 ±.1.5	9.1	14.5		
HbA1c	No.	%		No.	%		χ^2 value	p-value
<7%(good)	9	12.3		29	22.8		8.84	0.03*
7.1-8%(fair)	11	15.1		32	25.2			
8.1-9%(poor)	12	16.4		19	15.0			
>9(very poor)	41	56.2		47	37.0			

Table (3): Descriptive and percent distribution of Lipid Profile and of fasting blood glucose of Diabetic Patients according to gender

Variables	Males(n=73)			Females(n=127)				
	(Mean ± SD)	Min	Max	(Mean ± SD)	Min	Max	F-value	p-value
lipid profile								
Total Cholesterol	5.3± 4.12	1.95	28.5	4.31± 1.37	1.23	7.14	6.2	0.014*
Triglyceride	2.01± 1.01	0.63	4.55	1.53± 1.07	0.12	10.37	9.7	0.002**
LDL	2.28± 1.08	0.32	5.26	2.45± 0.98	0.5	5.26	1.33	NS
HDL	0.98± 0.49	0.21	3.05	1.24± 1.49	0.21	12.53	1.98	NS
Fasting blood glucose	10.28±7.16	1.51.5	59.0	9.28±3.53	2.37	26.4	1.73	NS
	No.	%		No.	%		χ^2 value	p-value
Total Cholesterol							4.7	0.05*
(0 -5.20)normal	51	69.9		89	70.1			
(≥5.21)	22	30.1		38	29.9			
	No.	%		No.	%		χ^2 value	p-value
Triglyceride							4.7	0.05*
(0.30 -2.30)	51	69.9		89	70.1			
(≥2.31)	22	30.1		38	29.9			
LDL								
(0 -3.75)	49	67.1		88	69.3			
(≥3.76)	24	32.9		39	30.7			
HDL								
(.9 – 1.55)	52	71.2		95	74.8			
(≥1.56)	21	28.8		32	25.2			

Table (4) Descriptive and percent distribution of blood pressure of Diabetic Patients according to gender

Variables	Males(n=73)			Females(n=127)				
	(Mean ± SD)	Min	Max	(Mean±SD)	Min	Max	F-value	pvalue
Blood pressure (BP)								
Systolic Blood Pressure	137.3± 22.1	90	214	145.9±24.5	94	214	6.17	0.01*
≥130mmHg(Hypertension)	148.9±16.15	130	214	156.6±18.6	130	214		
<130 normal	113.54±10.4	90	125	115.7± 8.7	94	128		
Systolic Blood Pressure	No.	%		No.	%			
≥130mmHg(Hypertension)	49	67.1		94	74.0			
<130 normal	24	32.9		33	26.0			
Diastolic Blood Pressure	73.9± 15.1	36	112	79.1±15.4	20	120	5.27	0.023*
≥80mmHg(Hypertension)	88.0± 6.87	80	112	89.7±11.2	80	120		
<80normal	64.14± 10.9	36	79	66.9±9.18	20	79		
Diastolic Blood Pressure	No.	%		No.	%			
≥80mmHg(Hypertension)	30	41.1		68	53.5			
<80normal	43	58.9		59	46.5			

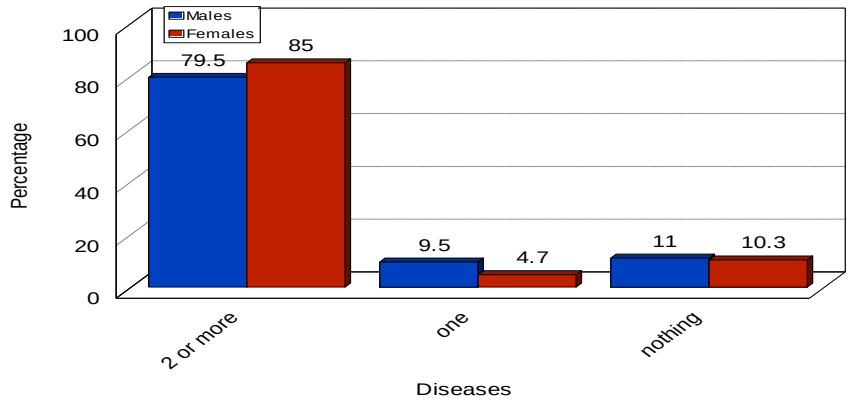

Fig (2): Percent distribution of chronic diseases of diabetic patients according to gender

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